

# **KALEIDO-MODULAR-X**

HIGH PICTURE COUNT, ULTRA-FLEXIBLE AND SCALABLE  
MULTIVIEWER

## **Hardware Description & Installation Manual**

M933-9802-111

2017-02-01



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Title	Kaleido-Modular-X Hardware Description & Installation Manual
Part Number	M933-9802-111
Revision	2017-02-01, 16:01

## Electrostatic Discharge (ESD) Protection



Electrostatic discharge occurs when electronic components are improperly handled and can result in intermittent failure or complete damage adversely affecting an electrical circuit. When you remove and replace any card from a frame always follow ESD-prevention procedures:

- Ensure that the frame is electrically connected to earth ground through the power cord or any other means if available.
- Wear an ESD wrist strap ensuring that it makes good skin contact. Connect the grounding clip to an *unpainted surface* of the chassis frame to safely ground unwanted ESD voltages. If no wrist strap is available, ground yourself by touching the *unpainted* metal part of the chassis.
- For safety, periodically check the resistance value of the antistatic strap, which should be between 1 and 10 megohms.
- When temporarily storing a card make sure it is placed in an ESD bag.
- Cards in an earth grounded metal frame or casing do not require any special ESD protection.

## Protection contre les décharges électrostatiques (DES)



Une décharge électrostatique peut se produire lorsque des composants électroniques ne sont pas manipulés de manière adéquate, ce qui peut entraîner des défaillances intermittentes ou endommager irrémédiablement un circuit électrique. Au moment de remplacer une carte dans un châssis, prenez toujours les mesures de protection antistatique appropriées :

- Assurez-vous que le châssis est relié électriquement à la terre par le cordon d'alimentation ou tout autre moyen disponible.
- Portez un bracelet antistatique et assurez-vous qu'il est bien en contact avec la peau. Connectez la pince de masse à une *surface non peinte* du châssis pour détourner à la terre toute tension électrostatique indésirable. En l'absence de bracelet antistatique, déchargez l'électricité statique de votre corps en touchant une surface métallique *non peinte* du châssis.
- Pour plus de sécurité, vérifiez périodiquement la valeur de résistance du bracelet antistatique. Elle doit se situer entre 1 et 10 mégohms.
- Si vous devez mettre une carte de côté, assurez-vous de la ranger dans un sac protecteur antistatique.
- Les cartes qui sont reliées à un châssis ou boîtier métallique mis à la terre ne nécessitent pas de protection antistatique spéciale.

## Recycling

Visit [www.grassvalley.com](http://www.grassvalley.com) for recycling information.

## Certification and Compliance

### Electromagnetic Compatibility



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

**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.



This equipment has been tested and found to comply with the requirements of the EMC directive 2014/30/EU:

- EN 55022 Class A Radiated and conducted emissions
- EN 61000-3-2 Limits for harmonic current emissions
- EN 61000-3-3 Limitation of voltage fluctuations and flicker
- EN 61000-4-2 Electrostatic discharge immunity
- EN 61000-4-3 Radiated, radio-frequency, electromagnetic field immunity
- EN 61000-4-4 Electrical fast transient immunity
- EN 61000-4-5 Surge transient immunity
- EN 61000-4-6 Conducted disturbances immunity
- EN 61000-4-11 Voltage dips, short interruptions and voltage variations immunity

### Environmental Compliance

部件名称 Part name	有毒有害物质或元素 (Toxic or hazardous substances and elements)					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr6)	多溴联苯 (PBB)	多溴二苯 (PBDE)
电缆及电缆组件 Cables and cable assemblies	X	O	O	O	O	O
电路模块 Circuit modules	X	O	O	O	O	O
金属零件 Metal parts	X	O	O	O	O	O

O: 表示该有毒有害物质在该部件所有均质材料中的含量均在 GB/T 26572-2011 规定的限量要求以下。

O: Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in GB/T 26572-2011.

**X:** 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572-2011 规定的限量要求。

**X:** Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials for this part is above the limit requirement in GB/T 26572-2011.

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# toc

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# 1 Installation

The Kaleido-Modular-X is a flexible and scalable 4K- and IP-ready multiviewer for TV production optimized for the space, power and weight considerations found in studios and outside broadcast trucks.

## Introduction

The Kaleido-Modular-X supports up to 64 video inputs, and up to four multiviewer outputs.

## Features

### Kaleido-Modular-X features

Space-efficient modular design	Modular design offers wide range of input/output configurations, with optional separation of input and output stages for streamlined, cost-saving cabling and optimization of space usage. Standard Densité frame housings enable <i>mix-and-match</i> capability of multiviewers with signal processing modules, URS frame reference, and GPI I/O via GPI-1501 cards.
Unique FlexBridge technology	Flexible coax cable bridging between input modules, and to the output modules. Expand your multiviewer beyond the number of slots within a single frame by bridging additional input or output modules housed in a different frame. Install the input stage next to the router and the output stage next to the displays to eliminate the HDMI extenders. More robust than cascading, with bypass relay protection to remain on air even when removing a module.
Unmatched image quality	Unmatched multiviewer picture quality, and superior on-screen graphics. Simultaneous HDMI and SDI outputs at full 1080p 50/60Hz resolution on up to four multiviewer displays. Input signal processing up to 3 Gb/s signal formats. Natively capable of handling 4K UHD quad-link sources seamlessly recombining them into a pixel perfect image.
Robust and serviceable design	Hot swappable cards with unique auto-recovery feature, which provides fast automated recovery after a <i>cold</i> spare is inserted. 4 RU, 3 RU and 1 RU Densité frame housings, with redundant power supplies, and quiet cooling.
Multi-room, multi-user oriented	A single Kaleido-Modular-X multiviewer can be used to share sources across multiple rooms or operator positions, with fully independent displays, audio monitoring and control panels dedicated to each operator.

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**Kaleido-Modular-X features (continued)**

Seamless control across multiple multiviewers	Kaleido multiviewers can be <i>mixed and matched</i> to create a seamless monitoring system across a facility. Choice of control options such as the standalone Kaleido-RCP2 or RCP-200 panels, integrated with router control systems and panels, iControl, and third-party control systems.
Superior layout flexibility	Unlimited signal repetition at any sizes across all displays, without blocking, grouping restrictions or bandwidth restrictions.
Router and switcher integration	Fast and easy NVISION router to multiviewer installation with M3 integration cable, which also offers space and weight reductions. The Kaleido-Modular-X integrates with the NVISION router family, and third-party routers and production switchers for tally and label/alias source management. Multiple multiviewers can be controlled from a single control panel.
Scalable for the largest systems	Virtually limitless multiviewer system expansion with upstream NVISION router. A combined multiviewer/router system may include up to 1152 video inputs, and 288 multiviewer outputs.

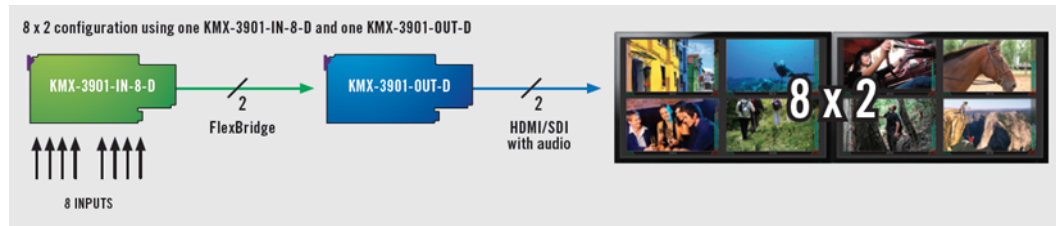
## Available Options

- Second power supply for redundant power security
- GPI-1501 GPI I/O module
- REF-1801 reference card
- Rear connector panels compatible with the M3 3 Gbps router integration cable (two models available: one for the KMX-3901-IN-16-D, one for the KMX-3901-IN-16-Q input cards)
- Double rear connector panels for the KMX-3901-IN input cards (five models available), compatible with the Densité 3+ FR4, and Densité 3+ FR1 housing frames only
- Single rear connector panel for the KMX-3901-OUT output cards, compatible with the Densité 3+ FR4, and Densité 3+ FR1 housing frames only

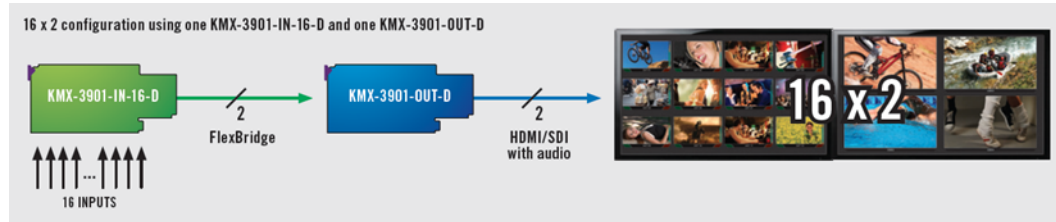
## Overview of the Kaleido-Modular-X System

Kaleido-Modular-X modules are interconnected using standard coax cables. FlexBridge connections are used to connect an input card to an output card, or to another input card as shown in the 32×4 configuration below. Up to four input and two output modules can be combined for multiviewer sizes of up to 64×4.

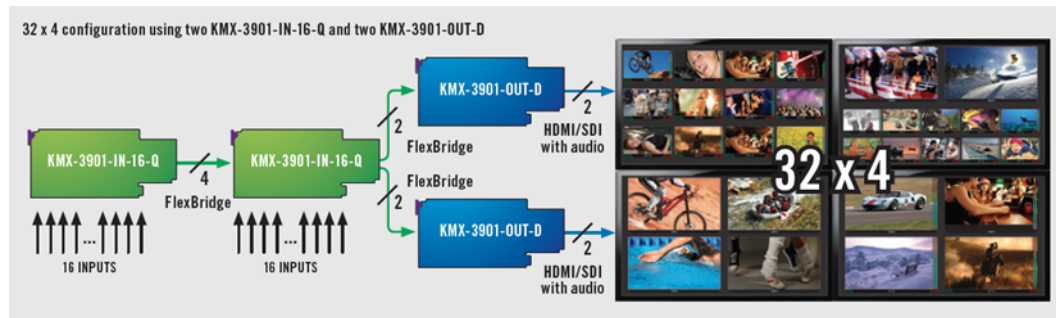
- KMX-3901-IN SDI input modules are available with two or four FlexBridge connectors for bridging to one or two KMX-3901-OUT output modules.
- KMX-3901-IN-IP input/output modules with two FlexBridge connectors for bridging to KMX-3901-OUT output heads are also available.
- Two FlexBridge connections per KMX-3901-OUT are required.



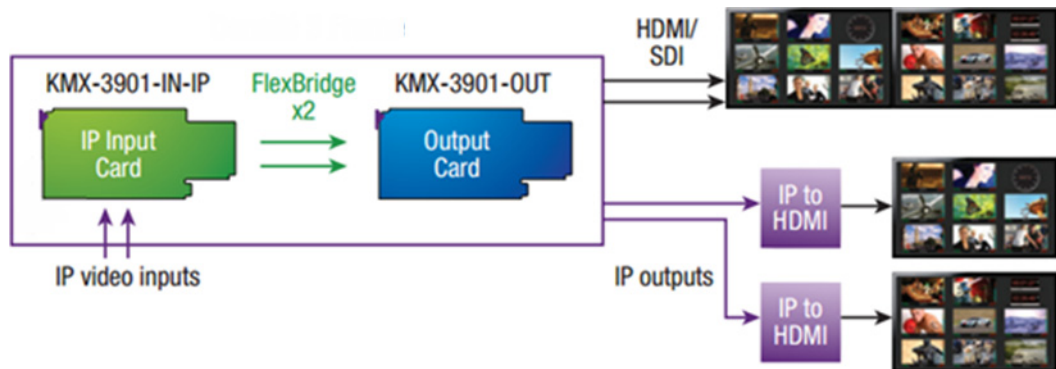
*Kaleido-Modular-X configuration with 8 inputs and 2 outputs*



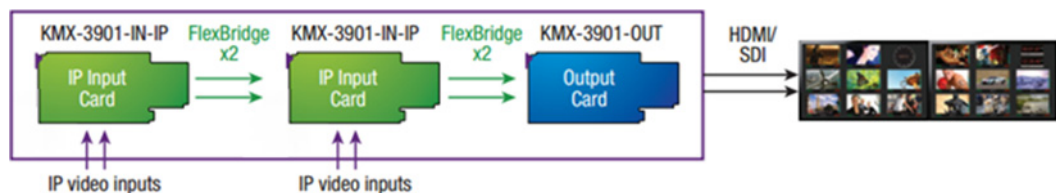
*Kaleido-Modular-X configuration with 16 inputs and 2 outputs*



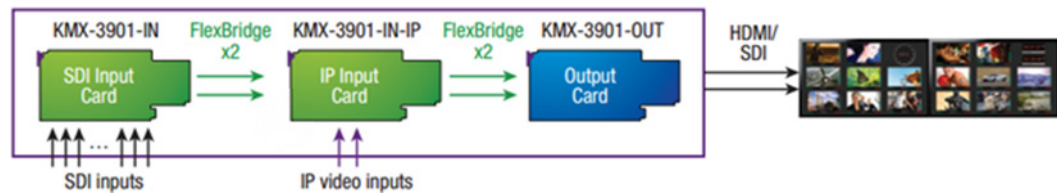
*Kaleido-Modular-X configuration with 32 inputs and 4 outputs*



*Kaleido-Modular-X configuration with IP inputs, 2 IP outputs, and 2 HDMI/SDI outputs*

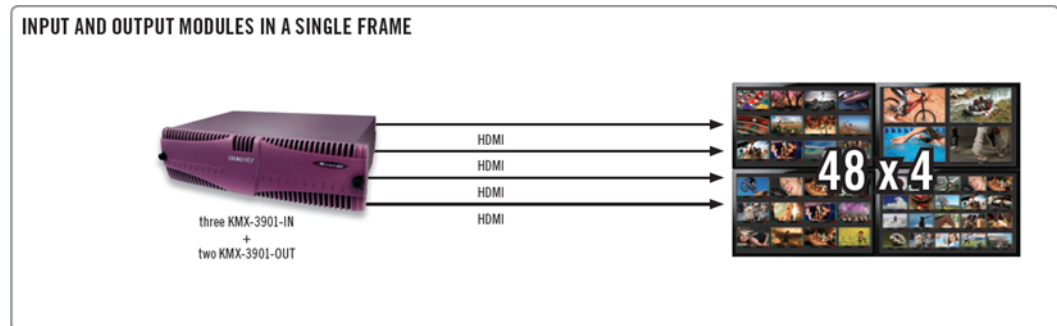


*Kaleido-Modular-X configuration with 2 IP input/output modules and 2 HDMI/SDI outputs*

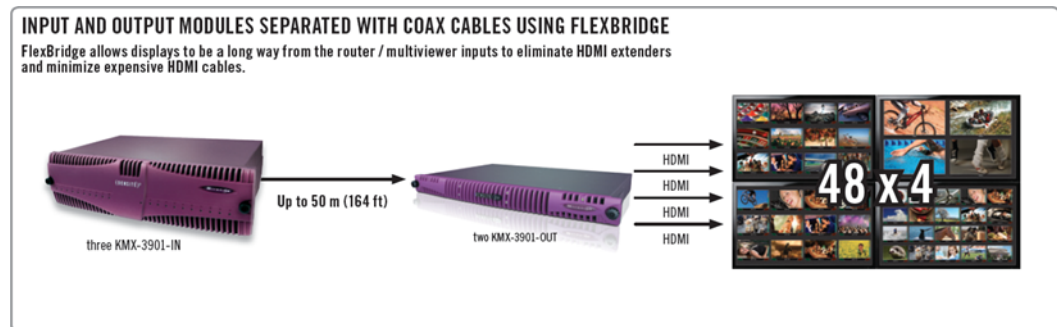


*Kaleido-Modular-X configuration supporting both SDI, and IP inputs, with 2 HDMI/SDI outputs*

Kaleido-Modular-X input and output modules can be housed in the same physical Densité frame, or in multiple frames, allowing expansion beyond the number of slots available within a single frame.



*Kaleido-Modular-X single-frame configuration with 48 inputs and 4 outputs*



*Kaleido-Modular-X distributed configuration with 48 inputs and 4 outputs*

SDI Input module parts	Description
KMX-3901-IN-8-D	8 input HD/SD-SDI and 3 Gbps input module with dual FlexBridge outputs. This card's revisions 300–310, and 400 are not fully compatible with the Densité 3+ FR4 frame (see <a href="#">Notes</a> , on page 19).
KMX-3901-IN-8-D-3TRP	Triple rear connector panel with bypass relay.
KMX-3901-IN-8-D-3+DRP	Double rear connector panel with bypass relay. Compatible with Densité 3+ FR1, and Densité 3+ FR4 only.
KMX-3901-IN-16-D	16 input HD/SD-SDI and 3 Gbps input module with dual FlexBridge outputs. This card's revisions 200, 201, 300–307, and 400 are not fully compatible with the Densité 3+ FR4 frame (see <a href="#">Notes</a> , on page 19).

SDI Input module parts	Description
KMX-3901-IN-16-D-3QRP	Quadruple rear connector panel with bypass relay.
KMX-3901-IN-16-D-3+DRP	Double rear connector panel with bypass relay. Compatible with Densité 3+ FR1, and Densité 3+ FR4 only.
KMX-3901-IN-16-Q	16 input HD/SD-SDI and 3 Gbps input module with quad FlexBridge outputs. Convertible to a 4K UHD prescaler. This card's revisions 300–307, and 400 are not fully compatible with the Densité 3+ FR4 frame (see <a href="#">Notes</a> , on page 19).
KMX-3901-IN-16-Q-3PRP	Quintuple rear connector panel with bypass relay.
KMX-3901-IN-16-Q-3+DRP	Double rear connector panel with bypass relay. Compatible with Densité 3+ FR1, and Densité 3+ FR4 only.

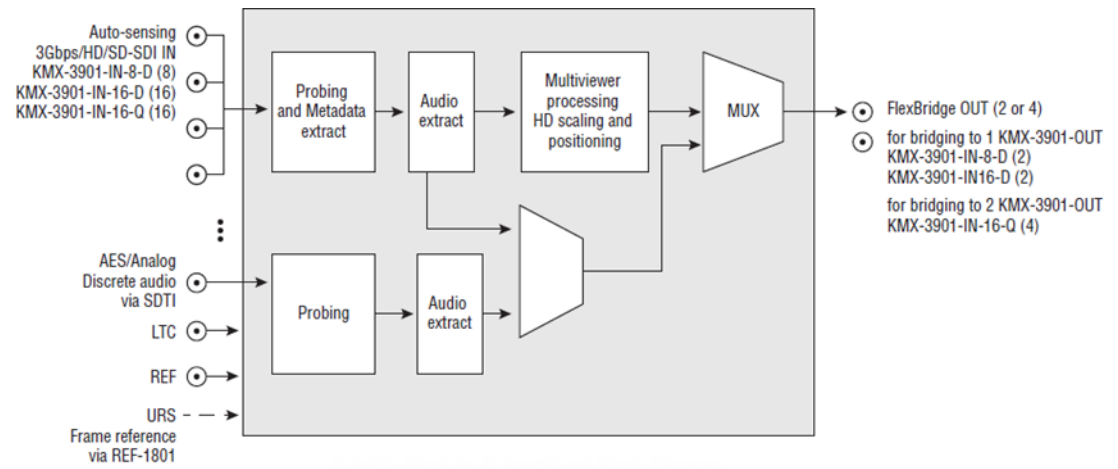
IP module parts	Description
KMX-3901-IN-IP-D	10 GigE IP input module for SMPTE-2022-6 (3G/HD/SD) sources. This module comprises <i>two cards</i> : a KMX-3901-IN-8-D input card, and an IPG-3901 SDI/IP gateway card. The KMX-3901-IN-8-D card's revisions 200, 201, 300–307, and 400 are not fully compatible with the Densité 3+ FR4 frame (see <a href="#">Notes</a> , on page 19). <i>KMX-IN-8-OPT-3GBPS license required for 3 Gb/s.</i>
KMX-3901-IN-IP-D-3+TRP	Triple rear connector panel. Compatible with Densité 3+ FR4 only.

M3 module parts	Description
KMX-3901-IN-M3-D-3QRP	Quadruple rear connector panel with bypass relay for the M3 cable. Use with KMX-3901-IN-16-D.
KMX-3901-IN-M3-Q-3PRP	Quintuple rear connector panel with bypass relay for the M3 cable. Use with KMX-3901-IN-16-Q.
KMX-3901-IN-M3-D-3+DRP	Double rear connector panel with bypass relay for the M3 cable. Use with KMX-3901-IN-16-D. Compatible with Densité 3+ FR1, and Densité 3+ FR4 only.
KMX-3901-IN-M3-Q-3+DRP	Double rear connector panel with bypass relay for the M3 cable. Use with KMX-3901-IN-16-Q. Compatible with Densité 3+ FR1, and Densité 3+ FR4 only.

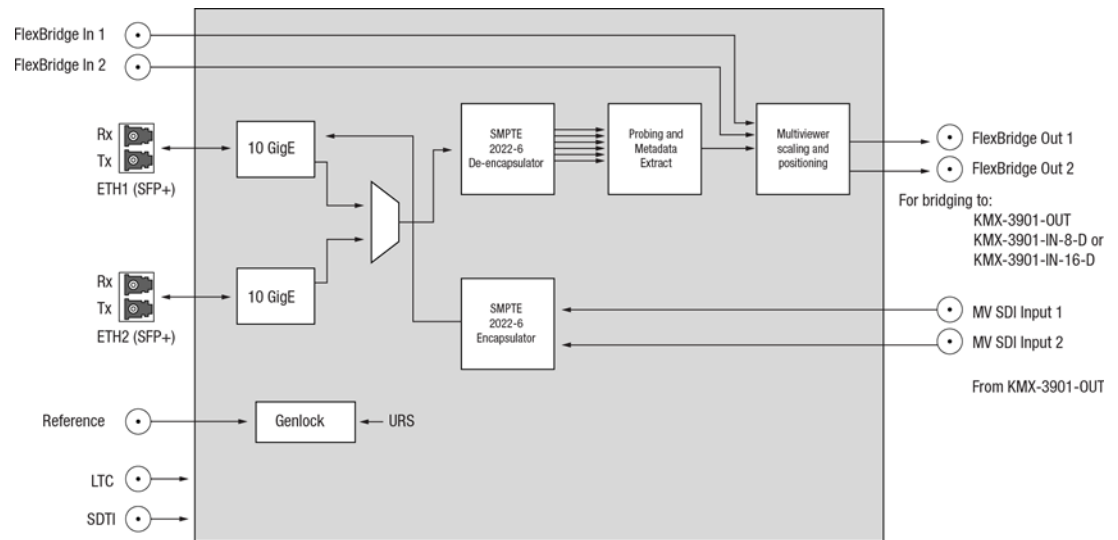
Output module parts	Description
KMX-3901-OUT-S	Single head output module, upgradable to dual head outputs.
KMX-3901-OUT-D	Dual head output module.
KMX-3901-OUT-D-3DRP	Double rear connector panel.
KMX-3901-OUT-D-3+SRP	Single rear connector panel. Compatible with Densité 3+ FR1, and Densité 3+ FR4 only.

## Installation

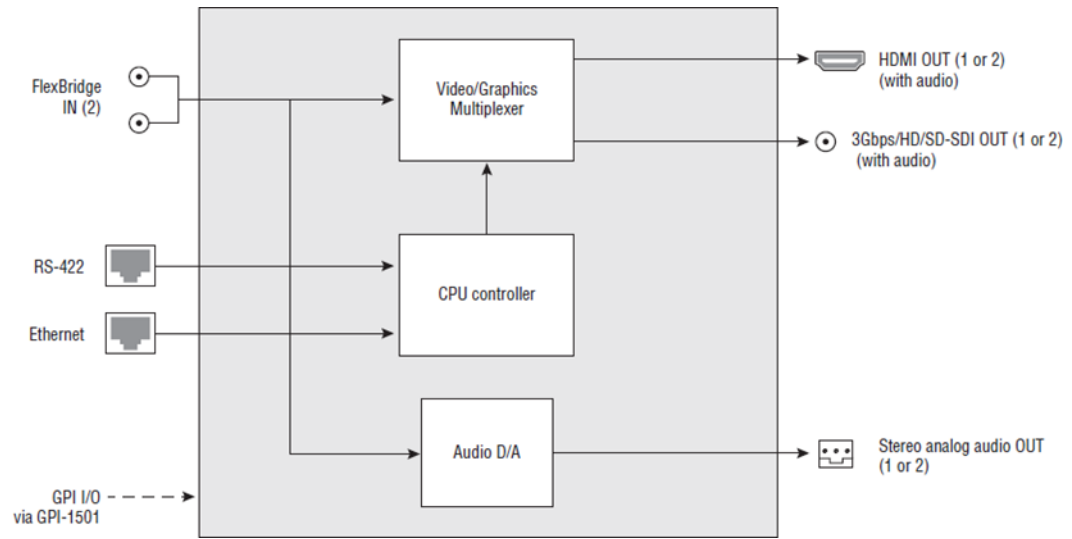
### Overview of the Kaleido-Modular-X System



*Kaleido-Modular-X functional block diagram: KMX-3901-IN input modules (KMX-3901-IN-8-D, KMX-3901-IN-16-D, and KMX-3901-IN-16-Q)*



*Kaleido-Modular-X functional block diagram: KMX-3901-IN-IP input/output modules*

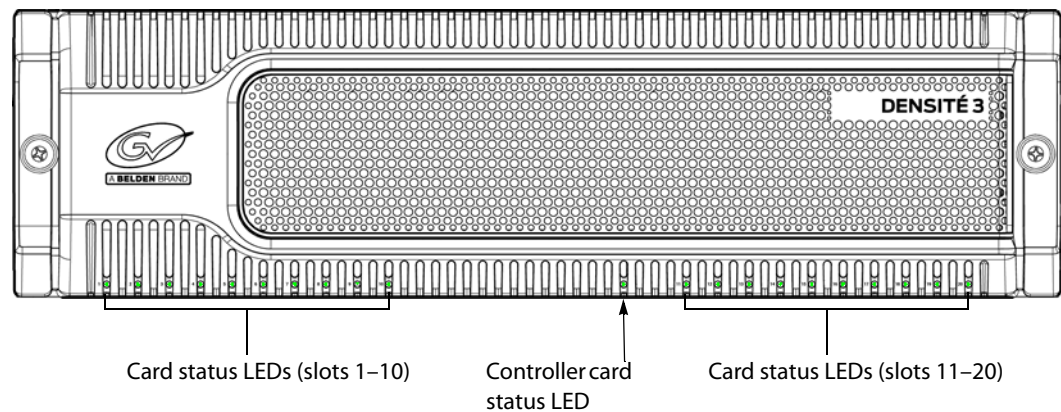


*Kaleido-Modular-X functional block diagram: KMX-3901-OUT output modules (KMX-390-OUT-D, and KMX-3901-OUT-S)*

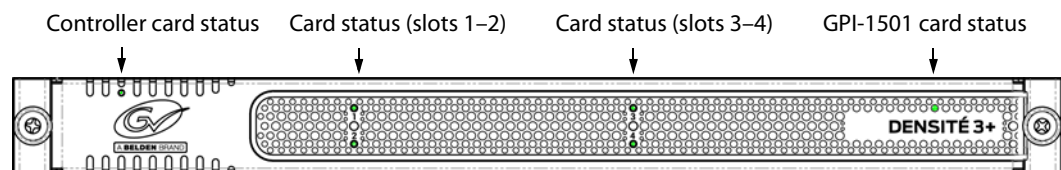
## Physical Interface

### Densité 3 and Densité 3+ FR1 frame interface

When the frame door is closed, the status LED on each of the cards in the frame is visible via a light pipe in the door. No other controls or indicators are present.



*Front of Densité 3 frame*



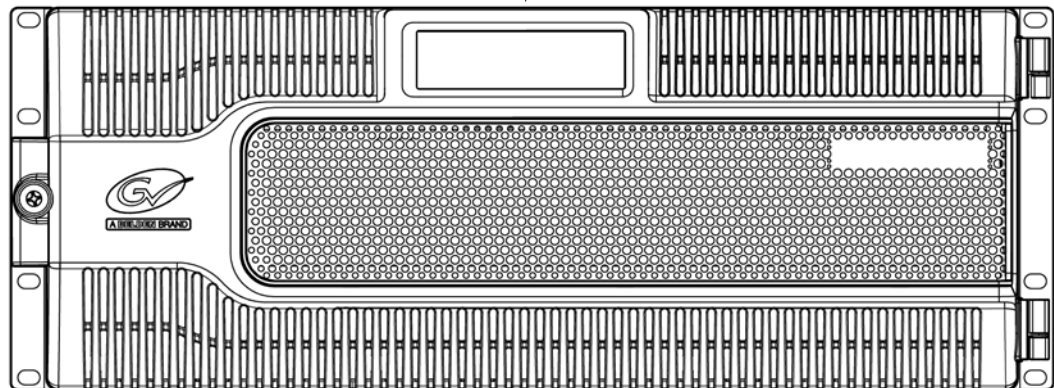
*Front of Densité 3+ FR1 frame*



### Densité 3+ FR4 frame interface

When the frame door is closed, the controller card touch screen is exposed through an opening in the top center of the door. All other front elements are concealed by the door.

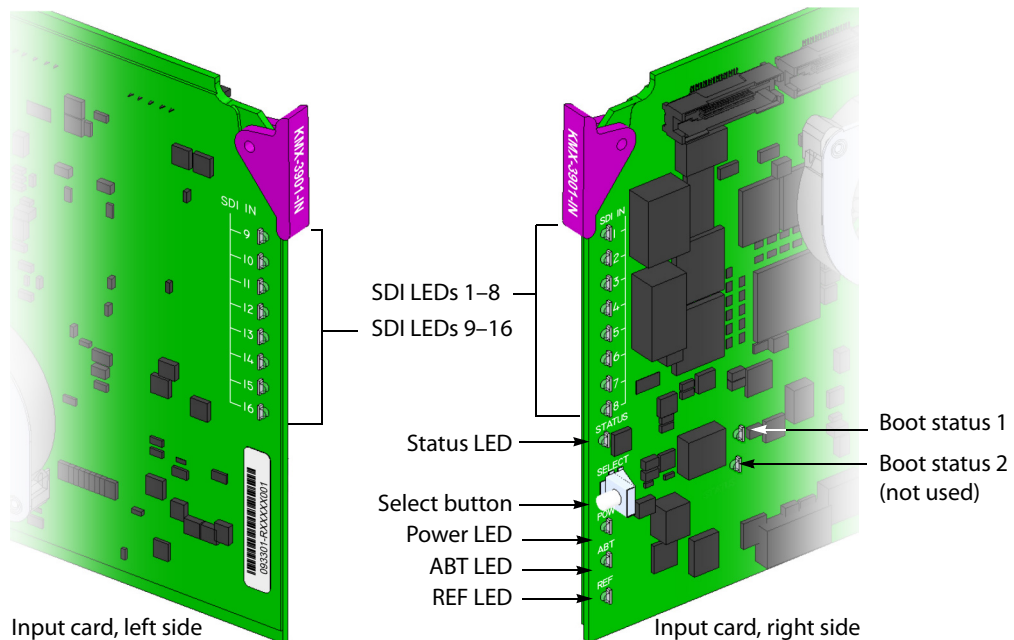
Densité 3+ CPU-ETH3 local control panel  
with controller and card status indicators



Front of Densité 3+ FR4 frame

### Front card-edge interface

The front card edges of the Kaleido-Modular-X input and output modules incorporate several operational elements. See [KMx-3901-IN Input Card Interface](#) on page 56, [KMx-3901-IN-IP Input/Output Card Interface](#), on page 59, [4K UHD Prescaler Card Interface](#), on page 59, and [KMx-3901-OUT Output Card Interface](#), on page 60, for more information.



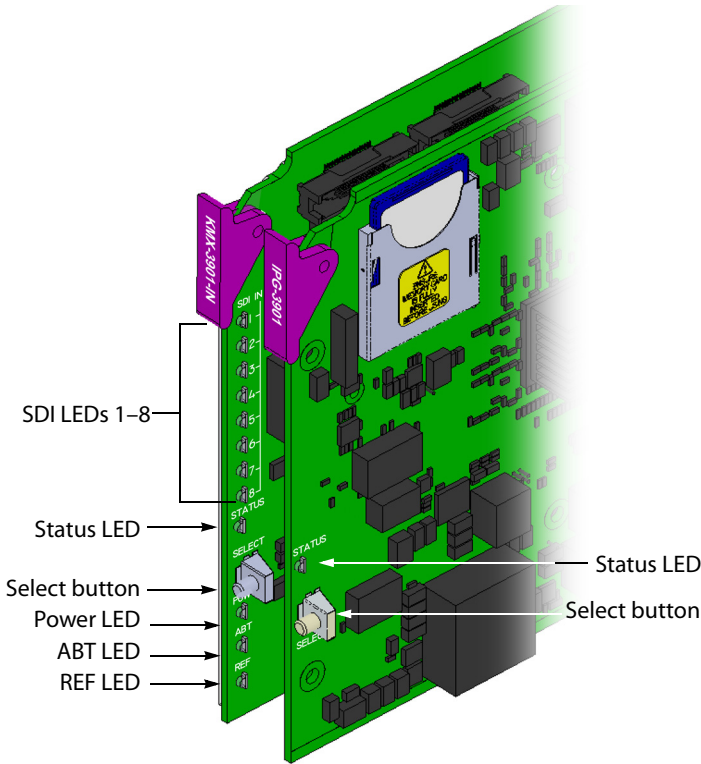
Input card, left side

Input card, right side

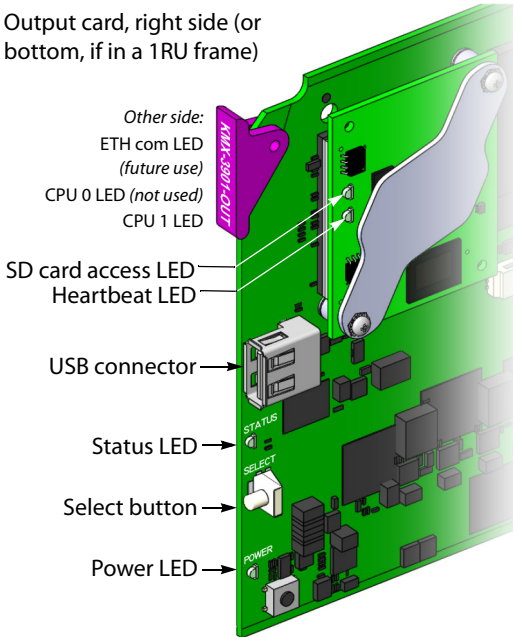
Summary view of the interface on the left side, and on the right side of a KMx-3901-IN SDI input card



The KMX-3901-IN-IP comprises two front modules: KMX-3901-IN-8-D, on the left, and IPG-3901, on the right. Each module has its own Select button and Status LED.



*Summary view of the interface on the right side of a KMX-3901-IN-IP input/output module*



*Summary view of the interface on a KMX-3901-OUT output card edge*

## Mechanical Installation

### Unpacking

Make sure the following items have been shipped with your Kaleido-Modular-X order. If any of these are missing, contact your distributor or Grass Valley (see [Contact Us](#), on page 96).

- 1–4 KMX-3901-IN input cards with matching rear modules, as per order (see [SDI Input module parts](#), on page 12)
- 1–4 KMX-3901-IN-IP input/output cards with matching rear modules, as per order (see [IP module parts](#), on page 13)
- 1–4 KMX-3901-IN-M3 rear modules, M3 cables, and NVISION router-side rears, as per order (see [M3 module parts](#), on page 13)
- 1 or 2 KMX-3901-OUT output cards, with rear modules, as per order (see [Output module parts](#), on page 13)
- 1–16 12-inch FlexBridge cables (DIN-DIN coax cables), as per order

#### Number of FlexBridge cables for typical configurations (SDI inputs)

Model	FlexBridge	Model	FlexBridge	Model	FlexBridge
8 × 1	1	24 × 1	2	48 × 2	6
8 × 2	2	24 × 2	4	48 × 4	12
16 × 1	1	32 × 2	4	64 × 2	8
16 × 2	2	32 × 4	8	64 × 4	16
16 × 4	4				

#### Number of FlexBridge cables for IP-only configurations

Number of IP input/output cards	1	2	3	4
FlexBridge cables	2	4	6	8

- 2 WECO analog audio mating connectors for each output card
- 2 serial port adapters (1 with straight cabling and 1 with crossover cabling — see [RS-422 connection diagram](#), on page 24) for every output card ordered with a double rear connector panel

Part number	Adapter cabling	RS-422 pinout at the DE-9P connector
1737-3000-102	Straight	Controller (SMPTE master) mode
1792-3700-100	Crossover	Tributary (SMPTE slave) mode

**Note:** The single rear connector panel KMX-3901-OUT-D-3+SRP does not have a serial port. To support a serial device, your Kaleido-Modular-X system must have at least one output card with a double rear connector panel (KMX-3901-OUT-D-3DRP).

- The Kaleido-Modular-X Quick Start Guide, which provides detailed instructions on installing cards and their associated rear panels for your initial deployment

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**Note:** In line with our commitment to environmental preservation, only the Quick Start Guide for your multiviewer model, and some ancillary documents (e.g., welcome letters, warranty cards) are distributed in printed form. You can obtain the latest version of the Kaleido-X User's Manual, Quick Start guides and hardware reference manuals for all multiviewer models, as well as the Release Notes, from the *Documentation Library* section of Grass Valley's website. (Refer to the *Documentation* section of the Release Notes for a complete list.) Software, drivers, sample databases, and useful data are available from the *Downloads* section of the website.

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In addition to the above, you need the following (not supplied):

- At least one Densité 3, Densité 3+ FR4, or Densité 3+ FR1 housing frame

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#### Notes

- Early revisions of the KMX-3901-IN input cards (see [SDI Input module parts](#), on page 12) are *not* fully compatible with the Densité 3+ FR4 frame. These cards are unable to properly extract the URS signal from the frame. Should you decide to rely on the card's external reference input (instead of the URS signal), to genlock your signals, the card will operate properly, however URS time code extraction will be unreliable. Grass Valley can modify these cards if needed (see [Contact Us](#), on page 96).
  - Input cards with a *double* rear connector panel are compatible with Densité 3+ FR4, and Densité 3+ FR1 only.
  - KMX-3901-IN IP input/output cards and their associated rear connector panel are compatible with Densité 3+ FR4 only.
- 
- For a quad-head system with 64 SDI inputs, or if you wish to have separate input and output stages, then you will also need a separate Densité 3, Densité 3+ FR4, or Densité 3+ FR1 frame to house your output cards

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**Note:** Output cards with a *single* rear connector panel (KMX-3901-OUT-D-3+SRP) are compatible with Densité 3+ FR4, and Densité 3+ FR1 only.

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- A Densité CPU-ETH2, or CPU-ETH3 frame controller card for each housing frame
- A GPI-1501 GPI I/O module (*optional*)
- A REF-1801 HD/SD frame reference module (*optional — not needed if the frame controller is a CPU-ETH3*)
- Up to 4 displays
- A dedicated 100Base-T Ethernet switch with enough ports for the KMX-3901-OUT output cards, the housing frames' CPU-ETH2, or CPU-ETH3 controller cards, client PCs, Kaleido-RCP2 units, and Audio Bridge Terminals
- Access to a separate network, for the KMX-3901-IN IP input/output modules' IPG-3901 card (if any) to connect to data streams
- Client PC

- Cables (to connect your multiviewer to video sources, to displays, and to the network):

Cable type	Purpose
CAT-5	For Ethernet connectivity
Display cables	<p>To connect the multiviewer's HDMI outputs to displays:</p> <ul style="list-style-type: none"><li>• Standard HDMI cables</li><li>• Extension modules—for example, Grass Valley's DXF-200 DVI/HDMI Optical Extension System:<ul style="list-style-type: none"><li>• part number DXF-200-B, for output cards with a double rear connector panel (KMX-3901-OUT-D-3DRP)</li><li>• part number DXF-200-C, for output cards with a single rear connector panel (KMX-3901-OUT-D-3+SRP)</li></ul></li></ul> <p>To connect the multiviewer's SDI outputs to displays:</p> <ul style="list-style-type: none"><li>• Standard coaxial cables with DIN 1.0/2.3 connectors</li><li>• SDI to HDMI 2.0 (or SDI to DisplayPort) converter—for example, AJA's Hi5-4K Mini-Converter (firmware version 2.2 or later)</li></ul>
Video cables	Standard coaxial cables with DIN 1.0/2.3 connectors

**Note:** On all Kaleido multiviewers, the network adapters are set to auto-negotiate. By default, the connection speed and duplex mode will be set automatically based on the corresponding port settings on the switch.

## Installation in the Densité Frame

The KMX-3901-IN input cards and the KMX-3901-OUT output cards can be installed in a Densité 3, Densité 3+ FR1, or Densité 3+ FR4 frame, depending on the rear connector panels you ordered. The KMX-3901-IN IP input/output cards and their associated rear connector panels must be installed in a Densité 3+ FR4 frame. It is not necessary to switch off the frame's power when installing or removing a card. For detailed instructions on installing cards and their associated rear panels for initial deployment, please consult the Kaleido-Modular-X Quick Start Guide that shipped with your system.

## Ventilation

In a **Densité 3** frame, ventilation for the frame is provided by a fan mounted in the center of the rear panel. In a **Densité 3+ FR1** frame, ventilation is provided by two fans, one located at each end of the rear panel. In a **Densité 3+ FR4** frame, ventilation is provided by two fan assemblies, each containing three fans, located on each side in the top section of the rear panel. The fans draw air through the frame and exhaust it to the rear. Ventilation slots in the front panel allow air to flow into the frame, and an air filter is mounted in the frame door.

### IMPORTANT

To ensure proper cooling, the front panel of the Densité frame must be closed at all times when cards are installed and operating.

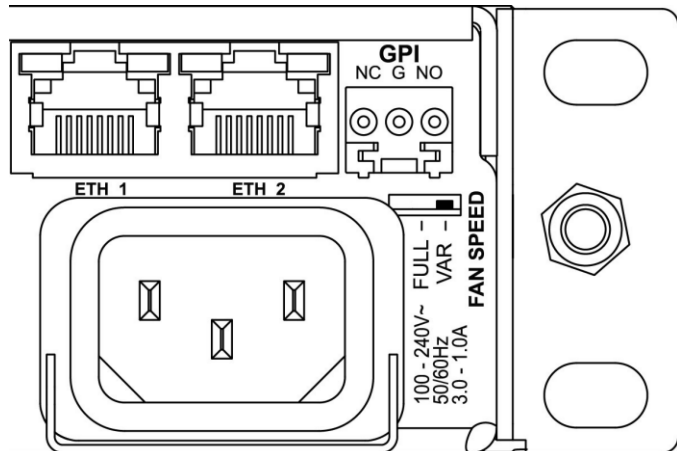
The frame-mounted fans are supplemented by thermostatically-controlled fans mounted in each power supply. They are not field-serviceable.

Ensure that the front panel ventilation slots are not obstructed. Check the air filter regularly to ensure that it is not plugged up with debris. The filter may be cleaned by rinsing in warm water. Dry thoroughly before replacing it in the frame. See [Replacing the Air Filter](#) on page 53, for details.

### Densité 3+ FR1 fan speed control

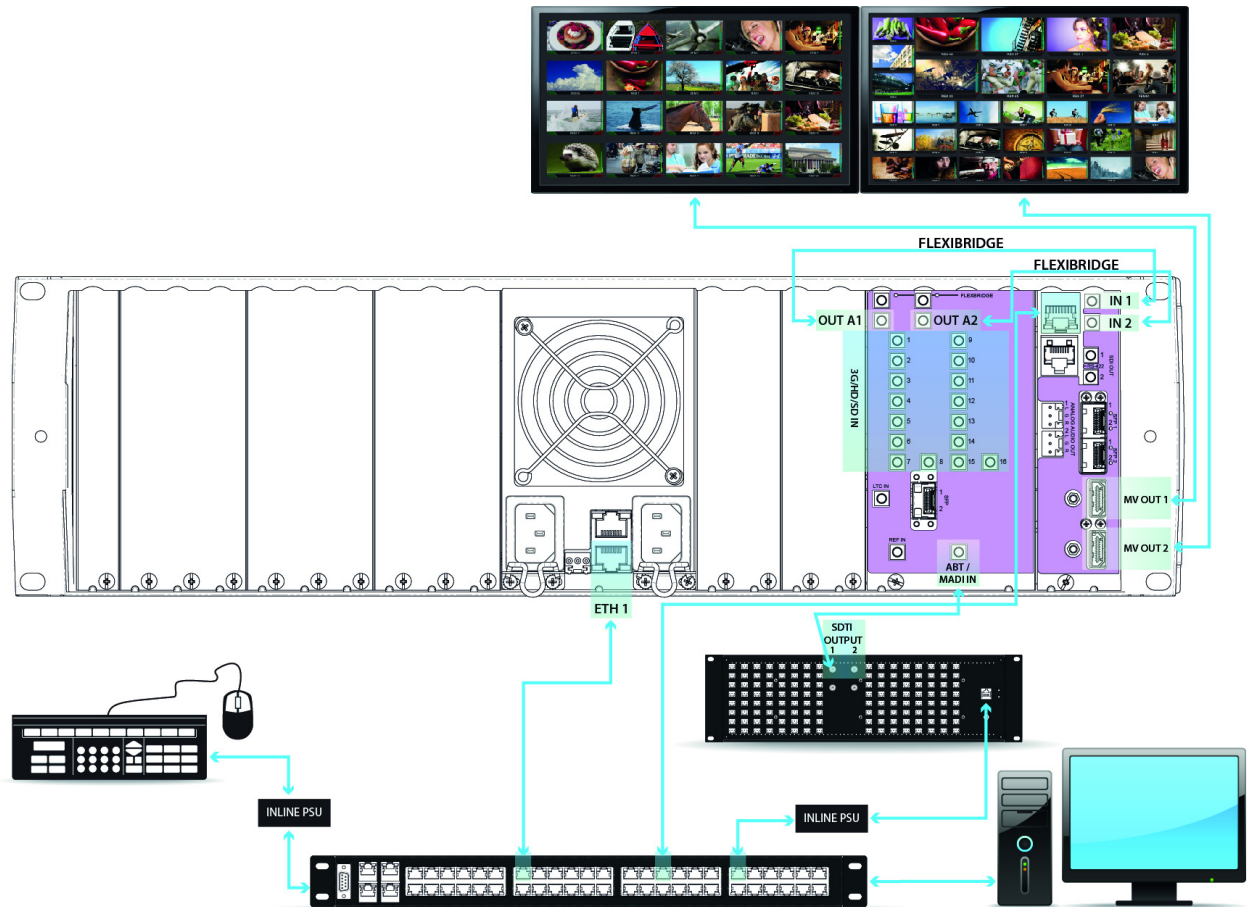
On the Densité 3+ FR1 frame's rear panel, a slider switch beside the controller-side fan allows the speed of the two rear-panel fans to be specified by the user. Two settings are provided:

- FULL – The fans operate at top speed at all times.
- VAR – The fan speed is managed by the controller card, which is monitoring the temperature inside the frame. This is the factory-default setting, and it is appropriate for most situations.



Use a small tool (e.g., a pen tip or a small screwdriver) to change the switch setting.

## Cabling

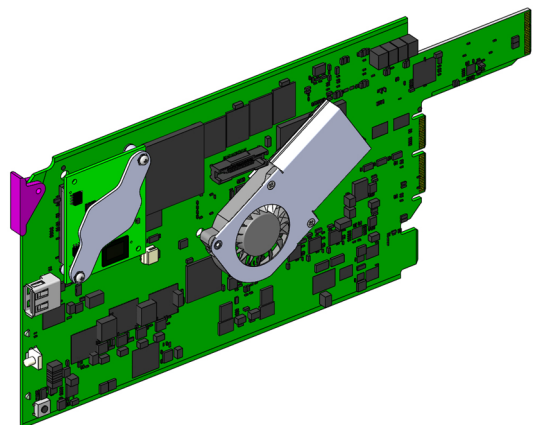


Cabling diagram, showing rear view of a Kaleido-Modular-X 16 × 2 system

## Signalling

### Output Cards

The KMX-3901-OUT cards are output modules that can be installed in a Densité 3, Densité 3+ FR1, Densité 3+ FR4 or Densité 3 mini frame, to be part of a Kaleido-Modular-X multiviewer system. Within a Kaleido-Modular-X system an output card can be designated as either *Output A*, or *Output B*. They are dual-head output cards, meaning that they support two independent outputs called *Head 1* and *Head 2*. Each output card is complemented



by a rear panel (KMx-3901-OUT-D-3DRP, or KMx-3901-OUT-D-3+SRP) that holds all input and output connectors associated with the card.

**Note:** Output cards with a single rear connector panel (KMx-3901-OUT-D-3+SRP) are compatible with Densité 3+ FR1, and Densité 3+ FR4 only.

In Kaleido-Modular-X systems with two cards, one card is considered the *master* card, and the others is the *slave* card. If the master card is removed, the other output card will take on the master role automatically.

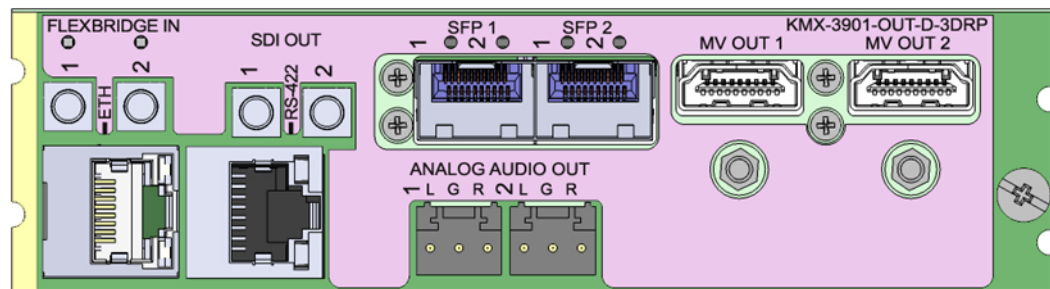
An output card is connected to the other cards in the Kaleido-Modular-X system to which it belongs through the housing frame's internal midplane (for cards housed in the same frame), in addition to Ethernet, and FlexBridge connections.

External connections to an output card are made through connectors that are found in two locations:

- on the rear panel (see [KMx-3901-OUT-D-3DRP rear panel connections](#), below, and [KMx-3901-OUT-D-3+SRP rear panel connections](#), on page 25)
- on the front card edge (see [KMx-3901-OUT front card-edge USB connector](#), on page 27)

### KMx-3901-OUT-D-3DRP rear panel connections

The KMx-3901-OUT-D-3DRP rear-panel covers 2 slots, and its layout includes 2 HDMI outputs, 2 HD-SDI monitoring outputs, 2 analog audio outputs, 1 Ethernet connector, 1 RS-422 connector, 2 FlexBridge inputs, and 2 SFP cages. In the case of the HDMI outputs, HD-SDI monitoring outputs, and analog audio outputs, in each pair, the output associated with the second head is **NOT** enabled if your output card is the single-head model (KMx-3901-OUT-S). A software option is available to enable the second head.



KMx-3901-OUT-D-3DRP rear panel



The following table lists the function of each connector associated with the output heads.

Connector label		Connector type	Function
Head 1	Head 2		
FLEXBRIDGE IN 1	FLEXBRIDGE IN 2	DIN 1.0/2.3	Connection carrying a 3G SDI signal, which contains the mosaic from the input cards (without graphical elements, i.e., no audio meters, no UMDs, etc.).
MV OUT 1	MV OUT 2	HDMI	High definition connection for the multiviewer output, which carries audio and video, and can support resolutions up to 1920 × 1200 (all progressive scan).
SDI OUT 1	SDI OUT 2	DIN 1.0/2.3	Serial digital HD output signal for monitoring purposes
ANALOG OUT 1 L	ANALOG OUT 2 L	WECO	Analog audio output (left channel) to feed the audio monitoring system
ANALOG OUT 1 R	ANALOG OUT 2 R	WECO	Analog audio output (right channel) to feed the audio monitoring system
SFP 1	SFP 2	—	Optional inputs. <i>Not yet supported.</i>

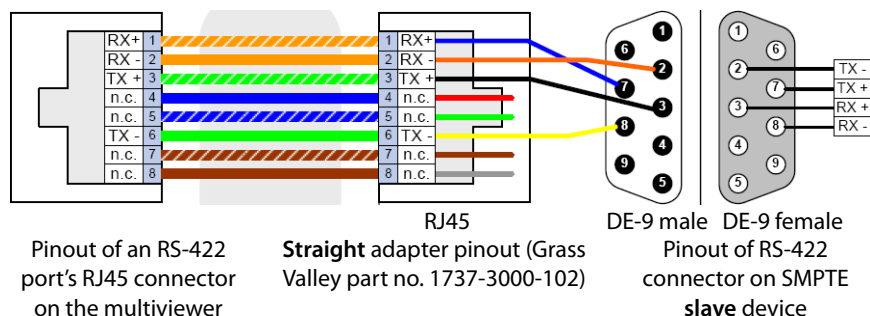
The following table lists the purpose of each connector associated with card control.

Connector label	Connector type	Function
ETH	RJ45	100 Base-T Ethernet connection
RS-422	RJ45 <sup>a</sup>	Connect to an RS-422 (SMPTE ST 207, EBU-3245) or RS-485 device or network

a. The KMX-3901-OUT's RS-422 ports have an RJ-45 connector in order to preserve space on a busy panel. The RS-422 interface specifies a DE-9 connector, so if you are using this interface, you will require a DE-9-to-RJ-45 adapter. Grass Valley supplies two adapter models, correctly wired for this application: a straight adapter (part no. 1737-3000-102), and a crossover adapter (part no. 1792-3700-100).

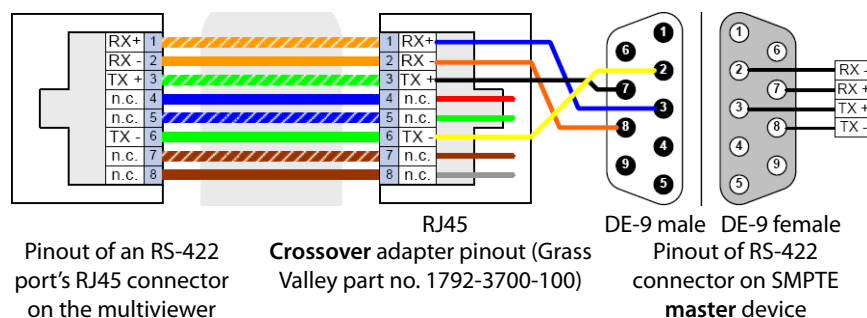
### RS-422 connection diagram

The pinout for the RS-422 signals on the RJ-45 connectors, and the wiring diagrams for the appropriate adapters, are shown here:



Standard wiring between multiviewer and devices wired to SMPTE "slave" specification (e.g. most routers, Ross Synergy switchers, Nevion ETH-CON)





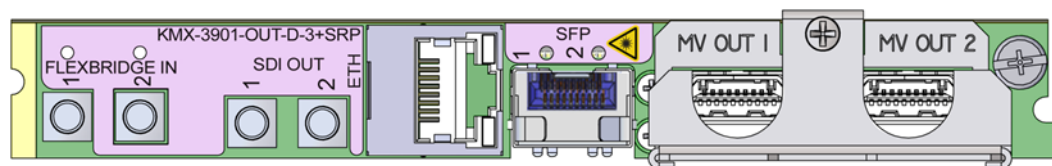
Standard wiring between multiviewer and devices wired to SMPTE "master" specification (e.g. Philips Jupiter router control system, Grass Valley Presmaster PCS)

**Note:** The two RS-422 ports on the multiviewer side have no ground pin. Using the appropriate DE-9S-to-RJ-45 adapter, an external device should be able to communicate with a multiviewer despite the lack of a ground.

For more information about the serial ports' specifications, see [Serial port](#), on page 93. For more information about the RS-422 serial connections, see the "Serial Connections" section in the *Routers* chapter of the Kaleido-X User's Manual.

### KMX-3901-OUT-D-3+SRP rear panel connections

The KMX-3901-OUT-D-3+SRP rear panel covers 1 slot, and its layout includes 2 HDMI outputs, 2 HD-SDI monitoring outputs, 1 Ethernet connector, 2 FlexBridge inputs, and 1 SFP cages. In the case of the HDMI outputs, and HD-SDI monitoring outputs, in each pair, the output associated with the second head is **NOT** enabled if your output card is the single-head model (KMX-3901-OUT-S). A software option is available to enable the second head.



KMX-3901-OUT-D-3+SRP rear panel

#### Notes

- The single rear connector panel KMX-3901-OUT-D-3+SRP does not have a serial port. To support a serial device, your Kaleido-Modular-X system must have at least one output card with a double rear connector panel (KMX-3901-OUT-D-3DRP).
- The single rear connector panel does not support analog audio outputs. Audio monitoring is available at the SDI and HDMI outputs only.

The following table lists the function of each connector associated with the output heads.

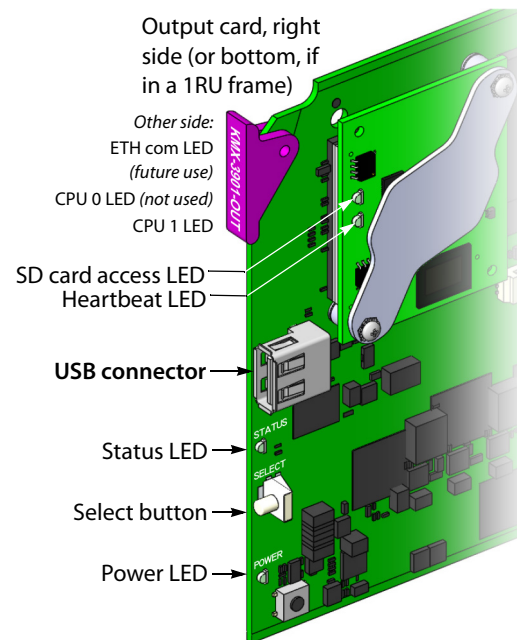
Connector label		Connector type	Function
Head 1	Head 2		
FLEXBRIDGE IN 1	FLEXBRIDGE IN 2	DIN 1.0/2.3	Connection carrying a 3G SDI signal, which contains the mosaic from the input cards (without graphical elements, i.e., no audio meters, no UMDs, etc.).
MV OUT 1	MV OUT 2	HDMI	High definition connection for the multiviewer output, which carries audio and video, and can support resolutions up to 1920 × 1200.
SDI OUT 1	SDI OUT 2	DIN 1.0/2.3	Serial digital HD output signal for monitoring purposes
SFP 1	SFP 2	—	Optional inputs. <i>Not yet supported.</i>

The following table lists the purpose of the connector associated with card control.

Connector label	Connector type	Function
ETH	RJ45	100 Base-T Ethernet connection

## KMX-3901-OUT front card-edge USB connector

The KMX-3901-OUT output cards have one USB connector, into which you may connect a mouse, keyboard, or USB flash memory for a software upgrade or data backup. The diagram below shows the USB connector, between various LED indicators and the Select button, on the output cards' front edge. See [KMX-3901-OUT Output Card Interface](#) on page 60, for a detailed description of the LED indicators, and [Using the Densité Frame Control Panel](#), on page 63, for more information on the Select button.



## Input Cards

The KMX-3901-IN cards are input modules that can be installed in a Densité 3, Densité 3+ FR1, or Densité 3+ FR4 frame, to be part of a Kaleido-Modular-X multiviewer system. SDI input cards are available with eight or 16 inputs. Two different 16-input card models are available to drive one or two output cards for two or four possible multiviewer outputs.

A KMX-3901-IN-IP input/output card is available with two (1+1 redundant) 10 GigE ports supporting up to 6 SMPTE ST 2022-6 IP video inputs (3G/HD/SD). This input card can drive one output card, for two multiviewer output. In addition, one or both multiviewer outputs can be looped back into this card's SDI inputs and made available over IP, as a SMPTE-2022-6 stream.

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### Notes

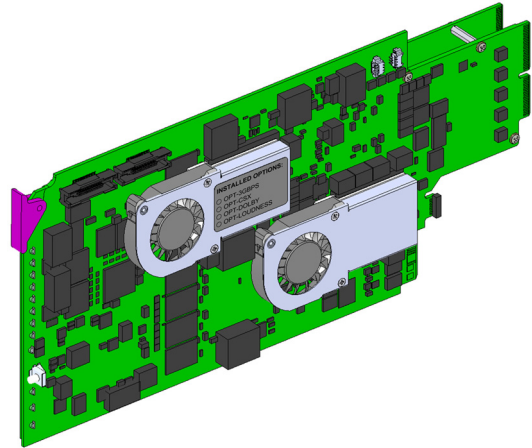
- Early revisions of the KMX-3901-IN input cards (see [SDI Input module parts](#), on page 12) are *not* fully compatible with the Densité 3+ FR4 frame. These cards are unable to properly extract the URS signal from the frame. Should you decide to rely on the card's external reference input (instead of the URS signal), to genlock your signals, the card will operate properly, however URS time code extraction will be unreliable. Grass Valley can modify these cards if needed (see [Contact Us](#), on page 96).

#### Notes (continued)

- Input cards with a double rear connector panel (KMx-3901-IN-8-D-3+DRP, KMx-3901-IN-16-D-3+DRP, KMx-3901-IN-16-Q-3+DRP, KMx-3901-IN-M3-D-3+DRP, KMx-3901-IN-M3-Q-3+DRP) are compatible with Densité 3+ FR1, and Densité 3+ FR4 only.
- KMx-3901-IN-IP input/output cards are compatible with Densité 3+ FR4 only.

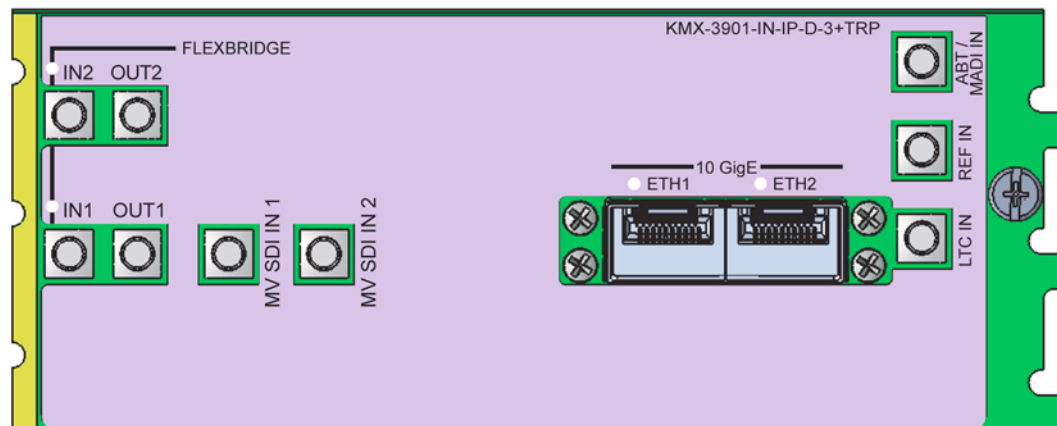
Within a Kaleido-Modular-X system, input cards are designated as *Input A*, *Input B*, *Input C*, and *Input D*, where Input A is the card closest to the output stage. Every KMx-3901-IN card is complemented by a rear panel that holds all input and output connectors associated with the card.

An input card is connected to the other cards in the Kaleido-Modular-X system to which it belongs through the housing frame's internal midplane (for cards housed in the same frame), and through FlexBridge connections.



#### Rear panel with IP input connectors

The KMx-3901-IN-IP rear panels include two (1+1 redundant) 10 GigE ports, 1 ABT/MADI audio input, 1 LTC input, 1 reference input, 2 FlexBridge inputs, 2 FlexBridge outputs, and 2 SDI input connectors for the SDI mosaic outputs from head 1 and head 2 of the KMx-3901-OUT-D output card.



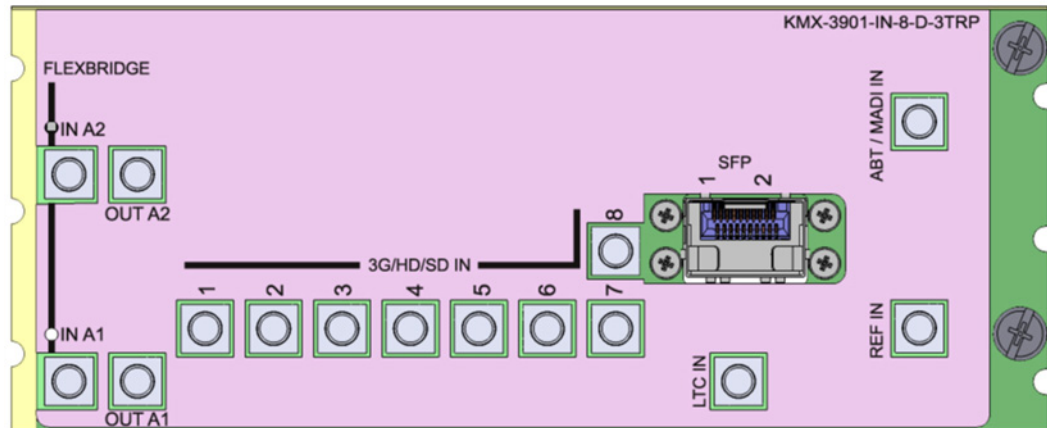
KMx-3901-IN-IP-D-3+TRP rear panel

Connector label	Connector type	Function
ETH1, ETH2	SFP+	SD-SDI, HD-SDI, or 3G-SDI video inputs.
ABT/MADI IN	DIN 1.0/2.3	Multiplexed audio from an external device (e.g., MADI multiplexer, or Audio Bridge Terminal).

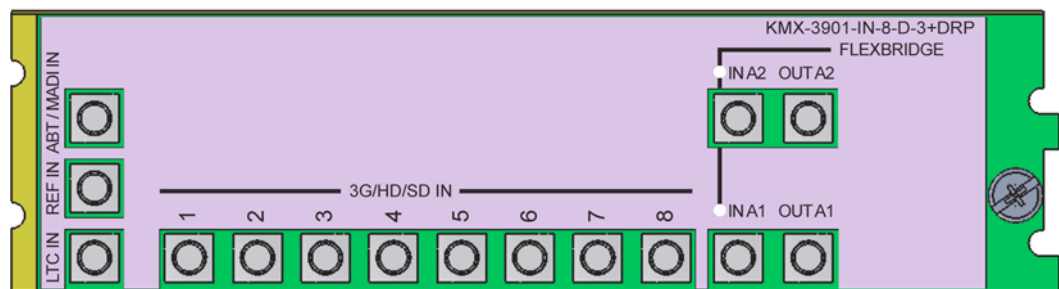
Connector label	Connector type	Function
LTC IN	DIN 1.0/2.3	Time code input.
REF IN	DIN 1.0/2.3	Reference signal to genlock the multiviewer to the local plant.
FLEXBRIDGE IN1, FLEXBRIDGE IN2	DIN 1.0/2.3	Connections carrying the 3G SDI signals, which contains the mosaic (without graphical elements, i.e., no audio meters, no UMDs, etc.) from an upstream input card, for two heads of the system.
FLEXBRIDGE OUT1, FLEXBRIDGE OUT2	DIN 1.0/2.3	Connections carrying the 3G SDI signals, which contains the mosaic (without graphical elements, i.e., no audio meters, no UMDs, etc.) resulting from any upstream input cards and the current input card, for two heads of the system.
MV SDI IN1, MV SDI IN2	DIN 1.0/2.3	3G-SDI inputs for the SDI mosaic outputs from head 1, and head 2 of the KMX-3901-OUT-D output card to be made available as a SMPTE 2022-6 signal at the ETH1 and ETH2 connectors.

### Rear panels with 8, or 16 SDI input connectors

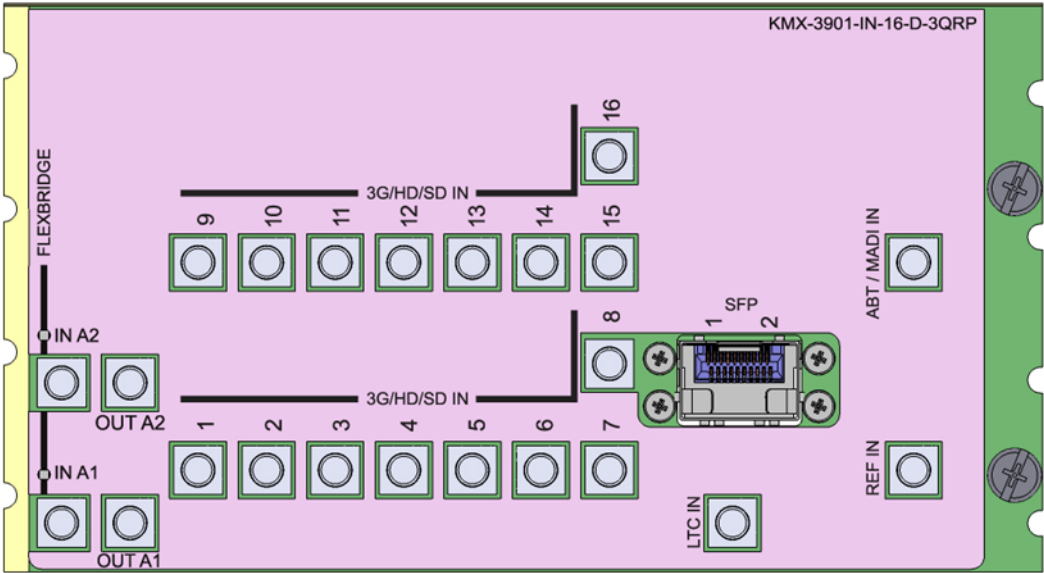
The KMX-3901-IN rear panels include 8 or 16 input connectors, 1 ABT/MADI audio input, 1 LTC input, 1 reference input, 2 or 4 FlexBridge inputs, 2 or 4 FlexBridge outputs, and 1 or 2 SFP cages (except for the *double* rear connector panels, which do not have any SFP cages).



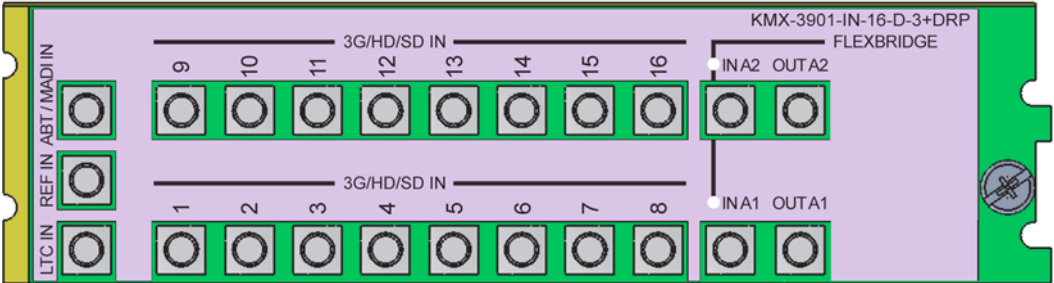
KMX-3901-IN-8-D-3TRP rear panel



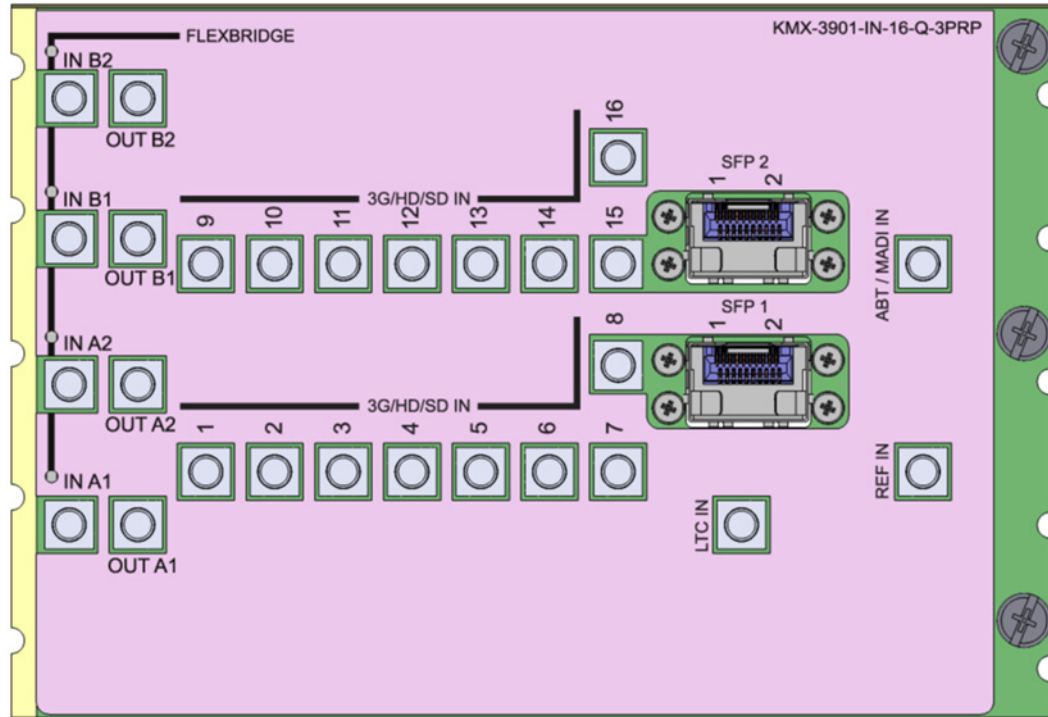
KMX-3901-IN-8-D-3+DRP rear panel



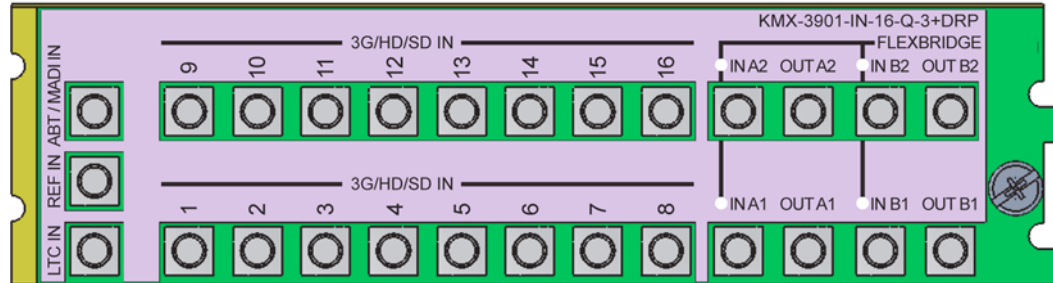
KMX-3901-IN-16-D-3QRP rear panel



KMX-3901-IN-16-D-3+DRP rear panel



*KMX-3901-IN-16-Q-3PRP rear panel*



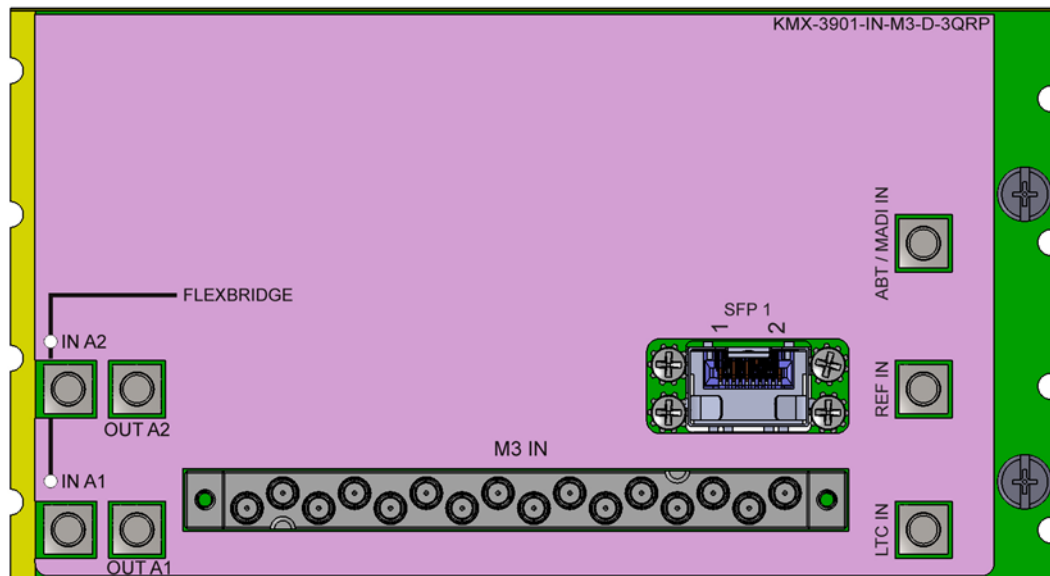
*KMX-3901-IN-16-Q-3+DRP rear panel*

Connector label	Connector type	Function
3G/HD/SD IN 1 to 3G/HD/SD IN 16	DIN 1.0/2.3	SD-SDI, HD-SDI, or 3G-SDI video inputs 1 to 16
ABT/MADI IN	DIN 1.0/2.3	Multiplexed audio from an external device (e.g., MADI multiplexer, or Audio Bridge Terminal)
LTC IN	DIN 1.0/2.3	Time code input
REF IN	DIN 1.0/2.3	Reference signal to genlock the multiviewer to the local plant.
FLEXBRIDGE IN A1, FLEXBRIDGE IN A2	DIN 1.0/2.3	Connections carrying the 3G SDI signals, which contains the mosaic (without graphical elements, i.e., no audio meters, no UMDs, etc.) from an upstream input card, for two heads of the system.

Connector label	Connector type	Function
FLEXBRIDGE OUT A1, FLEXBRIDGE OUT A2	DIN 1.0/2.3	Connections carrying the 3G SDI signals, which contains the mosaic (without graphical elements, i.e., no audio meters, no UMDs, etc.) resulting from any upstream input cards and the current input card, for two heads of the system.
FLEXBRIDGE IN B1, FLEXBRIDGE IN B2	DIN 1.0/2.3	Connections carrying the 3G SDI signals, which contains the mosaic (without graphical elements, i.e., no audio meters, no UMDs, etc.) from an upstream input card, for two heads of the system.
FLEXBRIDGE OUT B1, FLEXBRIDGE OUT B2	DIN 1.0/2.3	Connections carrying the 3G SDI signals, which contains the mosaic (without graphical elements, i.e., no audio meters, no UMDs, etc.) resulting from any upstream input cards and the current input card, for two heads of the system.
SFP 1, SFP 2	—	Optional ports. <i>Not yet supported.</i>

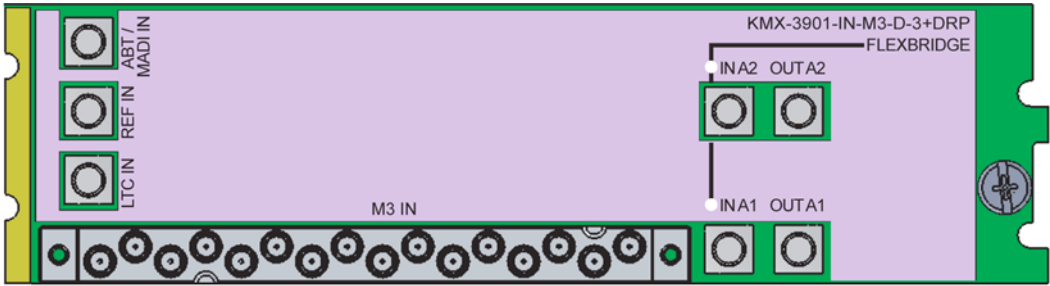
### Rear panels with M3 connector

The KMX-3901-IN-M3 rear panels include 1 M3 input connector, 1 ABT/MADI audio input, 1 LTC input, 1 reference input, 2 or 4 FlexBridge inputs, 2 or 4 FlexBridge outputs, and 1 or 2 SFP cages.

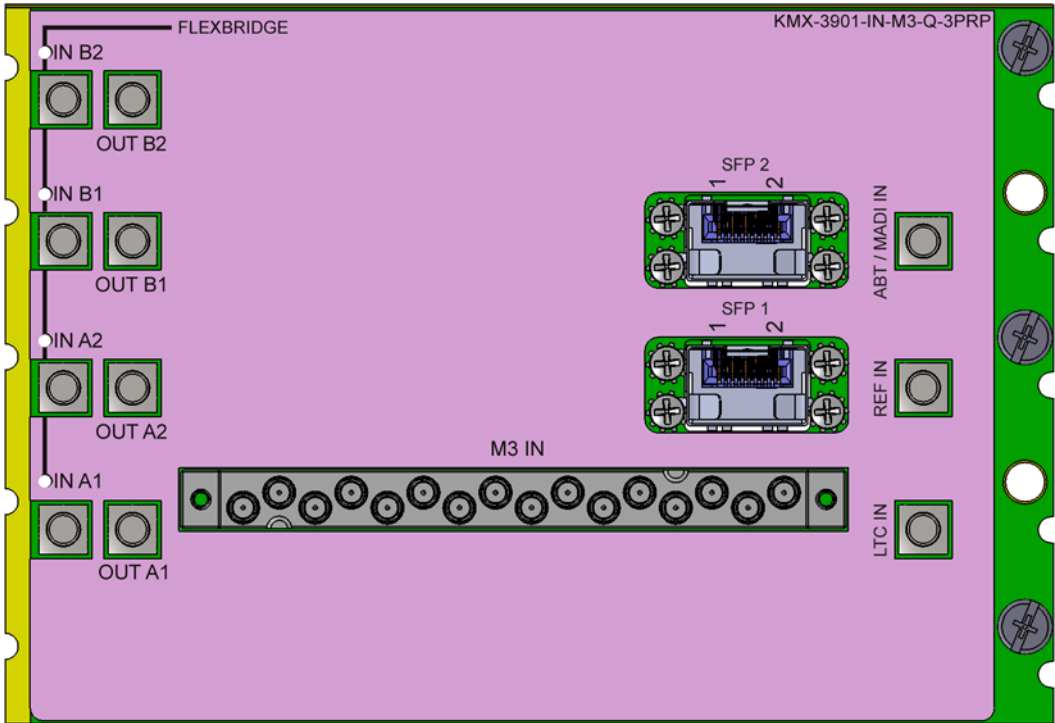


KMX-3901-IN-M3-D-3QRP rear panel

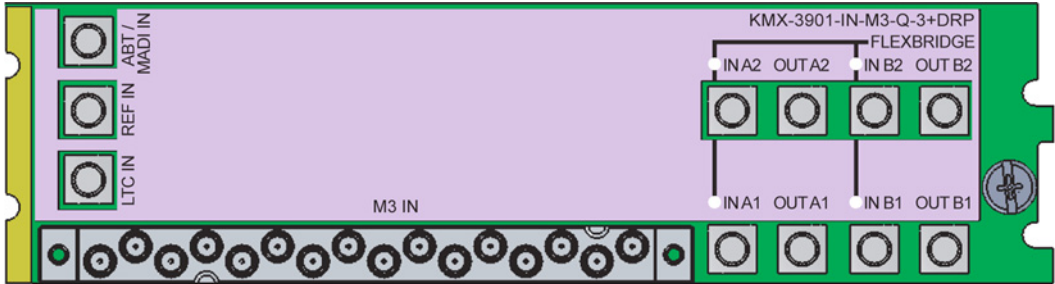




*KMX-3901-IN-M3-D-3+DRP rear panel*



*KMX-3901-IN-M3-Q-3PRP rear panel*



*KMX-3901-IN-M3-Q-3+DRP rear panel*

Connector label	Connector type	Function
M3 IN	M3	SD-SDI, HD-SDI, or 3G-SDI video inputs 1 to 16 from NVISION router output module. See <a href="#">NV8500 M3 Backplane Connections</a> below to determine the correct mapping between router outputs and multiviewer inputs, when using the M3 cable.
ABT/MADI IN	DIN 1.0/2.3	Multiplexed audio from an external device (e.g., MADI multiplexer, or Audio Bridge Terminal).
LTC IN	DIN 1.0/2.3	Time code input.
REF IN	DIN 1.0/2.3	Reference signal to genlock the multiviewer to the local plant.
FLEXBRIDGE IN A1, FLEXBRIDGE IN A2	DIN 1.0/2.3	Connections carrying the 3G SDI signals, which contains the mosaic (without graphical elements, i.e., no audio meters, no UMDs, etc.) from an upstream input card, for two heads of the system.
FLEXBRIDGE OUT A1, FLEXBRIDGE OUT A2	DIN 1.0/2.3	Connections carrying the 3G SDI signals, which contains the mosaic (without graphical elements, i.e., no audio meters, no UMDs, etc.) resulting from any upstream input cards and the current input card, for two heads of the system.
FLEXBRIDGE IN B1, FLEXBRIDGE IN B2	DIN 1.0/2.3	Connections carrying the 3G SDI signals, which contains the mosaic (without graphical elements, i.e., no audio meters, no UMDs, etc.) from an upstream input card, for two heads of the system.
FLEXBRIDGE OUT B1, FLEXBRIDGE OUT B2	DIN 1.0/2.3	Connections carrying the 3G SDI signals, which contains the mosaic (without graphical elements, i.e., no audio meters, no UMDs, etc.) resulting from any upstream input cards and the current input card, for two heads of the system.
SFP 1, SFP 2	—	Optional ports. <i>Not yet supported.</i>

### NV8500 M3 Backplane Connections

If the M3 output card is installed in the *upper output bays of an NV8576 router frame*, or in an NV8140, NV8144, or an NV8280, then the mapping between the router outputs and the multiviewer inputs will be as follows. Notice that router outputs 9, and 18 are skipped.

Router output	Multiviewer input	Router output	Multiviewer input
1	1	10	9
2	2	11	10
3	3	12	11
4	4	13	12
5	5	14	13
6	6	15	14
7	7	16	15
8	8	17	16

If the M3 output card is installed in the *lower output bays of an NV8576 router frame*, its backplane is *upside down* and the ordering of its ports differs from when the backplane is installed in the upper bays (right side up) of an NV8576 frame. Notice that router outputs 1, and 10 are skipped.

Router output	Multiviewer input	Router output	Multiviewer input
2	16	11	8
3	15	12	7
4	14	13	6
5	13	14	5
6	12	15	4
7	11	16	3
8	10	17	2
9	9	18	1

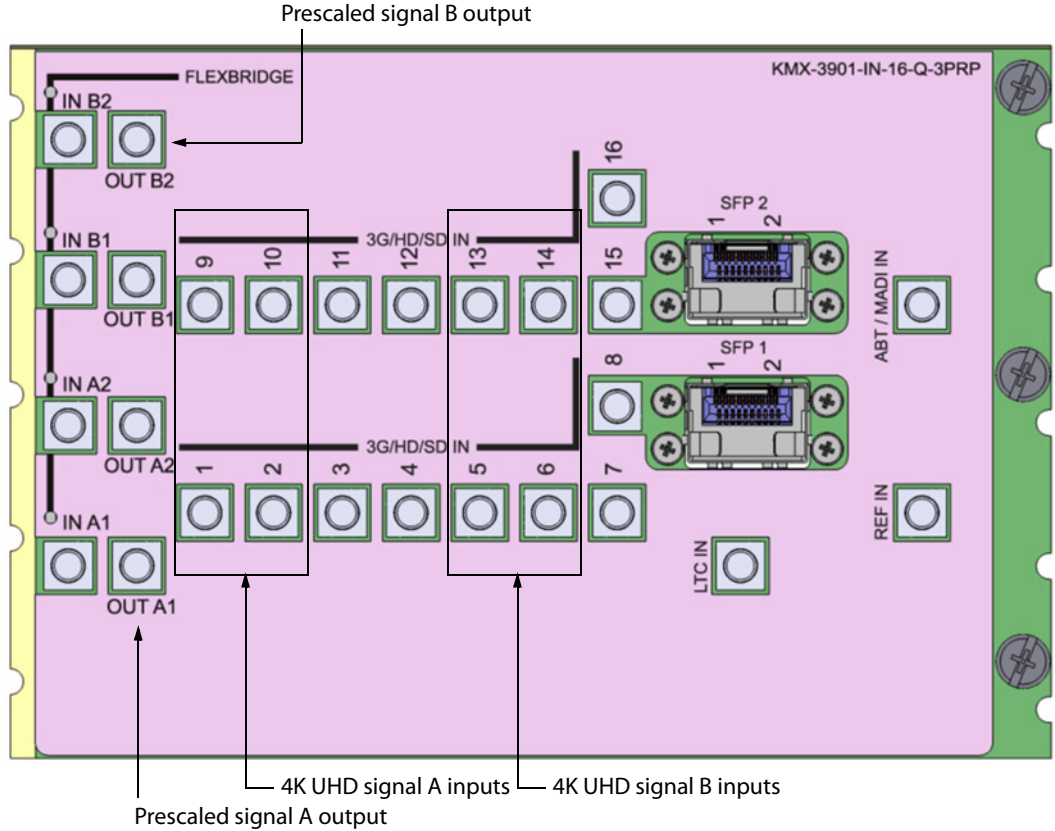
Refer to the *NV8500 Series User's Guide* (part no. UG0034) for more information on the M3 output card and backplane module.

## 4K UHD Prescaler

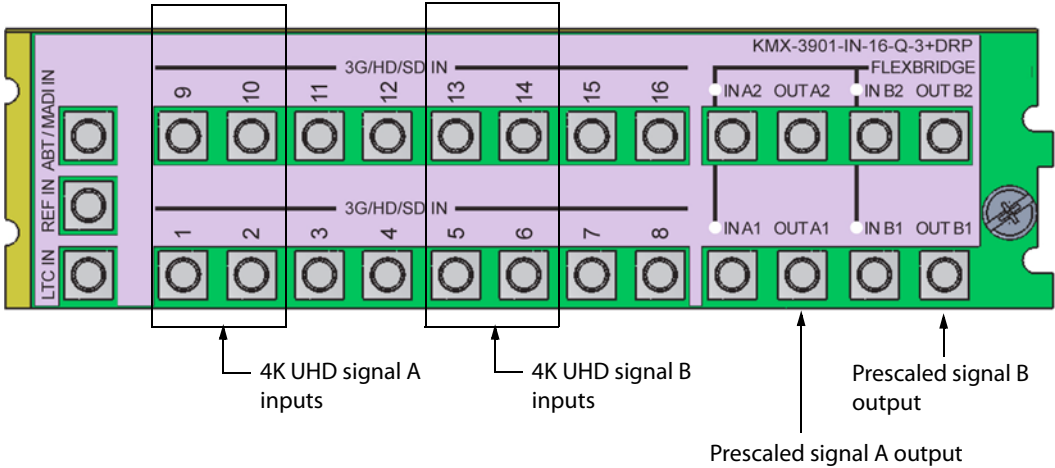
On the KMX-3901-IN-16Q configured as a 4K UHD prescaler, the input connectors 3G/HD/SD IN 3, 4, 7, 8, 11, 12, 15, and 16 are not used. The connectors listed in the table below support quad link 3G-SDI signal sources.

Connector	Description
3G/HD/SD IN 1	Link 1A – Top left quadrant of 4K UHD signal A
3G/HD/SD IN 2	Link 2A – Top right quadrant of 4K UHD signal A
3G/HD/SD IN 9	Link 3A – Bottom left quadrant of 4K UHD signal A
3G/HD/SD IN 10	Link 4A – Bottom right quadrant of 4K UHD signal A
FLEXBRIDGE OUT A1	1080p prescaled output of signal A
3G/HD/SD IN 5	Link 1B – Top left quadrant of 4K UHD signal B
3G/HD/SD IN 6	Link 2B – Top right quadrant of 4K UHD signal B
3G/HD/SD IN 13	Link 3B – Bottom left quadrant of 4K UHD signal B
3G/HD/SD IN 14	Link 4B – Bottom right quadrant of 4K UHD signal B
FLEXBRIDGE OUT B1	1080p prescaled output of signal B

Make sure that the 4K UHD prescaler card and its 4K UHD source signals are all referenced together. The refresh rate of the prescaler card outputs follow the refresh rate of the input reference signal. The eight audio channels embedded into the output signal come from video input 1 for head 1 and from video input 5 for head 2.



Connectors used on KMX-3901-IN-16-Q-3PRP rear panel for 4K UHD prescaler



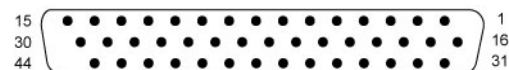
Connectors used on KMX-3901-IN-16-Q-3+DRP rear panel for 4K UHD prescaler

## GPI-1501 General Purpose Interface I/O Module

A GPI-1501 card supports 20 GPI inputs, and 8 configurable GPI input/output terminals. The associated rear panel holds a DB-44 connector, through which all signal inputs and outputs are routed.

The pinout of this connector is as follows:

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	GPIO-1 +	12	GPI-I 7	23	RS422-TX +	34	GPIO-5 –
2	GPIO-3 –	13	GPI-I 4	24	GPI-I 19	35	GND
3	GPIO-4 +	14	GPI-I 1	25	GPI-I 17	36	GPIO-7 +
4	GPIO-6 –	15	GND	26	GPI-I 13	37	RS422-RX –
5	GPIO-7 –	16	GPIO-1 –	27	GPI-I 11	38	GPI-I 20 / LTC
6	GPIO-8 +	17	GPIO-2 +	28	GPI-I 8	39	GPI-I 16
7	RS422-TX –	18	GPIO-4 –	29	GPI-I 5	40	GPI-I 14
8	GPI-I 18	19	GPIO-5 +	30	GPI-I 2	41	GND
9	GPI-I 15	20	GPIO-6 +	31	GND	42	GPI-I 9
10	GPI-I 12	21	GPIO-8 –	32	GPIO-2 –	43	GPI-I 6
11	GPI-I 10	22	RS422-RX +	33	GPIO-3 +	44	GPI-I 3



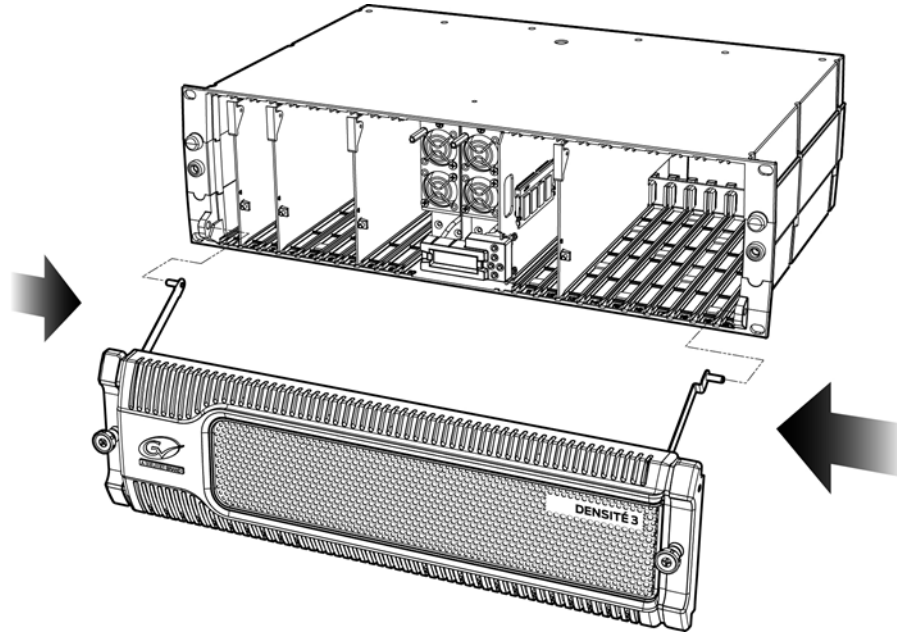
DB-44 connector

For ease of connection, you may use the GPI-1501-TBA terminal block adapter with integral 44-pin connector. Refer to the GPI-1501 Guide to Installation and Operation (available from the *Documentation Library* section of Grass Valley's website), for more information. Refer to the Kaleido-X User's Manual for detailed instructions on configuring a GPI-1501 within your multiviewer system.

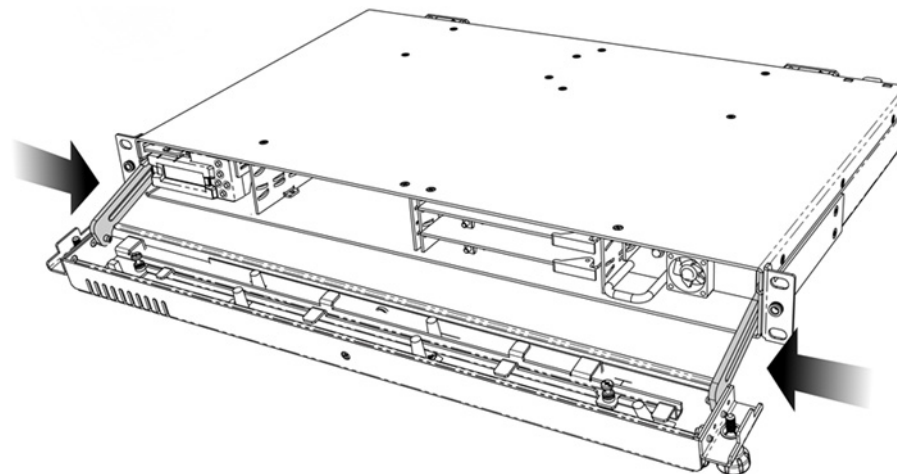
## Maintenance

### Handling the Front Door

The front door of a Densité 3 or Densité 3+ FR1 housing frame is fastened in place by two captive thumbscrews, one at each end of the door. The door is attached to the frame by guides that slide out of the frame as the door is pulled, and allow the door to be lowered below the frame so that cards and power supplies can be removed and installed.

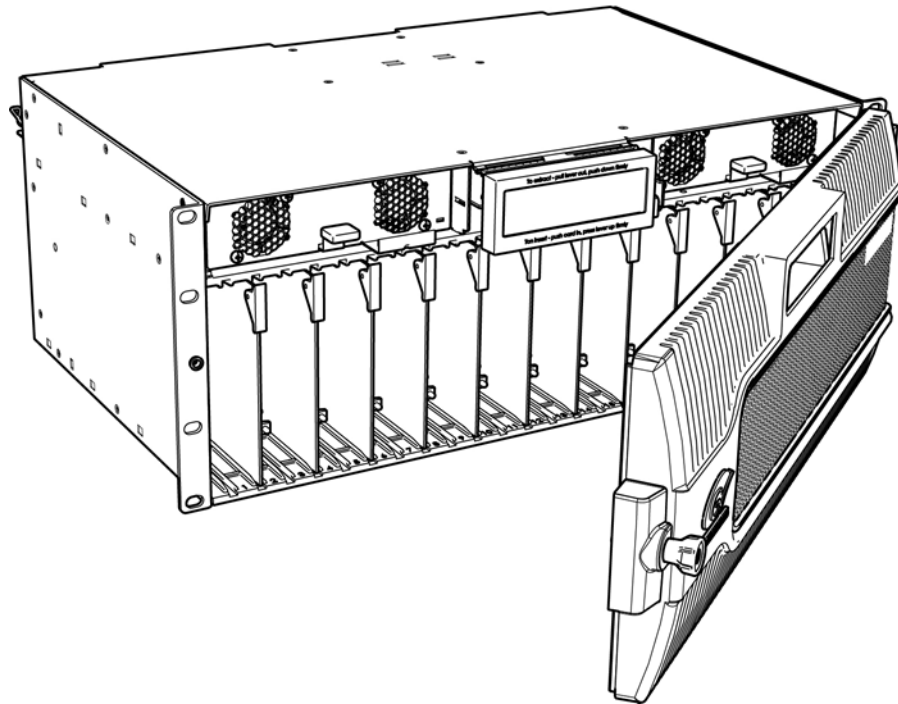


*Densité 3 frame with open door*



*Densité 3+ FR1 frame with open door*

The front door of the Densité 3+ FR4 frame is hinged on the right-hand side, and latched by a captive thumbscrew on the left-hand side. There are no electrical connections to the door.



*Densité 3+ FR4 frame with open door*

## Opening the front door

### To open the door of a Densité 3 or Densité 3+ FR1 frame

- Turn both thumbscrews counterclockwise until they release, and then pull the door away from the front of the frame.

### To open the door of a Densité 3+ FR4 frame

- Turn the thumbscrew counterclockwise until it releases, and then pull the door open.

## Removing the front door

### To remove the door of a Densité 3 or Densité 3+ FR1 frame

- Slip the ends of the guides off the posts on the door assembly.

---

**Note:** You must tilt the door on an angle so the guides can move freely. There are no electrical connections to the door.

---

### To remove the door of a Densité 3+ FR4 frame

- Slide it vertically off the hinge pins on the right-hand side.



## Closing the front door

### To close the door of a Densité 3 or Densité 3+ FR1 frame

- Slide it into position against the front of the frame, and then turn the captive thumbscrews clockwise until the door is securely fastened into place.

### To close the door of a Densité 3+ FR4 frame

- Slide the door down onto the hinge pins on the right-hand side, push it into the closed position, and then turn the thumbscrew on the left-hand side clockwise to latch the door in the closed position.

## Replacing Cards

All cards and rear panels can be installed with the frame power on. Each card has a connector which plugs into the frame's backplane for distribution of power and connection to the controller card, and one or two connectors (depending on the card type) that plug into the associated rear panel for inputs and outputs.

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### IMPORTANT

The rear panel must be installed before the card is inserted into the frame.

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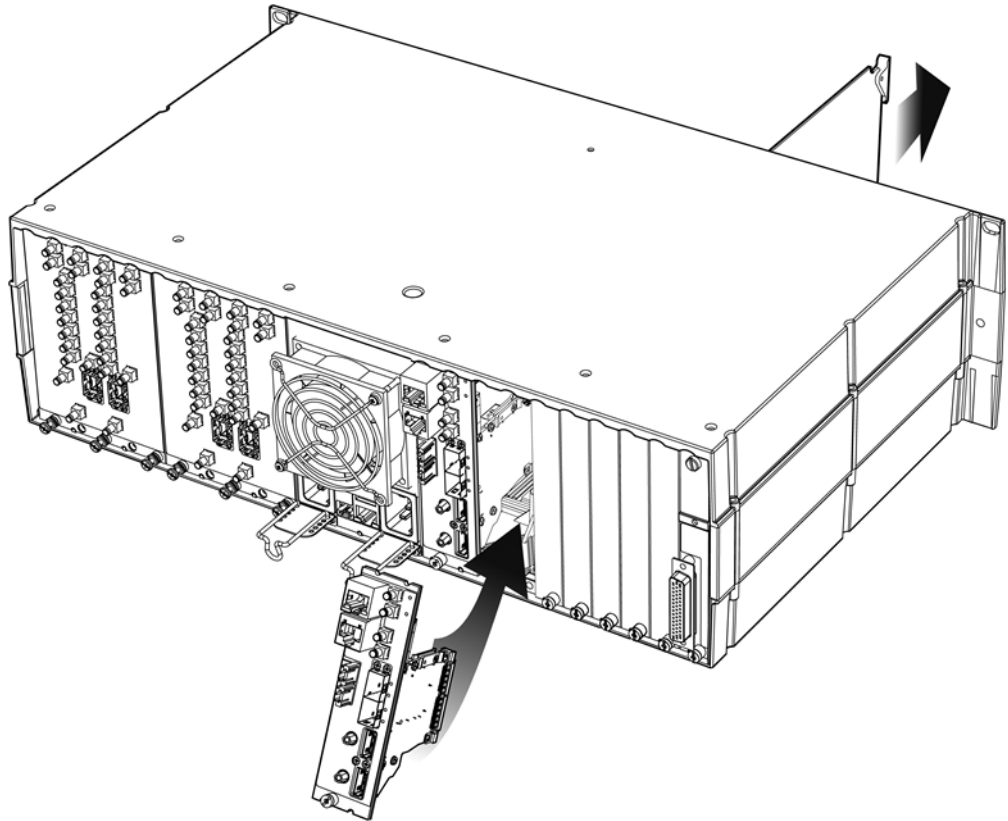
## Replacing rear connector panels

### To replace a rear connector panel in a Densité 3 or Densité 3+ FR4 frame

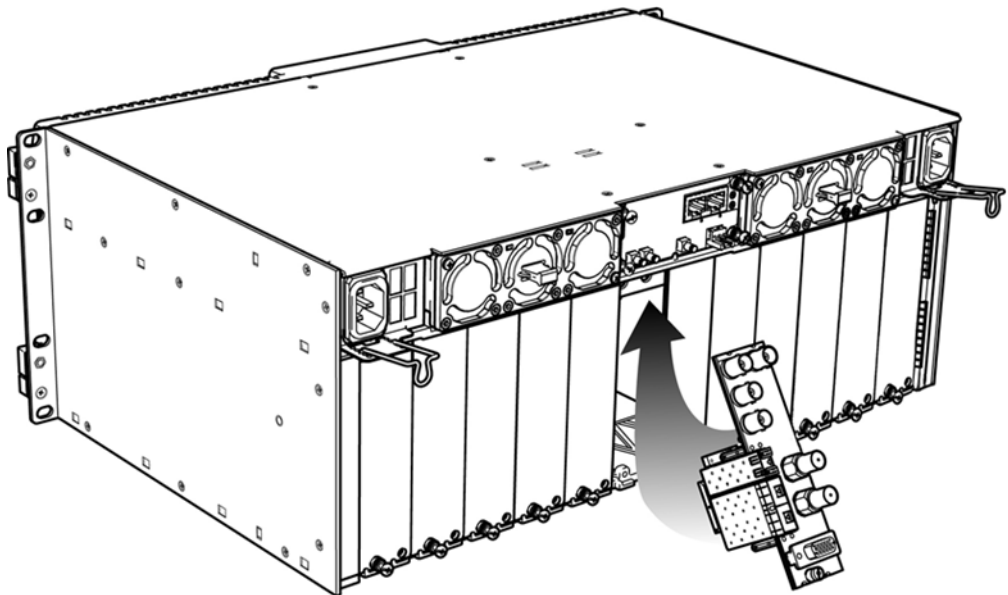
- 1 If a card is already installed in a slot covered by the rear panel you wish to change, remove it (see [Removing a card](#), on page 43).
- 2 Remove the existing panel (either blank or belonging to an existing card) by releasing the captive screws at the bottom.

There may be several captive screws, depending on the card type.

- 3 Position the new panel and secure it in place with the captive screws at the bottom.



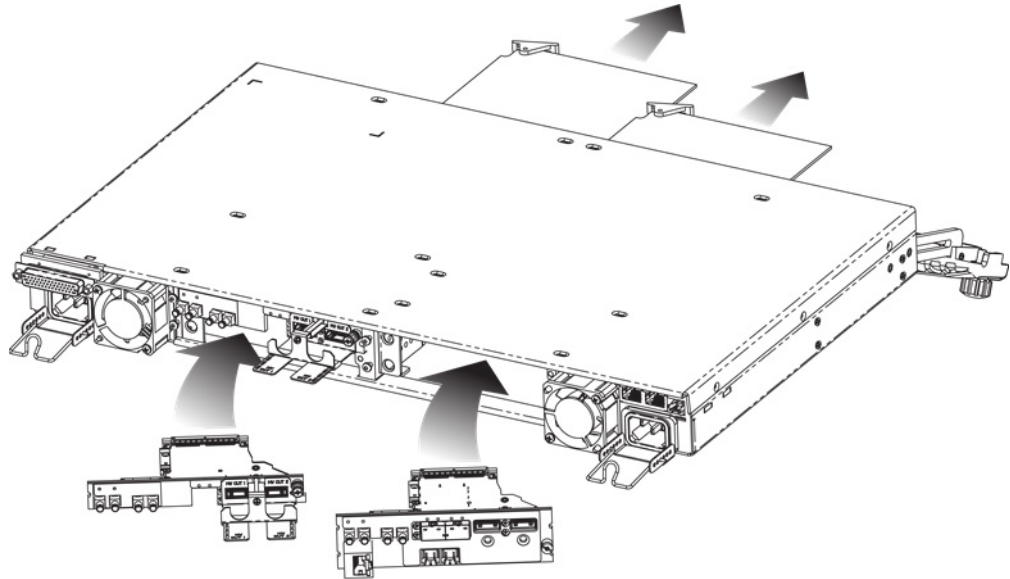
*Rear panel installation (Densité 3 frame)*



*Rear panel installation (Densité 3+ FR4 frame)*

#### To replace a rear connector panel in a Densité 3+ FR1 frame

- 1 If a card is already installed in a slot covered by the rear panel you wish to change, remove it (see [Removing a card](#), on page 43).
- 2 Remove the existing panel by releasing the captive screw.
- 3 Position the new panel and secure it in place with the captive screw.



#### Removing a card

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**Note:** Removing more than one input card from a Kaleido-Modular-X system in operation is not supported.

---

#### To remove a card

- 1 Open the front door of the frame (see [Opening the front door](#), on page 40).
- 2 Tilt the swivel handle, on the front of the card you wish to remove, to lever the connectors apart, and then use the handle to pull the card straight out of the slot.
- 3 Close the front door of the frame (see [Closing the front door](#), on page 41).

## Installing a card

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**Note:** The rear panel must be installed before the card. See [Replacing rear connector panels](#) on page 41.

---

### To install a card in a Densité 3 or Densité 3+ FR4 frame

- 1 Open the front door of the frame (see [Opening the front door](#), on page 40).
- 2 To install a card into an empty slot, slide the card into the slot, and push gently on the handle to seat the connectors.

Seating input cards requires more pressure. Their rear panels cover up to 5 slots, depending on the model, to accommodate a large number of connectors.

- In a Densité 3+ FR4 frame, input cards can be installed with a double-width rear panel, in which case they should be inserted into the left-hand slot (i.e., if the rear panel covers slots 2 and 3, you must insert the card itself at slot 2).
- A KMX-3901-IN-8-D input card with a triple rear panel occupies 3 slots and should be inserted in the center slot (e.g. if the rear panel covers slots 4–6, insert the card itself at slot 5).
- A KMX-3901-IN-16-D input card with a quadruple rear panel occupies 4 slots and should be inserted *one* slot to the left of the rightmost slot (e.g. if the rear panel covers slots 7–10, insert the card itself at slot 9).
- A KMX-3901-IN-16-Q input card with a quintuple rear panel occupies 5 slots and should be inserted *two* slots to the left of the rightmost slot (e.g. if the rear panel covers slots 11–15, insert the card itself at slot 13).
- In a Densité 3 frame, output cards must be installed with a double-width rear panel, and they should be inserted into the left-hand slot (i.e., if the rear panel covers slots 2 and 3, you must insert the card itself at slot 2).

Inserting the card into the wrong slot will not damage the card, and will be flagged by the on-card status LED flashing to indicate that there is no connection to the rear panel.

- 3 Close the front door of the frame (see [Closing the front door](#), on page 41).

### To install a card in a Densité 3+ FR1 frame

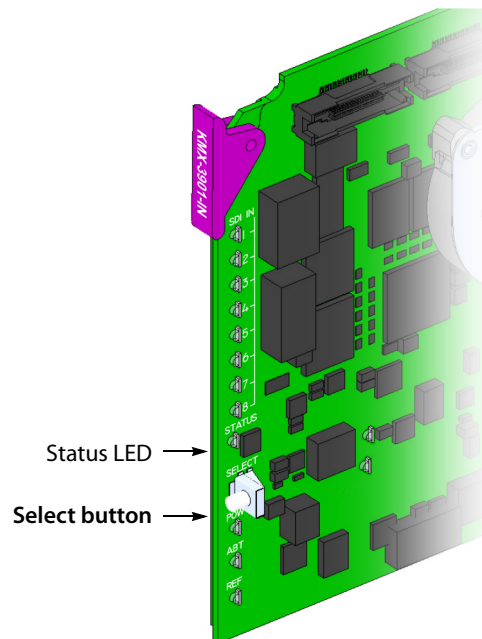
- 1 Open the front door of the frame (see [Opening the front door](#), on page 40).
- 2 To install a card into an empty slot, slide the card into the slot with the swivel handle to the right, and push gently on the handle to seat the connectors. If the card requires a double-width rear panel to accommodate a large number of connectors, it should be inserted into the lower slot. Inserting the card into the wrong slot will not damage the card, and will be flagged by the on-card status LED flashing to indicate that there is no connection to the rear panel.
- 3 Close the front door of the frame (see [Closing the front door](#), on page 41).

## 4K UHD Prescaler Configuration and Upgrade

### Converting a KMX-3901-IN-16-Q Input Card to a 4K UHD Prescaler

To configure a KMX-3901-IN-16-Q input card as a 4K UHD prescaler

- 1 Press the Select button on the front edge of the *KMX-3901-IN-16-Q* input card you wish to configure.



The Status LED on the selected card flashes orange, and the associated control menu appears on the LCD display of the Densité frame's local control panel.

- 2 On the local control panel, press the [-] button.  
CONFIG appears on the LCD display.
- 3 Press the SEL button.  
4K UHD PRESCALER appears on the LCD display.
- 4 Press the SEL button.
- 5 Press the [+] or [-] buttons, if needed, until ENABLE appears on the LCD display.
- 6 Press the SEL button.  
ENABLE appears on the top line of the LCD display, and then, after a few seconds, a message appears on the second line to let you know that the card will restart in 20 seconds.
- 7 After the card has restarted, notice that the SDI LEDs 3, 4, 7, 8, 11, 12, 15, and 16 are not lit.  
This indicates that the card is now configured as a 4K UHD prescaler.

## Converting a 4K UHD Prescaler to a KMX-3901-IN-16-Q Input Card

### To configure a 4K UHD prescaler as a KMX-3901-IN-16-Q input card

- 1 Press the Select button on the front edge of the prescaler card you wish to configure.  
The Status LED on the selected card flashes orange, and the associated control menu appears on the LCD display of the Densité frame's local control panel.
- 2 On the local control panel, press the [-] button.  
CONFIG appears on the LCD display.
- 3 Press the SEL button.  
4K UHD PRESCALER appears on the LCD display.
- 4 Press the SEL button.
- 5 Press the [+] or [-] buttons, if needed, until DISABLE appears on the LCD display.
- 6 Press the SEL button.  
DISABLE appears on the top line of the LCD display, and then, after a few seconds, a message appears on the second line to let you know that the card will restart in 20 seconds.
- 7 After the card has restarted, notice that all SDI LEDs are lit.  
This indicates that the card has reverted to its original mode.

## Upgrading 4K UHD Prescaler Cards

If your Kaleido-Modular-X system includes 4K UHD prescaler cards, these must be upgraded individually, *after* you have upgraded your system by the usual method.

### To upgrade your system's 4K UHD prescaler cards

- 1 Upgrade your Kaleido-Modular-X system by the usual method (refer to the Kaleido-X Release Notes for detailed instructions).
- 2 After all input and output cards have restarted, momentarily remove one of your system's KMX-3901-IN-16-Q input cards, and set it aside.
- 3 Repeat the following for every prescaler card in your system:
  - a Momentarily revert the prescaler card to an input card (see [Converting a 4K UHD Prescaler to a KMX-3901-IN-16-Q Input Card](#), on page 46).
  - b After the card you wish to upgrade has restarted, remove it from its slot, and then insert it in the slot you emptied at [step 2](#) above.  
The system detects that the newly inserted card has a different software version, and upgrades it automatically. This takes a few minutes, after which the card restarts.
  - c Once the card has restarted, remove it from the slot, and insert it back into its original position.
  - d Convert the card back to a 4K UHD prescaler (see [Converting a KMX-3901-IN-16-Q Input Card to a 4K UHD Prescaler](#), on page 45).
- 4 Insert the input card you had set aside at [step 2](#) back into its original position.

## Replacing the Frame Controller Card

### To replace a CPU-ETH2 frame controller

- 1 Open the front door of the frame (see [Opening the front door](#), on page 40).  
In a **Densité 3** frame, the frame controller card is located to the right of the power supply slots at the center of the frame.
  - Hook your finger through the opening at the top of the card.In a **Densité 3+ FR1** frame, the frame controller card is located on the upper left-hand side of the frame, above the left-hand power supply.
  - Grasp the metal handle on the upper left-hand side of the card; the handle will slide out so that it can be gripped properly.
- 2 Pull gently until the card is released from the rear connector, and then slide the card out of the frame.

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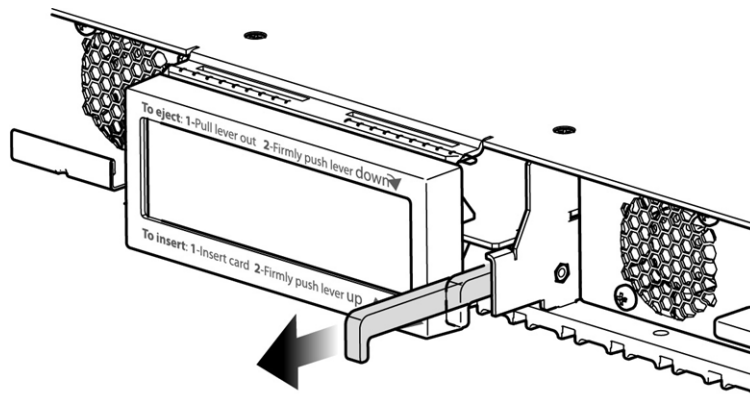
**Note:** Do not pull on the control panel to remove the card.

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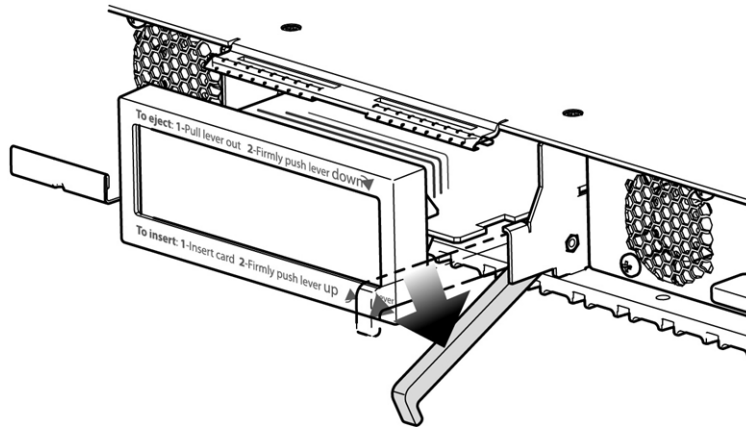
- 3 Slide the new card into the controller slot, and push gently on the card edge to engage the rear connectors.
- 4 Be sure to close the front door before operating your Kaleido-Modular-X system, to ensure proper ventilation (see [Closing the front door](#), on page 41).

### To replace a CPU-ETH3 frame controller

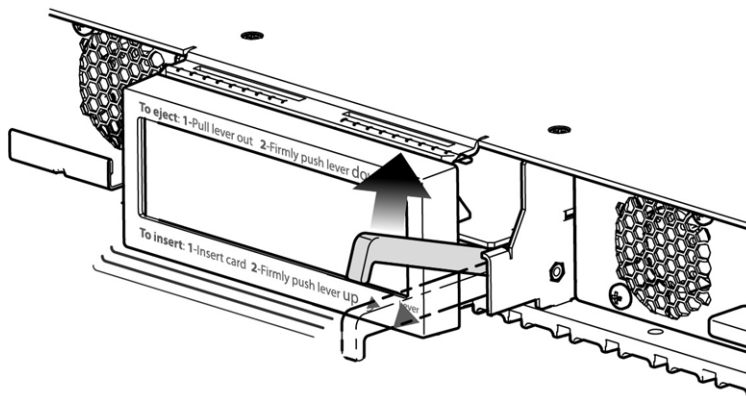
- 1 Open the front door of the frame (see [Opening the front door](#), on page 40).  
In a **Densité 3+ FR4** frame, the frame controller card is located at the top center of the frame.
- 2 Grasp the lever on the lower right-hand side of the controller beside the display, and pull it straight out until it is fully extended.



- 3 Push the lever firmly down to release the controller so that it can slide freely.



- 4 Pull gently on the display panel and slide the controller out of the frame.
- 5 With the lever extended, slide the new controller gently into the controller slot as far as you can until it stops.  
Do not apply any force, as it may damage the controller/display interface.
- 6 Firmly push the lever up to seat the card in its connectors.



- 7 Be sure to close the front door before operating your Kaleido-Modular-X system, to ensure proper ventilation (see [Closing the front door](#), on page 41).

## Replacing a GPI-1501 Card

In a **Densité 3+ FR1** frame, the GPI-1501 card is located in a special slot, on the upper right-hand side of the frame, above the (optional) right-hand power supply.

### To replace a GPI-1501 card

- 1 Open the front door of the frame (see [Opening the front door](#), on page 40).
- 2 Tilt the swivel handle, on the front of the card, to lever the connectors apart, and then use the handle to pull the card straight out of the slot.
- 3 Slide the new GPI-1501 card into the slot—with the swivel handle to the right, if in a 1RU frame —, and push gently on the handle to seat the connectors.
- 4 Close the front door of the frame (see [Closing the front door](#), on page 41).



## Replacing Power Supply Modules

The Densité frames support dual redundant hot-swappable power supplies. The basic configuration includes a single supply, with an empty slot for the optional redundant power supply. Installing a second power supply module and applying power to it automatically engages the redundant supply mode. Each power supply has its own power socket on the rear panel, and should be connected to the AC supply using the power cord that shipped with your hardware, or other approved cord.

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### Notes

- A single power supply can be installed in either of the two slots. In a 1RU frame, you may prefer to install the power supply module in the right-hand slot to avoid having to remove the controller card should you need to replace the power supply.
  - Power integrity is enhanced if the two power supplies are plugged into different circuits.
- 

### To install or change a power supply module in a Densité 3 frame

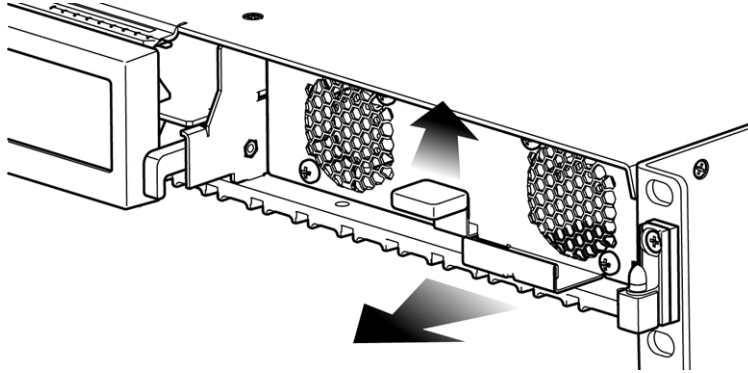
- 1 Open the front door of the frame (see [Opening the front door](#), on page 40).
- 2 Remove the controller card, to provide access to the power supply slots (see [Replacing the Frame Controller Card](#), on page 47).
- 3 Release the retaining spring by turning the captive screw mounted on the lower front panel of the power supply counterclockwise.
- 4 Remove the power supply module by pulling on the handle on its front panel and sliding it out of the frame.
- 5 Slide the new power supply module into the slot, and push it gently into position to seat the connectors.
- 6 Secure the supply in position by turning the captive screw mounted on the lower front of the power supply clockwise.  
This engages a retaining spring which holds the supply securely in place.
- 7 Replace the controller card.
- 8 Close the front door of the frame (see [Closing the front door](#), on page 41).

### To install or change a power supply module in a Densité 3+ FR1 frame

- 1 Open the front door of the frame (see [Opening the front door](#), on page 40).
- 2 If you are removing the left-hand side power supply, you must first remove the controller card. See [Replacing the Frame Controller Card](#) below.
- 3 Remove the power supply module by pulling on the handle on its front panel and sliding it out of the frame.
- 4 Slide the new power supply module into the slot, and push it gently into position to seat the connectors.  
There is no guiding slot—the supply base sits on the floor of the frame.
- 5 If you removed the controller card in [step 2](#), reinstall it (see [Replacing the Frame Controller Card](#)).
- 6 Close the front door of the frame (see [Closing the front door](#), on page 41).  
The door secures the power supplies in place.

**To install or change a power supply module in a Densité 3+ FR4 frame**

- 1 Open the front door of the frame (see [Opening the front door](#), on page 40).
- 2 Lift up the latching tab in the front center of the supply.



- 3 Slide the power supply out of the frame by pulling on the bracket on the bottom right of the supply.
- 4 Slide the new power supply module into the slot, and push it gently into position to seat the connectors.  
There is no guiding slot: the supply base sits on the floor of the frame. The latch clicks into position once the supply is properly seated.
- 5 Close the front door of the frame (see [Closing the front door](#), on page 41).

## Replacing Frame Ventilation Fans

The main cooling fans on the rear of Densité frames may be replaced in case of failure. Replacement fans are Grass Valley part number 1844-3000-200 for a Densité 3 frame, #03007-2100-100 for a Densité 3+ FR4 frame, or #0969-2100 for a Densité 3+ FR1 frame.

### Replacing the frame ventilation fan in a Densité 3 frame

#### To replace the frame ventilation fan in a Densité 3 frame

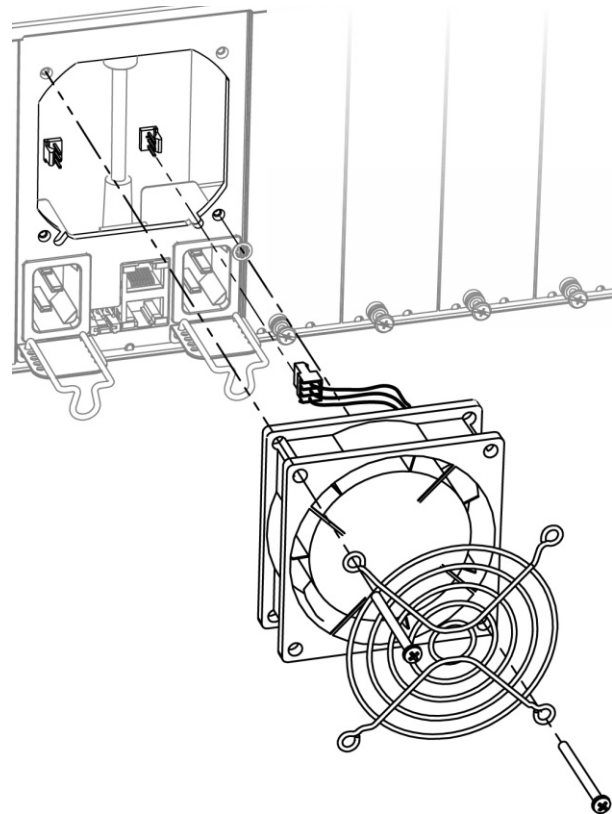
- 1 Remove the two screws that secure the grill and fan unit to the frame.  
Retain the screws and grill, as they will be used with the replacement fan.
- 2 Pull the unit away from the frame, and disconnect the power feed by grasping the connector and pulling straight out.

Grass Valley uses two different fan units for this product. While they are electrically equivalent, they have slightly different dimensions. The fan is installed with two screws located on opposite corners. The mounting plate has two sets of corner holes — one to fit each of the available fan models.

- 3 Start installing your new fan unit with one corner screw, and then try the diagonally opposite corner to see if it fits. If not, use the other pair of corners.

These two fan units also have different power connection configurations. There are two identical power connectors available on the frame for the fan's power cable. When you install the fan, you will be able to tell which one you should use: only one will be within reach.

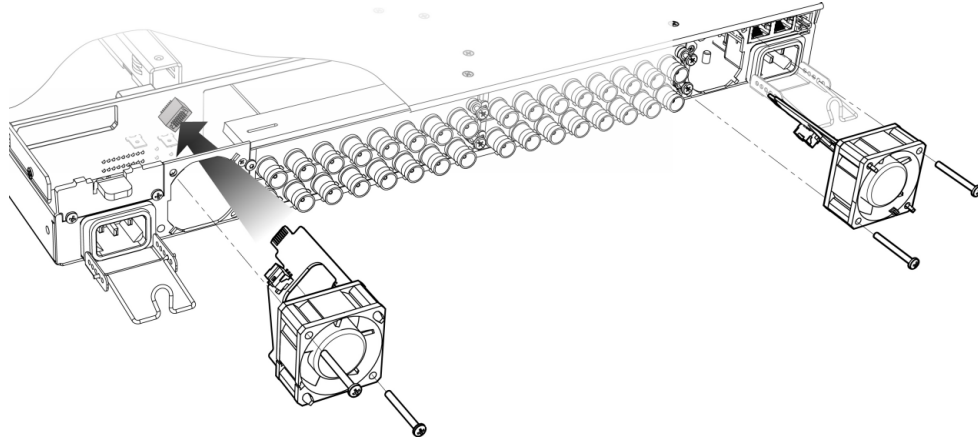
- 4 Grasp the power connector attached to the fan assembly, and push it onto the appropriately-located power outlet inside the cutout on the rear panel.
- 5 Use the two screws you retained from the old fan, to install the new fan and grill.



## Replacing the frame ventilation fan in a Densité 3+ FR1 frame

### To replace the frame ventilation fan in a Densité 3+ FR1 frame

- 1 Remove the two screws that secure the fan assembly to the frame, and pull the fan assembly straight out of the frame.  
Retain the screws, as they will be used with the replacement fan.
- 2 Slide the new fan assembly into the opening on the rear panel, pushing it straight in, and ensuring that the connector on the assembly mates with the socket in the frame.

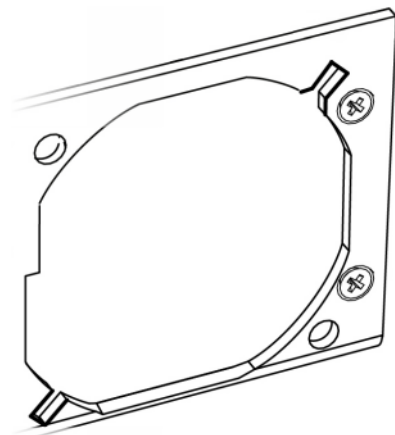


The two ventilator fans are mounted at different angles, as shown in the above figure.

- 3 Align the circuit board on the fan assembly with the notches in the edge of the rear-panel opening (see arrows in figure at right) to ensure the correct alignment.

The socket into which the circuit board connects is hidden from view by the fan assembly during installation and there is no guide to ensure that they are aligned. The easiest way to make sure that the connector and socket have mated properly is to install the fan with the frame power turned on. You will hear the fan start up when the connection is made.

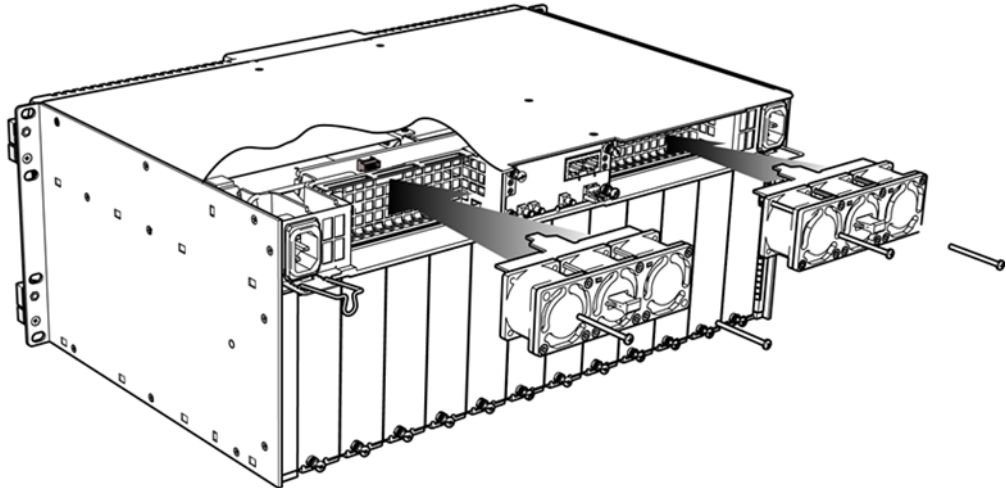
- 4 Use the two screws you retained from the old fan, to secure the new fan assembly to the rear panel.



## Replacing the frame ventilation fan in a Densité 3+ FR4 frame

### To replace the frame ventilation fan in a Densité 3+ FR4 frame

- 1 Remove the two screws (top left and bottom right corners) that secure the fan assembly to the frame, and pull the fan assembly straight out of the frame.  
Retain the screws, as they will be used to install the replacement fan assembly.
- 2 Slide the new fan assembly into the opening on the rear panel, pushing it straight in, and ensuring that the connector on the assembly mates with the socket in the frame.



- 3 Use the two screws you retained from the old fan, to secure the new fan assembly to the rear panel.

## Replacing the Air Filter

You may remove the air filter for cleaning or replacement.

### To remove the air filter in a Densité 3 or Densité 3+ FR1 frame

- 1 Open the front panel of the frame (see [Opening the front door](#), on page 40).
- 2 Grasp the top of the filter installed on the rear of the door, and pull it gently out of its mounting slot.

### To install a filter in a Densité 3 or Densité 3+ FR1 frame

- 1 Slide the filter into the slot at the bottom of the front panel door, and ensure that the filter is not bunched or folded.
- 2 Close the front panel of the frame (see [Closing the front door](#), on page 41).

### To remove the air filter in a Densité 3+ FR4 frame

- 1 Open the front door of the frame (see [Opening the front door](#), on page 40).
- 2 Lift the door up to slide it off the hinge pins, and lay it face down on a work surface.
- 3 Undo the captive thumbscrew at one end of the filter retaining bar.
- 4 Slip the other end of the retaining bar out of its slot.
- 5 Pull the filter away from the faceplate, by slipping it off the retaining hooks at the four corners.

**To install a filter in a Densité 3+ FR4 frame**

- 1 Orient the filter so the cutout for the controller display window lines up with the window in the frame door.
- 2 Slip the holes in the four corners of the filter over the hooks on the door panel.
- 3 Insert the tip of the retaining bar into the slot on the hinge end of the door.
- 4 Tighten the thumbscrew on the other end of the retaining bar to hold it in place.
- 5 Install the door onto the frame by sliding it down onto the hinge pins.
- 6 Close the front panel of the frame (see [Closing the front door](#), on page 41).

# 2

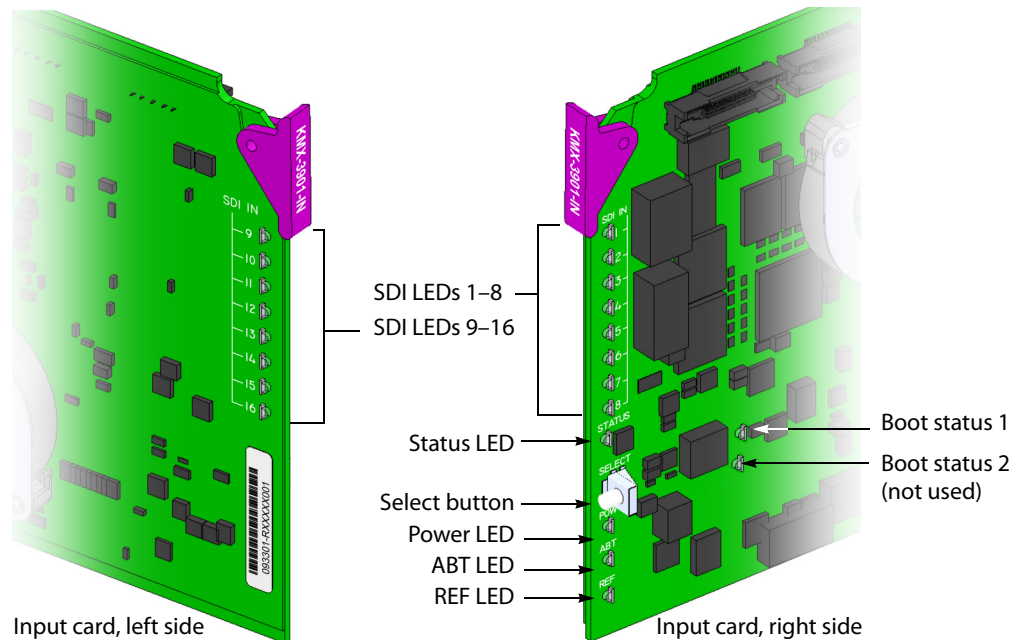
## Operation

A Kaleido-Modular-X multiviewer system can be controlled in different ways:

- In the housing frame, you can monitor card operating status of your Kaleido-Modular-X input and output cards by looking at the card-edge LEDs (see [LED Interface](#), on page 56), and use the CPU-ETH2, or CPU-ETH3 local control panel and its buttons to navigate menus and adjust parameter values (see [Using the Densité Frame Control Panel](#), on page 63).
- The loading and management of layouts is handled via a Java-based application, XEdit, accessed through a dedicated Ethernet port (refer to the Kaleido-X User's Manual).
- 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 (see [Remote Control Using iControl](#), on page 70).
- A GPI interface allows remote layout selection.
- The output resolution of the card can be controlled automatically through the EDID interface with the display.
- The RCP-200 advanced remote control panel, and the Kaleido-RCP2 control panel allow you to perform operations on the monitor wall, either by themselves or in association with an external keyboard and a mouse. Refer to the RCP-200, Kaleido-RCP2, and Kaleido-X documentation (available from the *Documentation Library* section of Grass Valley's website).

## LED Interface

### KMX-3901-IN Input Card Interface



*Summary view of the interface on the left side, and on the right side of a KMX-3901-IN input card*

#### Input card Status LED

The Status LED is located on the front edge of a KMX-3901-IN card, immediately above the Select button, and is visible through the front access door of the Densité frame. This multi-color LED indicates the status of the card, by color, and by blinking/steady illumination:

LED	Meaning
Green	Normal (communication established with an output card)
Blinking orange	Booting (or the card is selected for local control)
Red	Default color before firmware initialization is complete / update in progress (may last up to 10 minutes)
Blinking red	Fan failure / no rear

The Status LED always shows the most severe detected error status. In the table above, error severity increases from top to bottom, with green representing no error/disabled, and blinking red the most severe error conditions.

If the Status LED is blinking orange, it means that the card is selected for local control using the Densité frame's control panel (or that the card is booting up). See [Using the Densité Frame Control Panel](#), on page 63 for details.

If the Status LED is steady red (not blinking), use the Densité frame control panel to review card status information (see [Local Control Panel Menu Structure](#), on page 65). If the card



status menu reports that an update is in progress, then you know that you should not interrupt this process (by reseating the card, for example).

### Input card power LED

Monitors the status of the 1.8V and 3.3V power supplies on board the KMX-3901-IN input card.

LED	Meaning
Green	OK
OFF	Failure of the 1.8V or 3.3V on-board PSUs

### SDI LEDs

This group of LEDs monitors the status of the 8 or 16 inputs (depending on card model) to the KMX-3901-IN input cards. The frame door must be open for the LEDs to be visible.

LED	Meaning
Green	SD-SDI, HD-SDI or 3G input signal detected
Red	No input signal detected

### ABT LED

This LED monitors the status of the ABT/MADI input on the KMX-3901-IN input cards.

LED	Meaning
Green	ABT/MADI signal detected
Red	No signal detected

### REF LED

This LED monitors the status of the REF input on the KMX-3901-IN input cards.

LED	Meaning
Green	Black-burst or tri-level-sync signal detected
Red	No signal detected

### Boot status LED 1

Monitors the status of the firmware.

LED	Meaning
Green	Normal (firmware has completed initialization and communication was established with at least one output card)
Blinking orange	Error or no communication with an output card
Blinking green/red	Transitory state during firmware initialization
Red	Initial state

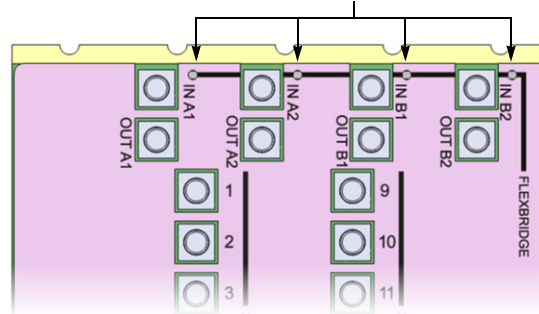
### Boot status LED 2

This LED is always red, and currently not relevant.

### Input card FlexBridge input LEDs

KMX-3901-IN input cards have 2 or 4 LEDs (depending on card model) monitoring the status of the FlexBridge inputs located on their rear connector panel.

Flexbridge input LEDS on quintuple rear panel  
(layout is similar on the other rear panels)

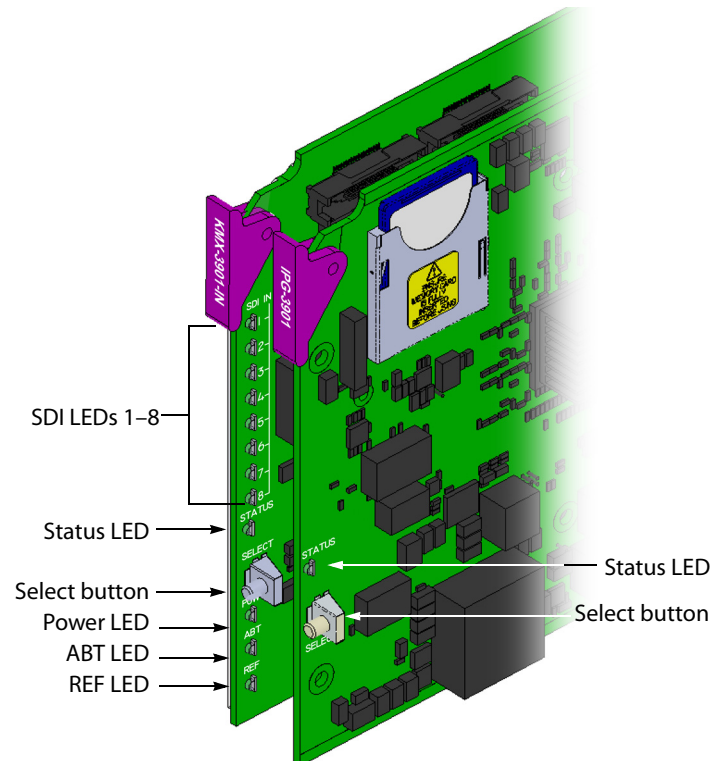


LED	Meaning
Green	HD-SDI or 3G-SDI signal detected
Red	No SDI signal detected

## KMX-3901-IN-IP Input/Output Card Interface

The KMX-3901-IN-IP comprises two front modules: KMX-3901-IN-8-D, on the left, and IPG-3901, on the right. Each module has its own Select button and Status LED.

- See [KMX-3901-IN Input Card Interface](#) on page 56 for more information on the KMX-3901-IN-8-D interface.
- Refer to the IPG-3901 Guide to Installation and Operation (available from the *Documentation Library* section of Grass Valley's website), for more information on the IPG-3901 user interface.



Summary view of the interface on the right side of a KMX-3901-IN-IP input/output module

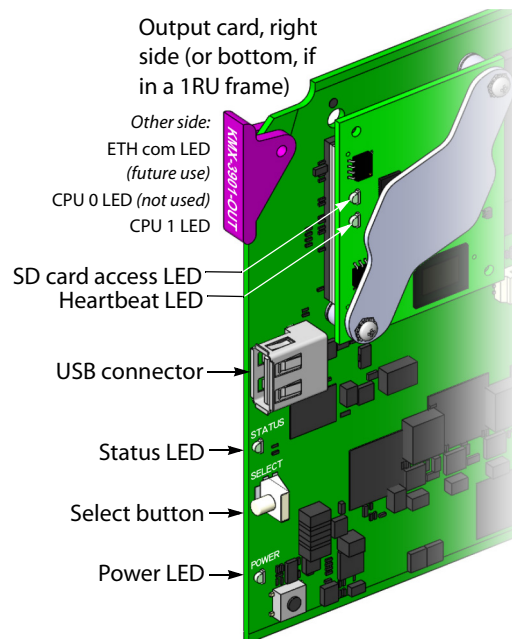
## 4K UHD Prescaler Card Interface

When a KMX-3901-IN-16-Q card operates as a 4K UHD prescaler, its SDI LEDs 3, 4, 7, 8, 11, 12, 15, and 16 are always off. SDI LEDs 1, 2, 5, 6, 9, 10, 13, and 14 monitor the status of the two quad link inputs to the prescaler card, and behave as indicated below. The frame door must be open for the LEDs to be visible.

LED	Meaning
Green	1080p 60/50 input signal detected
Orange	1080p 60/50 input signal detected, with EAV/SAV errors
Red	No input signal detected, or detected signal is not 1080p 60/50

Refer to [KMX-3901-IN Input Card Interface](#), on page 56, for more information about the other LEDs on the card.

## KMX-3901-OUT Output Card Interface



*Summary view of the interface on a KMX-3901-OUT output card front edge*

### Output card Status LED

The Status LED is located on the front edge of a KMX-3901-OUT card, immediately above the Select button, and is visible through the front access door of the Densité frame. This multi-color LED indicates the status of the card, by color, and by blinking/steady illumination:

LED	Meaning
Green	Normal
Blinking orange	Booting (or the card is selected for local control)
Red	Firmware initialization in progress / no Ethernet / SD card error / CPU kernel error / update in progress (may last up to 10 minutes)
Blinking red	Fan failure / no rear / duplicate IP address

The Status LED always shows the most severe detected error status. In the table above, error severity increases from top to bottom, with green representing no error/disabled, and blinking red the most severe error conditions.

If the Status LED is blinking orange, it means that the card is selected for local control using the Densité frame's control panel (or that the card is booting up). See [Using the Densité Frame Control Panel](#), on page 63 for details.

If the Status LED is steady red (not blinking), use the Densité frame control panel to review card status information (see [Local Control Panel Menu Structure](#), on page 65). If the card status menu reports that an update is in progress, then you know that you should not interrupt this process (by reseating the card, for example).

### Output card power LED

Monitors the status of the power supplies on board the KMX-3901-OUT card.

LED	Meaning
Green	OK
OFF	Failure of an on-board PSU, or there was a glitch on the 3.3V PSU (in which case reseating the card may resolve the problem). In the first case, reseating the card will not resolve the problem.

### Output card heartbeat LED

Monitors the status of the system firmware.

LED	Meaning
Blinking red	System OK ( <i>heartbeat</i> signal)

### Memory card access LED

Monitors read/write operations to the SD memory card.

LED	Meaning
OFF	No read/write operations in progress
Blinking green	Read or write operation in progress

### ETH communication LED

This LED is always OFF, and currently not relevant.

### CPU 0 LED (not used)

This LED is always orange, and currently not relevant.

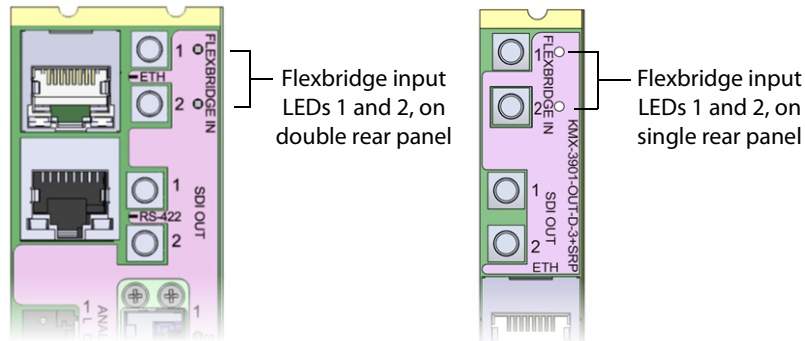
### CPU 1 LED

Monitors the status of the firmware during the startup process.

LED	Meaning
Green	Normal (the Kaleido-X software, XEdit, XAdmin are available)
Blinking orange	Firmware initialization completed (waiting for the Kaleido-X software to start)
Orange	Transitory state during firmware initialization
Red	Initial state

## Output card FlexBridge input LEDs

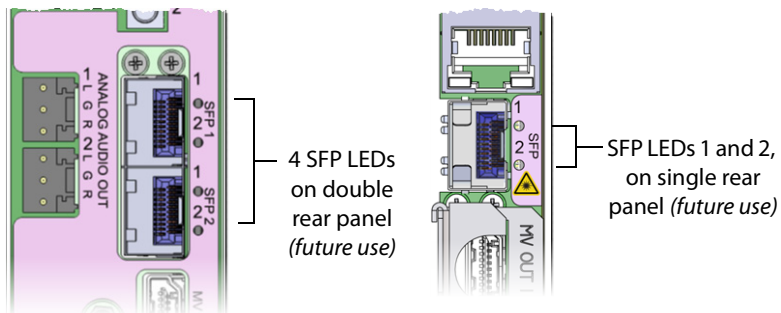
KMX-3901-OUT output cards have 2 LEDs monitoring the status of their FlexBridge inputs 1 and 2 located on their rear connector panel.



LED	Meaning
Green	HD-SDI or 3G-SDI signal detected
Red	No SDI signal detected

## SFP LEDs

KMX-3901-OUT output cards have 2 or 4 SFP LEDs (depending on rear model) located on their rear connector panel. These LEDs are always OFF, and currently not relevant.

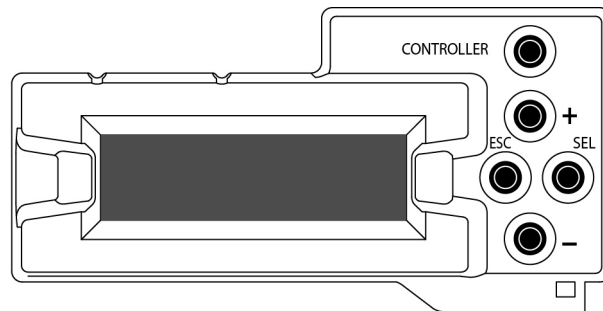


## Using the Densité Frame Control Panel

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.

### CPU-ETH2 Local Control Panel

In the case of a Densité 3 or Densité 3+ FR1 frame, the local control panel is fastened to the CPU-ETH2 controller card, and consists of a display unit capable of displaying two lines of text, each 16 characters in length, and five buttons.



*CPU-ETH2 local control panel*

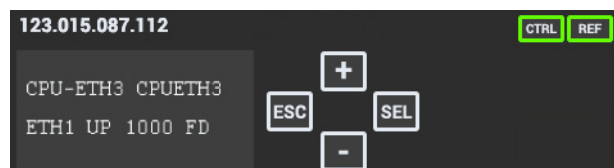
The panel is assigned to operate any card in the frame by pressing the Select button *on the front edge of that card*. The Status LED on the selected card will then be blinking orange.

Press the CONTROLLER button on the control panel to select the controller card itself.

### CPU-ETH3 Local Control Panel

In the case of a Densité 3+ FR4 frame, the local control interface is fastened to the front of the CPU-ETH3 controller card, and when installed is located in the top center of the frame.

The control interface is a touch screen, with four virtual navigation buttons (SEL, ESC, [+], and [-]), a display area where status information and options appear as you navigate the menus, and two virtual Select buttons (CTRL, and REF) to access the local menus for the frame controller itself, and for its reference module. These two buttons also behave as status indicators for the controller and reference modules.



*CPU-ETH3 local control panel*

The panel is assigned to operate any card in the frame by pressing the Select button *on the front edge of that card*. The Status LED on the selected card will then be blinking orange.

Touch the CTRL button on the control panel to select the controller card itself. Touch the SEL button on the control panel to select the controller's reference module.

## Navigating the Local Control Panel Menu

The Kaleido-Modular-X has operating parameters which may be adjusted locally at the controller card interface. Press the Select button *on the front edge of a Kaleido-Modular-X input or output card* to assign the local control panel to operate the card.

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**Note:** The KMX-3901-IN IP input modules comprise two cards: a KMX-3901-IN-8-D input card, and an IPG-3901 SDI/IP gateway card, configured separately through their respective menu.

---

The local control panel displays a menu that can be navigated using the four buttons located next to the display. The functionality of the buttons is as follows:

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

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

**ESC** Cancels the effect of parameter value changes that have not been confirmed; pressing or touching ESC causes the parameter to revert to its former value. Pressing or touching ESC moves the user back up to the previous menu level. At the main menu, ESC does not exit the menu system. To exit, press the Select button on the front edge of the card being controlled.

If no controls are operated for 30 seconds, the controller reverts to its normal standby status, and the selected card's Status LED reverts to its normal operating mode. If a parameter was changed on the card but not submitted (SEL was not pressed or touched) and the 30 second timeout occurs, the parameters will be confirmed as if the SEL button had been pressed or touched.



## Local Control Panel Menu Structure

Where applicable, default values are underlined.

### KMX-3901-OUT output card local menu

STATUS	{CARD STATUS}**	
{CARD VERSION}**		
RESOLUTION	HEAD1	{List of resolutions,* = current}**
	HEAD2	{List of resolutions,* = current}**
{LINK STATE}**		
FANS	{CPU FAN STATUS}**	
	{FPGA FAN STATUS}**	
NETWORK SETTINGS	FRAME IP ADDRESS EDIT	###.###.###.###
	NETMASK EDIT	###.###.###.###
	DEFAULT GW EDIT	###.###.###.###
	LINK MODE EDIT	<u>Auto-negotiate</u>
		100Mbps half-duplex
		100Mbps full-duplex
	OUTPUT A IP EDIT	###.###.###.###
	OUTPUT B IP EDIT	###.###.###.###
	{POSITION}**	
	{MAC ADDRESS}**	

\* All KMX-3901-OUT output cards within a housing frame must have their output heads configured with the same refresh rate. If your frame is referenced, then the heads' refresh rate must also match the reference signal's refresh rate.

\*\* Parameters shown here in braces {} will display the actual value of the item and not the text shown above.

### KMX-3901-IN input card local menu

STATUS	CARD STATUS	{CARD STATUS}**	
	INPUT STATUS	1 {FORMAT}**	
		2 {FORMAT}**	
		3 {FORMAT}**	
		:	
		16 {FORMAT}**	
CONFIG	4K UHD PRESCALER	ENABLE	
		<u>DISABLE</u>	
	SFP CONFIG***	SFP OUT 1	<u>ON</u>
			OFF
		SFP OUT 2	<u>ON</u>
			OFF
		SFP OUT 3	<u>ON</u>

### KMX-3901-IN input card local menu (*continued*)

			OFF
		SFP OUT 4	<u>ON</u>
			OFF
FACTORY DEFAULT	RESTORE		
{CARD VERSION}**			

\*\* Parameters shown here in braces {} will display the actual value of the item and not the text shown above.  
\*\*\* The SFP ports are not yet supported.

### Kaleido-Modular-X 4K UHD prescaler local menu

STATUS	CARD STATUS	{CARD STATUS}**	OFF
	INPUT STATUS	1 {FORMAT}**	
		2 {FORMAT}**	
		3 {FORMAT}**	
		:	
		16 {FORMAT}**	
	REF STATUS	{EXTERNAL   URS   FREE RUN   FLEXBRIDGE}**	
CONFIG	4K UHD PRESCALER	ENABLE	
		<u>DISABLE</u>	
	SFP CONFIG***	SFP OUT 1	<u>ON</u>
			OFF
		SFP OUT 2	<u>ON</u>
			OFF
		SFP OUT 3	<u>ON</u>
			OFF
		SFP OUT 4	<u>ON</u>
			OFF
FACTORY DEFAULT	RESTORE		
{CARD VERSION}**			

\*\* Parameters shown here in braces {} will display the actual value of the item and not the text shown above.  
\*\*\* The SFP ports are not yet supported.

### IPG-3901 SDI/IP gateway local menu

STATUS	GENERAL	REAR TYPE	KMX-3901-IN-IP-D-3PRP
		SERIAL NUMBER	{XXXXXX-XXXXXXXX}**
	REFERENCE	{MISSING   REF NTSC   REF PAL   REF URS 29   REF URS 25   NO REF   REF-MISMATCH   UNSUPPORTED   NOT LOCKED}**	
	ETH1	LINK STATUS	{LINK UP   LINK DOWN}**
		MAC ADDRESS	{00:00:00:00:00:00}**
	ETH2	LINK STATUS	{LINK UP   LINK DOWN}**
		MAC ADDRESS	{00:00:00:00:00:00}**
	GATEWAY	SDI IN 1	{ACTIVE   INACTIVE   DISABLED}** {video format at MV OUT 1}**
		SDI IN 2	{ACTIVE   INACTIVE   DISABLED}** {video format at MV OUT 2}**
		SDI IN/OUT 1	{ACTIVE   INACTIVE   DISABLED}** {video format at MV IN 1}**
		SDI IN/OUT 2	{ACTIVE   INACTIVE   DISABLED}** {video format at MV IN 2}**
		SDI IN/OUT 3	{ACTIVE   INACTIVE   DISABLED}** {video format at MV IN 3}**
		:	
		SDI IN/OUT 7	{ACTIVE   INACTIVE   DISABLED}** {video format at MV IN 7}**
		SDI OUT 1	{ACTIVE   INACTIVE   DISABLED}** {video format at MV IN 8}**

**IPG-3901 SDI/IP gateway local menu (*continued*)**

		SDI OUT 2	<i>Not relevant in the context of the KMX-3901-IN-IP I/O module</i>
	HEALTH	{HARDWARE STATUS}** {FAN STATUS}** {TEMPERATURE STATUS}**	
CARD PRESET	LOAD	DEFAULT USER 2 USER 3 USER 4 USER 5	
	SAVE	DEFAULT USER 2 USER 3 USER 4 USER 5	
NETWORK CONFIG	ETH1	IP ADDRESS MASK GATEWAY	###.###.###.### ###.###.###.### ###.###.###.###
	ETH2	IP ADDRESS MASK GATEWAY	###.###.###.### ###.###.###.### ###.###.###.###
SYSTEM	SCAN RATE	50 / 25Hz <u>59.94</u> / 29.97Hz	
TEST PATTERN	FORMAT	<u>1080i</u> 720p SD	
	FORCE ALL	ON <u>OFF</u>	
	SDI IN 1	ON  <u>OFF</u>	<i>Enables a test pattern in the selected video format at MV SDI OUT 1</i>
	SDI IN 2	ON  <u>OFF</u>	<i>Enables a test pattern in the selected video format at MV SDI OUT 2</i>

**IPG-3901 SDI/IP gateway local menu (*continued*)**

	SDI IN/OUT 1	ON	Enables a test pattern in the selected video format at MV SDI IN 1
		<u>OFF</u>	
	SDI IN/OUT 2	ON	Enables a test pattern in the selected video format at MV SDI IN 2
		<u>OFF</u>	
	SDI IN/OUT 3	ON	Enables a test pattern in the selected video format at MV SDI IN 3
		<u>OFF</u>	
	:		
	SDI IN/OUT 7	ON	Enables a test pattern in the selected video format at MV SDI IN 7
		<u>OFF</u>	
	SDI OUT 1	ON	Enables a test pattern in the selected video format at MV SDI IN 8
		<u>OFF</u>	
	SDI OUT 2	Not relevant in the context of the KMX-3901-IN-IP I/O module	
VERSION	{CARD VERSION}** {FPGA BUILD}**		
FACTORY DEFAULT	WITHOUT NETWORK	CANCEL   APPLY	
	INCLUDE NETWORK	CANCEL   APPLY	

\*\* Parameters shown here in braces {} will display the actual value of the item and not the text shown above.

## Remote Control Using iControl

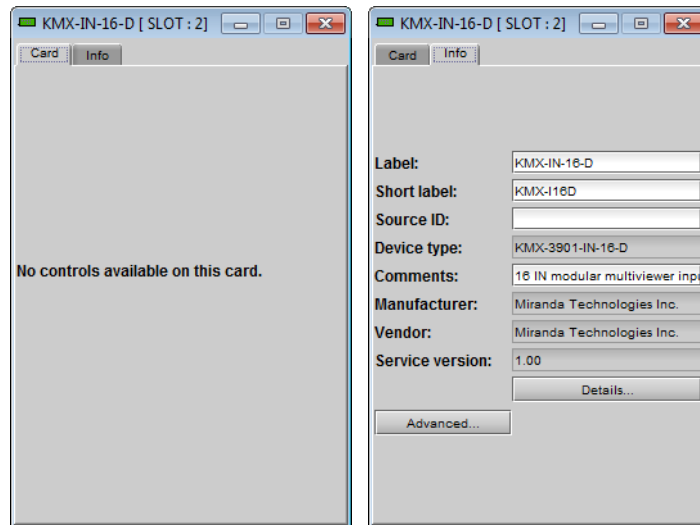
The KMX-3901-IN input cards and KMX-3901-OUT output cards may be controlled by using Grass Valley's iControl version 4.43 or later. The KMX-3901-IN-IP input/output cards require iControl version 7.10 or later. This section describes the three control panels associated with the Kaleido-Modular-X's input and output cards and their use. Refer to the iControl User's Guide for information about setting up and operating iControl.

In iControl Navigator, iControl Web, or iControl Solo, double-click the icon for a Kaleido-Modular-X input or output card (KMX-3901-OUT, KMX-3901-IN-8-D, KMX-3901-IN-16-D, or KMX-3901-IN-16-Q) to open the associated control panel.

### Kaleido-Modular-X Service Control Panels in iControl

The card label (*KMX-IN-16-D*, and *KMX-OUT* in the examples below) and the slot number where the card is installed in the Densité frame are indicated in the window's title bar.

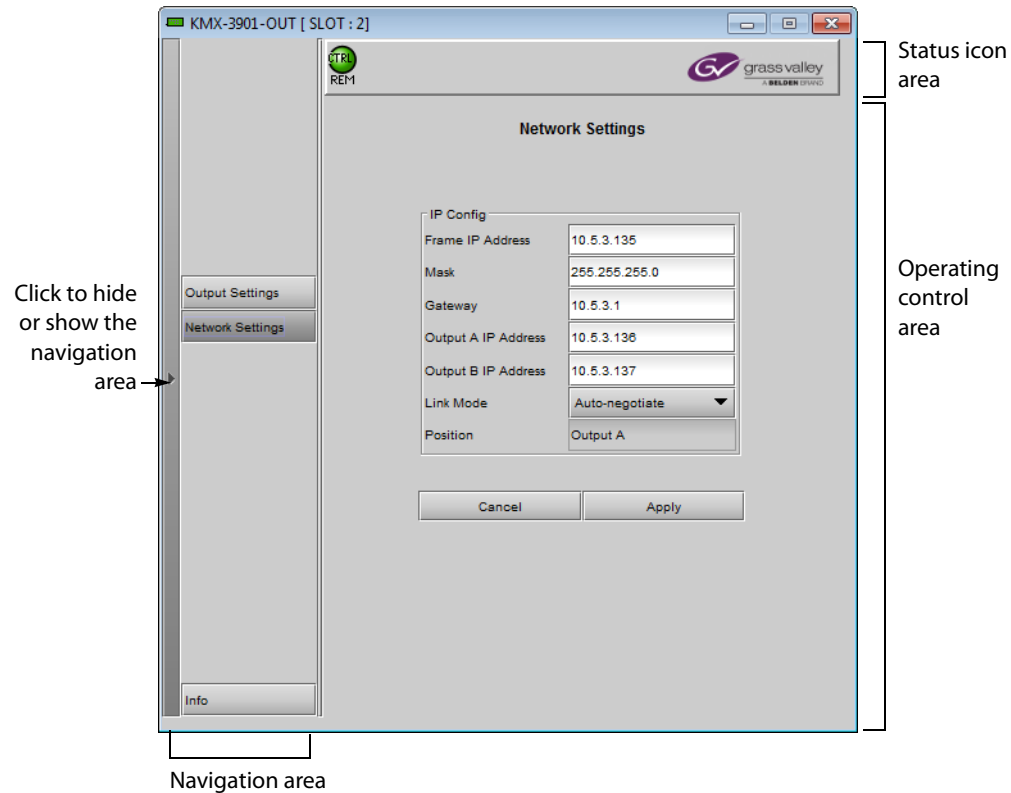
The service control panel for **KMX-3901-IN input cards** only offers information.



Service control panel for a KMX-3901-IN input card



See [Info Panel](#) on page 78 for more information.

In the control panel window for a KMX-3901-OUT output card, or for an IPG-3901 gateway card (part of the KMX-3901-IN-IP input/output modules), there are three main areas: the status icon area, the navigation area, and the operating control area.



*Service control panel for a KMX-3901-OUT output card*

The KMX-3901-OUT panel's status icon area contains only one icon: the control status icon.

- A green control status icon  indicates that the card is available for remote control from the service control panel in iControl.
- A yellow icon  indicates that someone is controlling the card from the control panel on the housing frame (see [Using the Densité Frame Control Panel](#), on page 63).

The status icon area of the IPG-3901 panel contains several icons, in addition to the control status icon described above. Refer to the IPG-3901 Guide to Installation and Operation, for more information on the other status icons.



*Service control panel for an IPG-3901 gateway card—partial view showing status icon area*

The navigation area contains buttons that control the contents of the main area.

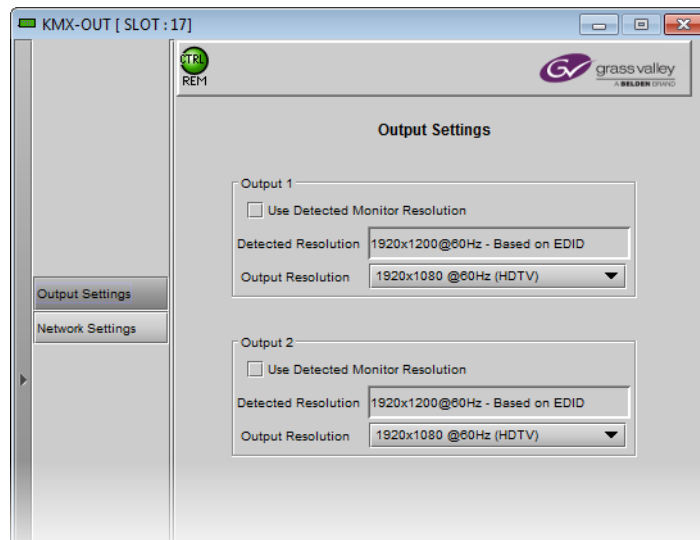
- Click a button to access the associated features.
- Click the left side border (identified by a small arrow icon) to hide or reveal this area.

The operating control area contains the main operating controls for managing the Kaleido-Modular-X multiviewer's feature set. The contents change depending on the button you clicked in the navigation area. The relevant panels are described individually in the following sections:

- [KMX-3901-OUT Output Settings Panel](#), on page 72
- [KMX-3901-OUT Network Settings Panel](#), on page 74
- [IPG-3901 Network Config Panel](#), on page 75
- [IPG-3901 Gateway Config Panel](#), on page 76
- [Info Panel](#), on page 78

## KMX-3901-OUT Output Settings Panel

Set the resolution of the multiviewer output heads to an appropriate value based on the displays in use. If a display uses EDID (Extended Display Identification Data) to communicate its characteristics to the Kaleido-Modular-X multiviewer via the HDMI connector, the matching can be done automatically, in which case the detected resolution appears in the **Detected resolution** box. Select the check box to use the detected resolution. If the detected resolution is not used (either because the check box is not selected or because the display does not make the information available) the value selected in the **Output resolution** list will be used.





The following table lists some (but not all) output formats supported at the HDMI connections. You can customize your own timing rates for resolutions ranging from 1024 × 768 pixels up to 1920 × 1200 pixels (all progressive scan), by using XEdit.

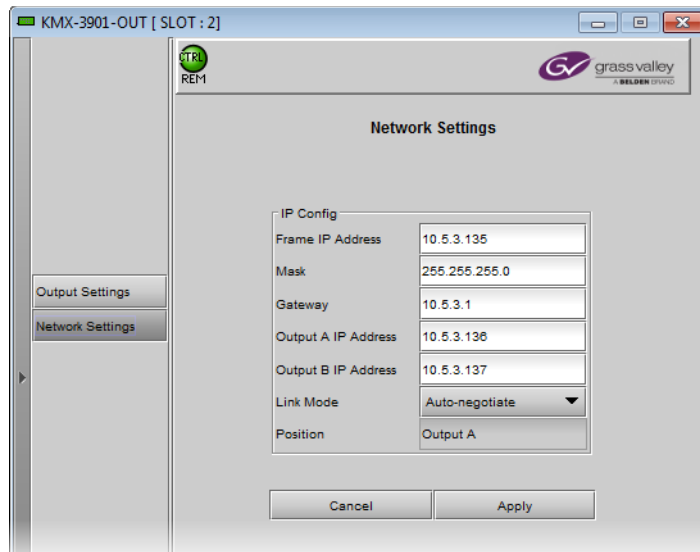
**KMX-3901-OUT HDMI output resolutions**

Resolution	Format name	Refresh rates (Hz)
1024 × 768	XGA	50.00, 59.94
1280 × 720	Margay	50.00, 59.94
1280 × 768	WXGA	50.00, 59.94
1280 × 1024	SXGA	50.00, 59.94
1280 × 1024	BARCO	59.94
1360 × 768	NEC	50.00, 59.94
1480 × 1200	Christie	50.00, 59.94
1600 × 1200	UXGA	50.00, 59.94
1920 × 1080	Baycat	50.00, 59.94
1920 × 1200	WUXGA	50.00, 59.94

**Note:** All KMX-3901-OUT output cards within a housing frame must have their output heads configured with the same refresh rate. If your frame is referenced, then the heads' refresh rate must also match the reference signal's refresh rate.

## KMX-3901-OUT Network Settings Panel

KMX-3901-OUT output cards are shipped with default network settings, which you must replace with values suitable for your network environment. You may need to consult your network administrator to get the correct values. Enter the appropriate IP address, mask and gateway information to configure a KMX-3901-OUT output card within your Ethernet network.



Click **Apply** to set these values into the card, or **Cancel** to leave the original values unchanged.

---

### Notes

- These settings apply to the rear-panel Ethernet port of the KMX-3901-OUT output cards; *not* to the Ethernet ports at the back of the Densité controller card.
  - On all Grass Valley multiviewers, the network adapters are set to auto-negotiate. By default, the connection speed and duplex mode will be set automatically based on the corresponding port settings on the switch.
  - The position of the output card is not configurable; the information is presented here for information only.
  - Quad-head Kaleido-Modular-X systems, which include two output cards, require three IP addresses: one for each output card, and a virtual IP address for the system. A dual- or single-head system requires only one IP address (the output card's IP address automatically doubles as the system IP address). Refer to the Kaleido-Modular-X Quick Start Guide for detailed setup information.
-

## IPG-3901 Network Config Panel

In the context of a Kaleido-Modular-X system with KMX-3901-IN-IP input/output cards, if you wish to stream the system's mosaic output to your TCP/IP network, then you must configure network settings for the IPG-3901 module. These settings are available on the IPG-3901 module's **Network Config** panel, under the **Settings** tab. You may need to consult your network administrator to get the correct values.

Type the appropriate IP address, mask and gateway information to configure the IPG-3901 module within your Ethernet network. Click **Apply** to set these values into the card, or **Cancel** to leave the original values unchanged.

The screenshot shows the 'IPG-3901 [ SLOT : 18]' window. The 'Network Config' tab is selected, showing 'Settings', 'Status', and 'Statistics' sub-tabs. The 'Settings' sub-tab is active, displaying 'Network configuration' for two Ethernet ports. For 'ETH 1 Port', the IP Address is 192.168.3.31, Subnet Mask is 255.255.255.0, and Gateway is 0.0.0.0. For 'ETH 2 Port', the IP Address is 192.168.2.32, Subnet Mask is 255.255.255.0, and Gateway is 0.0.0.0. There is an 'Enabled' checkbox for ETH 2 Port which is currently unchecked. Below the configuration fields are 'Apply' and 'Cancel' buttons for each port. At the bottom, there are 'Test Address' input fields and 'Ping' buttons for both ports. The left sidebar contains buttons for 'Gateway Config', 'Network Config', 'Gateway Status', 'Reference', 'Test', 'Factory/Presets', 'Alarm config', 'Info', 'Current Preset', and 'User custom'. The top right corner features the 'grass valley' logo and 'A BILDER GROUP' text.

**Note:** These settings apply to the rear-panel Ethernet port of the KMX-3901-IN-IP input/output cards; *not* to the Ethernet ports at the back of the CPU-ETH3 frame controller card.

## IPG-3901 Gateway Config Panel

In the context of a Kaleido-Modular-X system with KMX-3901-IN-IP input/output cards, you must configure a stream addresses, and select a signal format for each input or output gateway you choose to enable on the IPG-3901 modules. These settings are available on the IPG-3901 module's **Gateway Config** panel, under the **Gateways** tab. You may need to consult your network administrator.

En.	SDI I/O	Dir.	Stream Address	IGMPv3 Source	Format
<input checked="" type="checkbox"/>	SDI IN 1 MV OUT 1	→	192.168.3.31:20000 0.0.0.0:1000	- -	HD
<input checked="" type="checkbox"/>	SDI IN 2 MV OUT 2	→	192.168.3.31:20001 0.0.0.0:1000	- -	HD
<input checked="" type="checkbox"/>	SDI IN/OUT 1 MV IN 1	←	192.168.3.31:10001 0.0.0.0:1000	0.0.0.0 0.0.0.0	HD
<input checked="" type="checkbox"/>	SDI IN/OUT 2 MV IN 2	←	192.168.3.31:10002 0.0.0.0:1000	0.0.0.0 0.0.0.0	HD
<input type="checkbox"/>	SDI IN/OUT 3 MV IN 3	←	192.168.3.31:10003 0.0.0.0:1000	0.0.0.0 0.0.0.0	HD
<input type="checkbox"/>	SDI IN/OUT 4 MV IN 4	←	192.168.3.31:10004 0.0.0.0:1000	0.0.0.0 0.0.0.0	HD
<input type="checkbox"/>	SDI IN/OUT 5 MV IN 5	←	192.168.3.31:10005 0.0.0.0:1000	0.0.0.0 0.0.0.0	HD
<input type="checkbox"/>	SDI IN/OUT 6 MV IN 6	←	192.168.3.31:10006 0.0.0.0:1000	0.0.0.0 0.0.0.0	HD
<input type="checkbox"/>	SDI IN/OUT 7 MV IN 7	←	192.168.3.31:10007 0.0.0.0:1000	0.0.0.0 0.0.0.0	HD
<input type="checkbox"/>	SDI OUT 1 MV IN 8	←	192.168.3.31:10008 0.0.0.0:1000	0.0.0.0 0.0.0.0	HD
<input type="checkbox"/>	SDI OUT 2 N/A	←	0.0.0.0:1000 0.0.0.0:1000	0.0.0.0 0.0.0.0	HD

Select an item above to edit:

SDI I/O	Dir.	Stream Address	S. Port	IGMPv3 Source	Format
SDI OUT 2	←	0.0.0.0	1000	0.0.0.0	HD
N/A		0.0.0.0	1000	0.0.0.0	

Apply Cancel

Determine how many input and output gateways you need, and then clear the check box, in the **En.** column, for every gateway you do *not* wish to use. For example, if you do not wish to stream the mosaic output at all, clear the check boxes for both MV OUT 1 and MV OUT 2, or, if two input gateways can handle the number of streams you wish to monitor, then clear the check boxes for the remaining input gateways.

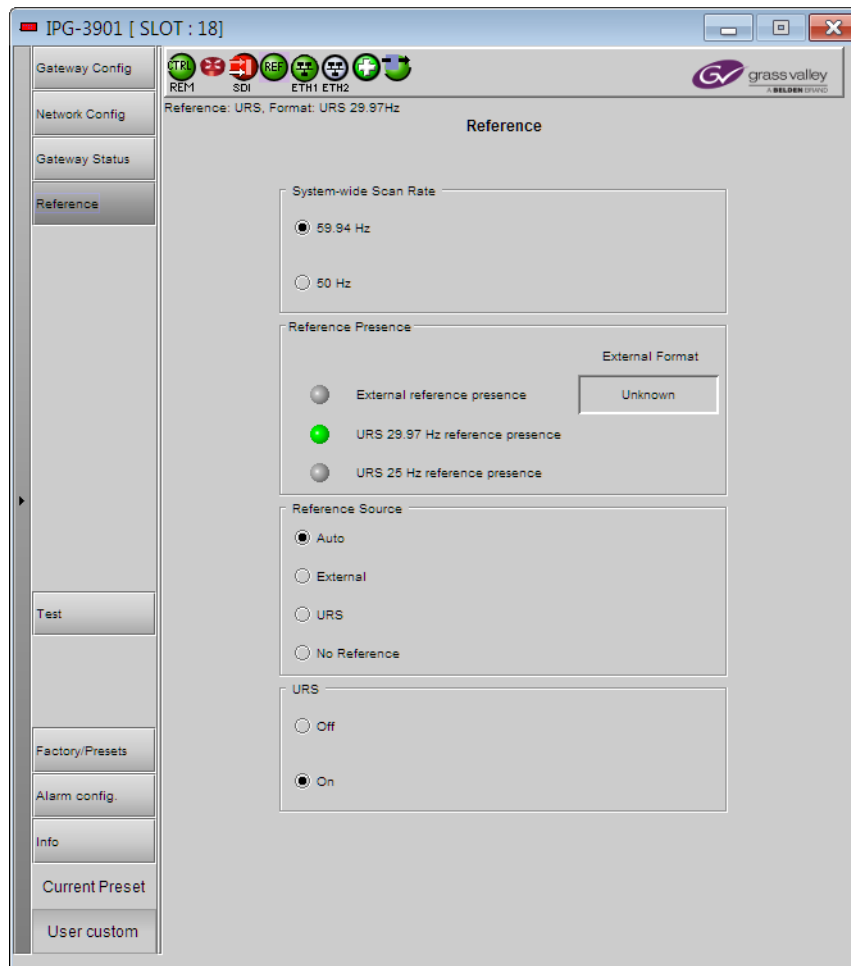
**Note:** The current version of the KMX-3901-IN-IP card supports a maximum of 6 HD input streams.

Select an enabled MV IN or MV OUT gateway, by clicking anywhere in the corresponding row. In the editing area at the bottom of the panel, enter the appropriate stream address and port number, and select the appropriate signal format. Click **Apply** to set these values

into the card, or **Cancel** to leave the original values unchanged. Proceed in the same fashion for all enabled gateways.

## IPG-3901 Reference Panel

In the context of a Kaleido-Modular-X system with KMX-3901-IN-IP input/output cards, the IPG-3901 module must be bounded to the frame controller's URS signal. Make sure the selected scan rate is appropriate for your facilities, that URS is enabled (**On**), and that the module is configured to automatically lock to the available reference source (**Auto**).



## Info Panel

When a Kaleido-Modular-X input or output card is included in an iControl environment, certain information about the card may be made available to the iControl system. In the boxes with a white background, you can type labels and comments that will make this card easier to identify in a complex setup.

The image displays two screenshots of the iControl software interface, specifically the 'Info' panel for Kaleido-Modular-X cards.

**Left Screenshot: KMX-OUT [ SLOT : 17]**

The interface shows a sidebar with 'Output Settings' and 'Network Settings' buttons. The main area is titled 'Info' and contains the following fields:

- Label:** KMX-OUT
- Short label:** KMX-OUT
- Source ID:** (empty)
- Device type:** KMX-3901-OUT
- Comments:** -SDI OUT modular multiviewer output module
- Manufacturer:** Miranda Technologies Inc.
- Vendor:** Miranda Technologies Inc.
- Service version:** 1.00

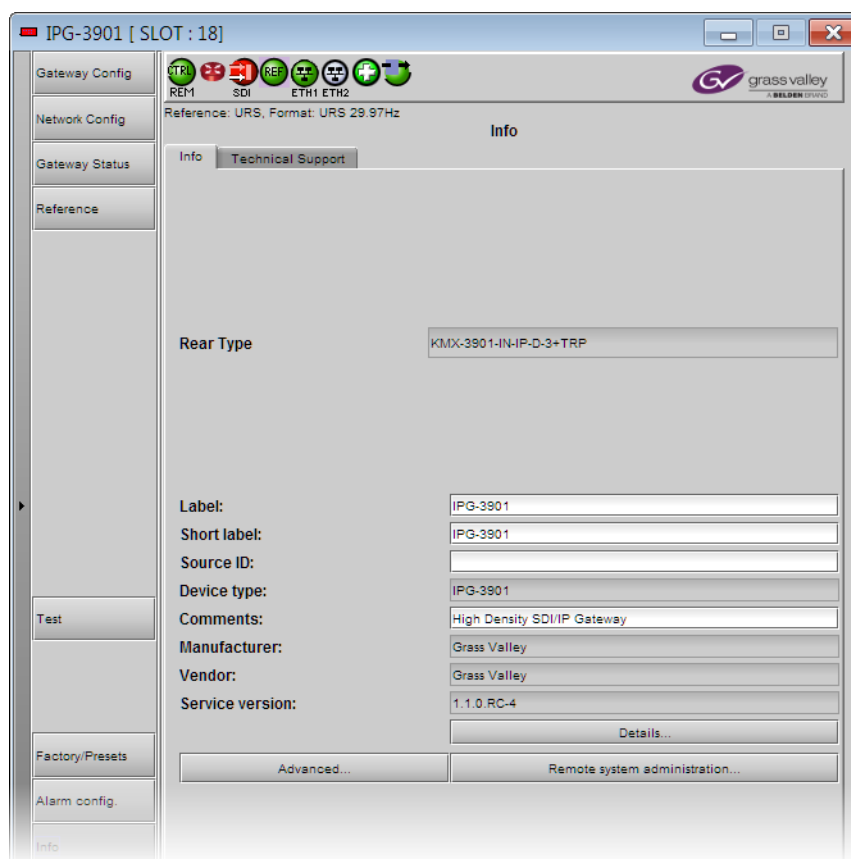
Buttons for 'Advanced...' and 'Details...' are located at the bottom of the form.

**Right Screenshot: KMX-IN-16-D [ SLOT : 2]**

The interface shows a sidebar with 'Card' and 'Info' buttons. The main area is titled 'Info' and contains the following fields:

- Label:** KMX-IN-16-D
- Short label:** KMX-I16D
- Source ID:** (empty)
- Device type:** KMX-3901-IN-16-D
- Comments:** 16 IN modular multiviewer inp
- Manufacturer:** Miranda Technologies Inc.
- Vendor:** Miranda Technologies Inc.
- Service version:** 1.00

Buttons for 'Advanced...' and 'Details...' are located at the bottom of the form.



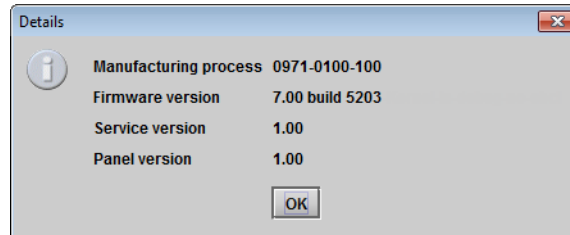
- Label** Type a label to identify this Kaleido-Modular-X card when it appears in iControl applications. This label appears in the service panel's title bar, in iControl Solo, and in the iControl Navigator views
- Short label** Type the shorter label that iControl uses in some cases (8 characters).
- Source ID** Type a descriptive name for this Kaleido-Modular-X card.
- Comments** Type any desired text.

The remaining boxes show manufacturing information about this card, including the card type (e.g., KMX-3901-OUT, KMX-3901-IN-16-D), and, in the case of the IPG-3901 (part of a KMX-3901-IN-IP input/output card), the rear type (KMX-3901-IN-IP-D-3+TRP).

**Note:** The services currently available with iControl do not yet recognize the 4K UHD prescaler mode. When the input card control panel reports a KMX-3901-IN-16-Q card type, there are no indications as to whether the prescaler mode is enabled or not.

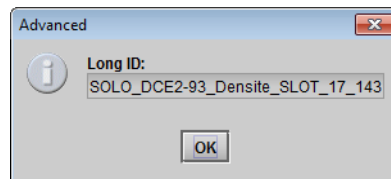
Three buttons give access to additional information and controls:

**Details** Reports the firmware version, service version, and panel version for this card.

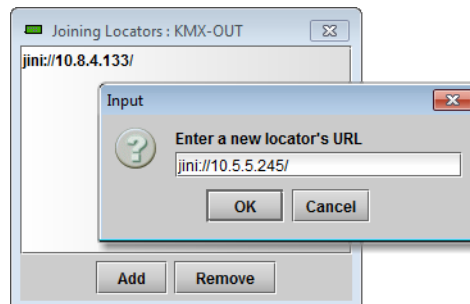


*Output card Details window*

**Advanced** Shows the Long ID for this Kaleido-Modular-X card. The Long ID is the address of this card in the iControl network.



**Remote system administration** Opens the **Joining Locators** window, which lists remote lookup services to which this Kaleido-Modular-X card is registered.



- Click **Add** to force the iControl service for this Kaleido-Modular-X card to register itself on a lookup service, by using the following syntax in the **Input** window:  
`jini://<ip_address>`  
where <ip\_address> is the IP address of the server running the lookup service.
- Select one of the services listed in the window by clicking on it, and then click **Remove** to remove it from the list.



# 3 Specifications

This chapter lists equipment specifications for the Kaleido-Modular-X input, output, and companion cards, and their rear panels.

## KMX-3901-IN Input Cards

The KMX-3901-IN-8-D cards support 8 signal inputs. The KMX-3901-IN-16-D and KMX-3901-IN-16-Q support 16 signal inputs. The supported video input types include SD-SDI, HD-SDI, 3G-SDI, and 4K UHD<sup>1</sup> (auto-detected). The processing delay is two fields if the video inputs are genlocked, and two or three fields if the video inputs are not genlocked. In rotation mode the processing delay may increase by one field. Signal inputs require DIN 1.0/2.3 connectors.

## Video Inputs

### SD-SDI inputs

Signal	4:2:2 SMPTE ST 259-C (270 Mbps), SMPTE ST 272
Formats	525 and 625
Audio	SMPTE ST 274
Return loss	> 15 dB up to 270 MHz
Alignment jitter (100 kHz)	< 0.2 UI
Timing jitter (10 Hz)	< 1 UI
Cable length	250 m (820 ft) (Belden 1694A) 150 m (492 ft) (Belden 1855A)

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1. From 4K UHD prescaler (see [KMX-3901-IN 4K UHD Prescaler Cards](#), on page 86).

### HD-SDI inputs

Signal	SMPTE ST 292-1 (1.485, 1.485/1.001 Gbps)
Formats <sup>a</sup>	720p29.97, 720p30, 720p50, 720p59.94 1080i50, 1080i59.94 1080PsF23.98, 1080PsF24, 1080PsF25, 1080PsF29.97 1080p23.98, 1080p24, 1080p25, 1080p29.97, 1080p30
Audio	SMPTE ST 299
Return loss	> 15 dB up to 1.5 GHz
Alignment jitter (100 kHz)	< 0.2 UI
Timing jitter (10 Hz)	< 1 UI
Cable length	100 m (328 ft) (Belden 1694A) 45 m (148 ft) (Belden 1855A)

a. The Kaleido-X software does not distinguish between 1080PsF25 and 1080i50, between 1080PsF29.97 and 1080i59.94, between 720p29.97 and 720p30, and between 1080p29.97 and 1080p30. On the monitor wall and in XAdmin's Status and Options page, 1080PsF25 is reported as 1080i50, 1080PsF29.97 is reported as 1080i59.94, 720p30 as 720p29.97, and 1080p30 as 1080p29.97.

### 3G-SDI inputs

Signal	SMPTE ST 424 (2.97, 2.97/1.001 Gbps)
Formats	1080p50 1080p59.94
Audio	SMPTE ST 299
Return loss	> 15 dB up to 1.5 GHz > 10 dB up to 3 GHz
Alignment jitter (100 kHz)	< 0.3 UI
Timing jitter (10 Hz)	< 2 UI
Cable length	100 m (328 ft) (Belden 1694A) 45 m (148 ft) (Belden 1855A)

### Graphic converted to HD-SDI from KXI-DVI-Bridge<sup>a</sup>

Signal	SMPTE ST 292-1 (1.485, 1.485/1.001 Gbps)
Format	1080p60
Cable length	100 m (328 ft) (Belden 1694A) 45 m (148 ft) (Belden 1855A)

a. A *Dual Channel DVI to HD Bridge* must be connected between the multiviewer and the PC or laptop that provides the graphics to the multiviewer. To order this optional device (Part No. KXI-DVI-BRIDGE), contact your Grass Valley sales representative.

## Discrete Audio Inputs

Every Kaleido-Modular-X input card supports one ABT/MADI audio input.

### MADI audio inputs

Signal	AES10-2008
Sampling frequency	48 kHz nominal, 64 channels, synchronous with video reference signal
Return loss	$\geq 15$ dB 100 kHz to 125 MHz
Cable length	100 m (325 ft) (Belden 8281 or Belden 1694A)
Connector	Coaxial via DIN 1.0/2.3, 75 $\Omega$

### ABT audio inputs

Signal	SMPTE ST 259-C (270 Mbps), SMPTE ST 305
Format	SDTI
Return loss	$> 15$ dB up to 270 MHz
Alignment jitter (100 kHz)	$< 0.2$ UI
Timing jitter (10 Hz)	$< 1$ UI
Cable length	250 m (820 ft) (Belden 1694A) 150 m (492 ft) (Belden 1855A)
Connector	DIN 1.0/2.3

## FlexBridge Inputs/Outputs

The KMX-3901-IN-8-D, and KMX-3901-IN-16-D support 2 FlexBridge inputs, and 2 FlexBridge outputs. The KMX-3901-IN-16-Q cards support 4 FlexBridge inputs, and 4 FlexBridge outputs.

### FlexBridge inputs and outputs

Signal	SMPTE ST 424 (2.97, 2.97/1.001 Gbps)
Formats	<i>Proprietary</i>
Audio	SMPTE ST 299
Return loss	$> 15$ dB up to 1.5 GHz $> 10$ dB up to 3 GHz
Alignment jitter (100 kHz)	$< 0.3$ UI
Timing jitter (10 Hz)	$< 2$ UI
Cable length between two input cards	10 m (33 ft) (Belden 1694A) 6 m (20 ft) (Belden 1855A)
Cable length from input card to output card	50 m (164 ft) (Belden 1694A) 35 m (115 ft) (Belden 1855A)
Connector	DIN 1.0/2.3

## Control

### Reference Inputs

The KMX-3901-IN cards support one external reference input for system genlock.

#### Reference Input

Supported formats	SMPTE ST 170 / SMPTE ST 318 / ITU 624-4 black burst SMPTE ST 274 / SMPTE ST 296 tri-level sync
Connector	DIN 1.0/2.3

### LTC Inputs

The KMX-3901-IN cards support one unbalanced LTC input for clock synchronization, or for monitoring a time code source from a timer, VTR, etc.

#### LTC Inputs

Signal	SMPTE ST 309-1999, SMPTE ST 12-1995 (EBU-3097-E)
Level	500 mVp-p to 10 Vp-p
Impedance	>12 k $\Omega$
Refresh rate	50/59.94 Hz
Connector	DIN 1.0/2.3

## Electrical

### Power consumption

KMX-3901-IN-8-D	28 W max
KMX-3901-IN-16-D	46 W max
KMX-3901-IN-16-Q	55 W max

## Physical

Full spec. temperature range	0–40°C (32–104°F) (ambient)
Max. storage humidity	90% RH non-condensing
Max. functional humidity	65% RH non-condensing
<i>Weight</i>	
KMX-3901-IN-8-D	207 g
KMX-3901-IN-8-D-3TRP	97 g
KMX-3901-IN-8-D-3+DRP	55 g
KMX-3901-IN-16-D	351 g
KMX-3901-IN-16-D-3QRP	141 g
KMX-3901-IN-16-D-3+DRP	67 g
KMX-3901-IN-M3-D-3QRP	124 g
KMX-3901-IN-M3-D-3+DRP	80 g
KMX-3901-IN-16-Q	381 g
KMX-3901-IN-16-Q-3PRP	161 g
KMX-3901-IN-16-Q-3+DRP	72 g
KMX-3901-IN-M3-Q-3PRP	163 g
KMX-3901-IN-M3-Q-3+DRP	85 g

## KMX-3901-IN 4K UHD Prescaler Cards

When a KMX-3901-IN-16-Q card is configured as a 4K UHD prescaler, it supports two quad link 3G-SDI signal inputs, which are assumed to be the constituent parts of two UHD 4K 3840×2160 sources. The processing delay is two fields (the video inputs must be genlocked).

### Video inputs

Signal	SMPTE ST 424 (2.97, 2.97/1.001 Gbps) Level A / Level B dual link
Formats <sup>a</sup>	SMPTE ST 425-5 12G over 4 3G links Square division quad split 2160p59.94 2160p50 2160p30 2160p29.97 2160p25
Audio	SMPTE ST 299
Return loss	> 15 dB up to 1.5 GHz > 10 dB up to 3 GHz
Alignment jitter (100 kHz)	< 0.3 UI
Timing jitter (10 Hz)	< 2 UI
Cable length	100 m (328 ft) (Belden 1694A) 45 m (148 ft) (Belden 1855A)
Connector	DIN 1.0/2.3

a. The Kaleido-X software does not distinguish between 2160p30 and 2160p29.97. On the monitor wall and in XAdmin's Status and Options page, 2160p30 is reported as 2160p29.97.

### Video outputs

Signal	SMPTE ST 424 (2.97, 2.97/1.001 Gbps) Level A
Formats	1080p50 1080p59.94
Audio	SMPTE ST 299 First 8 channels from quadrant 1 (top left)
Alignment jitter (100 kHz)	< 0.3 UI
Timing jitter (10 Hz)	< 2 UI
Cable length	50 m (164 ft) (Belden 1694A) 35 m (115 ft) (Belden 1855A)
Connector	DIN 1.0/2.3

### Electrical

Power consumption	55 W max
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### Physical

Full spec. temperature range	0–40°C (32–104°F) (ambient)
Max. storage humidity	90% RH non-condensing
Max. functional humidity	65% RH non-condensing
<i>Weight</i>	
KMX-3901-IN-16-Q	381 g
KMX-3901-IN-16-Q-3PRP	161 g
KMX-3901-IN-16-Q-3+DRP	72 g

## KMX-3901-IN-IP Input/Output Cards

### IP Communications

#### Ethernet port

Physical	2 SFP+ sockets for copper, short reach and long reach fiber
Standard	IEEE 802.3-2008 10 Gb Ethernet
IP standard	SMPTE-2022-6
Transport	Multicast or unicast

### Video Inputs Over IP

#### SD-SDI inputs

Signal	4:2:2 SMPTE ST 259-C (270 Mbps), SMPTE ST 272
Formats	525 and 625
Audio	SMPTE ST 274
Return loss	> 15 dB up to 270 MHz
Alignment jitter (100 kHz)	< 0.2 UI
Timing jitter (10 Hz)	< 1 UI
Cable length	250 m (820 ft) (Belden 1694A) 150 m (492 ft) (Belden 1855A)

### HD-SDI inputs

Signal	SMPTE ST 292-1 (1.485, 1.485/1.001 Gbps)
Formats	720p50, 720p59.94 1080i50, 1080i59.94
Audio	SMPTE ST 299
Return loss	> 15 dB up to 1.5 GHz
Alignment jitter (100 kHz)	< 0.2 UI
Timing jitter (10 Hz)	< 1 UI
Cable length	100 m (328 ft) (Belden 1694A) 45 m (148 ft) (Belden 1855A)

### 3G-SDI inputs

Signal	SMPTE ST 424 (2.97, 2.97/1.001 Gbps)
Formats	1080p50 1080p59.94
Audio	SMPTE ST 299
Return loss	> 15 dB up to 1.5 GHz > 10 dB up to 3 GHz
Alignment jitter (100 kHz)	< 0.3 UI
Timing jitter (10 Hz)	< 2 UI
Cable length	100 m (328 ft) (Belden 1694A) 45 m (148 ft) (Belden 1855A)

## Video Inputs Over SDI

The KMX-3901-IN-IP input/output card supports 2 SDI input connectors intended for streaming the output card's mosaic output.

### MV SDI Inputs

Physical	2 DIN 1.0/2.3 connectors
Standard	SMPTE-424M (2.970, 2.970/1.001 Gb/s)
Supported formats	1080p59.94, 1080p50



## FlexBridge Inputs/Outputs

The KMX-3901-IN IP cards support 2 FlexBridge inputs, and 2 FlexBridge outputs.

### FlexBridge inputs and outputs

Signal	SMPTE ST 424 (2.97, 2.97/1.001 Gbps)
Formats	<i>Proprietary</i>
Audio	SMPTE ST 299
Return loss	> 15 dB up to 1.5 GHz > 10 dB up to 3 GHz
Alignment jitter (100 kHz)	< 0.3 UI
Timing jitter (10 Hz)	< 2 UI
Cable length between two input cards	10 m (33 ft) (Belden 1694A) 6 m (20 ft) (Belden 1855A)
Cable length from input card to output card	50 m (164 ft) (Belden 1694A) 35 m (115 ft) (Belden 1855A)
Connector	DIN 1.0/2.3

## Control

The KMX-3901-IN-IP cards support one external reference input for system genlock.

### Reference Input

Supported formats	SMPTE ST 170 / SMPTE ST 318 / ITU 624-4 black burst
Connector	DIN 1.0/2.3

The KMX-3901-IN-IP cards support one unbalanced LTC input for clock synchronization, or for monitoring a time code source from a timer, VTR, etc.

### LTC Inputs

Signal	SMPTE ST 309-1999, SMPTE ST 12-1995 (EBU-3097-E)
Level	500 mVp-p to 10 Vp-p
Impedance	>12 k $\Omega$
Refresh rate	50/59.94 Hz
Connector	DIN 1.0/2.3

## Electrical

Power consumption	60 W
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## Physical

Full spec. temperature range	0–40°C (32–104°F) (ambient)
Max. storage humidity	90% RH non-condensing
Max. functional humidity	65% RH non-condensing
<i>Weight</i>	
KMX-3901-IN-8-D	207 g
IPG-3901	207 g
KMX-3901-IN-IP-D-3+TRP	96 g

## KMX-3901-OUT Output Cards

### Mosaic Outputs

The KMX-3901-OUT cards support one, or two progressive scan HDMI outputs.

#### HDMI outputs

Signal	HDMI V1.3
Format	1024 × 768 up to 1920 × 1200, configurable (all progressive scan) Supported refresh rates: 50 Hz and 59.94 Hz
Audio	PCM 24 bits
Cable length	15 m (50 ft) with Gefen CAB-HDMI-50MM
Connector	HDMI type connector
Signal path	24 bits RGB

## SDI Monitoring Outputs

The KMX-3901-OUT cards support one, or two 3G/HD-SDI outputs (with embedded audio).

### HD-SDI monitoring outputs

Signal	SMPTE ST 292-1 (1.485, 1.485/1.001 Gbps)
Formats	720p50 720p59.94 1080i50 1080i59.94
Audio	SMPTE ST 299-1 (limited to one pair, embedded on group 1, pair 1)
Return loss	> 15 dB up to 1.5 GHz
Alignment jitter (100 kHz)	< 0.2 UI
Timing jitter (10 Hz)	< 2.5 UI
Cable length	100 m (328 ft) (Belden 1694A) 45 m (148 ft) (Belden 1855A)
Connectors	DIN 1.0/2.3
Quantization	8 bits

### 3G-SDI monitoring outputs

Signal	SMPTE ST 424 (2.97 Gbps / 2.97/1.001 Gbps)
Formats (Level A only)	1080p50 1080p59.94
Audio	SMPTE ST 299-1 (limited to one pair, embedded on group 1, pair 1)
Return loss	> 15 dB up to 1.5 GHz > 10 dB up to 3 GHz
Alignment jitter (100 kHz)	< 0.3 UI
Timing jitter (10 Hz)	< 2 UI
Cable length	100 m (328 ft) (Belden 1694A) 45 m (148 ft) (Belden 1855A)
Connectors	DIN 1.0/2.3
Quantization	8 bits

## Analog Audio Outputs

KMX-3901-OUT cards with a double rear connector panel<sup>2</sup> support one, or two analog audio outputs.

### Analog audio outputs

Signal	Unbalanced analog stereo
Impedance	10 kΩ
Level	2 V p-p
Connector	WECO

## FlexBridge Inputs

The KMX-3901-OUT cards support one, or two FlexBridge inputs.

### FlexBridge inputs

Signal	SMPTE ST 424 (2.97, 2.97/1.001 Gbps)
Formats	<i>Proprietary</i>
Audio	SMPTE ST 299
Return loss	> 15 dB up to 1.5 GHz > 10 dB up to 3 GHz
Alignment jitter (100 kHz)	< 0.3 UI
Timing jitter (10 Hz)	< 2 UI
Cable length from input card to output card	50 m (164 ft) (Belden 1694A) 35 m (115 ft) (Belden 1855A)
Connector	DIN 1.0/2.3

## Communication

### Ethernet

Signal	10/100 BASE-T
Standard	IEEE 802.3
Connector	RJ45

---

2. The single rear connector panel does not support analog audio outputs (see [KMX-3901-OUT-D-3+SRP rear panel connections](#), on page 25). With the single panel, audio monitoring is available at the SDI and HDMI outputs only.

### Serial port

Signal	RS-422 (SMPTE ST 207, EBU-3245), RS-485
Connector	RJ45 <sup>a</sup>

a. Not available on the single rear connector panel

### USB

Standard	USB version 2.0
Peripherals supported	Mouse, keyboard, memory stick
Connector	USB type A

## Electrical

### Power consumption

KMX-3901-OUT-S KMX-3901-OUT-D	25 W max
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## Physical

Full spec. temperature range	0–40°C (32–104°F) (ambient)
Max. storage humidity	90% RH non-condensing
Max. functional humidity	65% RH non-condensing
<i>Weight</i>	
KMX-3901-OUT-S	212 g
KMX-3901-OUT-D	218 g
KMX-3901-OUT-D-3DRP	87 g
KMX-3901-OUT-D-3+SRP	78 g

## GPI-1501 GPI I/O module

This card supports 20 GPI inputs, and 8 configurable GPI inputs/outputs.

### GPI input (up to 20)

Description	Contact closure to GND
Pull-up voltage	2.3 Volts
Source current	2 mA when input shorted
Low-level activation	0.8 Volts max
Over voltage	25 Volts max
Connector	DB-44

### GPI bidirectional (up to 8)

Description	Contact closure to GND
Signal	Open collector 5 to 12 VDC
Connector	DB-44

#### *Input mode*

Pull-up voltage	2.3 Volts
Source current	2 mA when input shorted
Low-level activation	0.8 Volts max
Over voltage	25 Volts max

#### *Output mode*

Contact closure current	50 mA max
Reverse voltage	-15 Volts max
Reverse current	-50 mA max
V out low	0.6 Volts at 1.5mA

### Electrical

Power consumption	1 W max
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### Weight

GPI-1501 card	84 g
GPI-1501-SRP-3RU rear panel	30 g





## **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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