Imagine COMMUNICATIONS™

Installation and Operation Manual

Platinum IP3

Wideband Digital Multirate Routing Switchers Frames and Modulesy

Preliminary January 2012

Edition 175-100448-00

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Platinum IP3

Wideband Digital Multirate Routing Switchers Frames and Modules

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Edition B

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Publication Information

This publication is designed to assist in the use of the product as it exists on the date of publication of this manual, and may not reflect the product at the current time or an unknown time in the future. This publication does not in any way warrant description accuracy or guarantee the use for the product to which it refers.

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Contents

Preface

Manual Information

Purpose

This manual details the features, installation, operation, maintenance, and specifications for the Platinum IP3 Wideband Digital Multirate routing Switchers Frames and Modules.

Audience

This manual is written for engineers, technicians, and operators responsible for installation, setup, maintenance, and/or operation of the Platinum IP3 Wideband Digital Multirate routing Switchers Frames and Modules.

Revision History

Table 1-1 Revision History of Manual

Edition	Date	Comments
A	December 2012	Preliminary Release
B	January 2013	First Release

Writing Conventions

This manual adheres to the following writing conventions:

Table P-2. Writing Conventions

Term or Convention	Description
Bold	Indicates dialog box, property sheet, field, button, check box, list box, combo box, menu, submenu, window, list, and selection names
Italics	Indicates email addresses, names of books and publications, and first instances of new terms and specialized words that need emphasis
CAPS	Indicates a specific key on the keyboard, such as ENTER, TAB, CTRL, ALT, DELETE
`Code`	Indicates variables or command-line entries, such as a DOS entry or something you type into a field.
>	Indicates the direction of navigation through a hierarchy of menus and windows.

Table P-2. Writing Conventions *(Continued)*

Term or Convention	Description
hyperlink	Indicates a jump to another location within the electronic document or elsewhere
Internet address	Indicates a jump to a Web site or URL
Note:	Indicates important information that helps to avoid and troubleshoot problems

Obtaining Documents

Product support documents can be viewed or downloaded from our website. Alternatively, contact your Customer Service representative to request a document.

Unpacking/Shipping Information

Unpacking a Platinum IP3 Product

All products have been carefully inspected, tested, and calibrated before shipment to ensure years of stable and trouble-free service.

1. Check the equipment for any visible damage that may have occurred during transit.
2. Confirm that you have received all items listed on the packing list.
3. Contact your dealer if any item on the packing list is missing.
4. Contact the carrier if any item is damaged.
5. Remove all packaging material from the product and its associated components before you install the unit.

Returning a Platinum IP3 Product

In the unlikely event that a product fails to operate properly, please contact our Customer Service Department to obtain a Return Authorization (RA) number, then send the unit back for servicing.

Keep at least one set of original packaging in the event that a product needs to be returned for service. If the original package is not available, you can supply your own packaging as long as it meets the following criteria:

- The packaging must be able to withstand the product's weight.
- The product must be held rigid within the packaging.
- There must be at least 2 in. (5 cm) of space between the product and the container.
- The corners of the product must be protected.

If the product is still within the warranty period, we will return it to you by prepaid ground shipment after servicing.

Product Servicing

Except for firmware upgrades, Platinum IP3 modules are not designed for field servicing. All hardware upgrades, modifications, or repairs require you to return the modules to the Customer Service center.

Safety

Refer the **IP3 Safety and Standards Manual** for details.

Waste from Electrical and Electronic Equipment (WEEE) Compliance

The European Union (EU) Directive 2002/96/EC on Waste from Electrical and Electronic Equipment (WEEE) deals with the collection, treatment, recovery, and recycling of electrical and electronic waste products. The objective of the WEEE Directive is to assign the responsibility for the disposal of associated hazardous waste to either the producers or users of these products. As of August 13, 2005, the producers or users of these products were required to recycle electrical and electronic equipment at end of its useful life, and may not dispose of the equipment in landfills or by using other unapproved methods. (Some EU member states may have different deadlines.)

In accordance with this EU Directive, companies selling electric or electronic devices in the EU will affix labels indicating that such products must be properly recycled. (See our website for more information.) Contact your local sales representative for information on returning these products for recycling. Equipment that complies with the EU directive will be marked with a WEEE-compliant emblem, as shown in **Figure 1-1**.

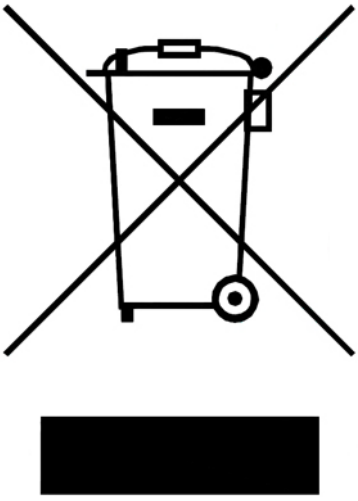


Figure 1-1 WEEE Compliance Emblem

1 Introduction

Platinum IP3 Overview

The **Platinum IP3™** Intelligent Signal Routing System provides unprecedented scalability and flexibility to designers of new broadcast facilities, OB production vehicles, and other television switching, monitoring, and transmission facilities worldwide.

The IP3 features enhanced crosspoint and switching architectures which allow scalability to extremely large systems, coupled with a new frame design for improved density and reliability in large system configurations.

Product Description

The IP3 routing switcher system extends both the matrix size and functionality of our routing switcher product line. Its flexible modular architecture accommodates standard definition, high definition, and 1080p digital video signals while keeping a versatile frame and control system. This combination allows high performance, multi-format video, audio and embedded audio routing within a single, flexible frame.

The IP3 routing switcher system provides matrix expandability beyond 8×8, to 576×1024 in a single frame. The 8×8 building block provides ideal growth and flexibility for mixed applications such as high definition and serial digital interface, and other integrated processing opportunities such as analog and/or digital conversion. With its ability to route signals ranging from 3.0 Mb/s to 2.97 Gb/s, the IP3 router offers a clear growth path from lower bit rate signals to high bandwidth, high definition format signals. This router will also handle both AES and polarity sensitive ASI/SSI signal formats.

The IP3 Router is available in the following frame size:
28 RU(PX-FR-28) frame supporting matrices up to 576x1024

Features

- **Routing for large systems**
  - 576x1024 in a single 28RU frame
  - 1152x1024 in two 28RU frames
  - 576x2048 in two 28RU frames
  - 1152x2048 in four 28RU frames
  - 1152x3072 in six 28RU frames
- **Video routing**
  - HD-SDI digital multirate from 3.00 Mb/s to 2.97 Gb/s

  - Digital video signals including SMPTE 310, SDI, ASI, HD-SDI
  - Analog video via conversion to/from SDI on I/O modules
- **Audio routing**
  - Digital audio signals including balanced and unbalanced (coaxial) AES
  - Analog stereo audio via conversion to/from AES on I/O modules
  - MADI audio - Embedded audio with the use of Audio De-multiplexing and Multiplexing boards
- Module I/O in groups of 8 or 9 inputs and 8 or 16 outputs
- Route to/from digital and analog signals with no external processing
- Front-loading, hot swappable modules
- Redundancy (power supplies, resource modules, signal paths) throughout
- Enhanced control and monitoring capabilities
- Secure access rights with restrictions by level, source, and destination
- CCSP, SNMP, and third-party protocol support

IP3 Frame (PX-FR-28)

The flagship frame in the Platinum IP3 system is a 28RU frame, featuring 576 wideband video inputs distributed across 64 modular input slots, and 1024 wideband video outputs distributed across 64 modular slots. This can expand to 1152x1024 in two 28RU frames, while providing 2N redundant crosspoint (XPT) modules. See **Video Matrix Expansion**.

The IP3 frame is similar to the 28RU Platinum frame with some modifications. Larger matrix sizes are achieved via new crosspoint (XPT) modules, a new backplane (MI), and new Input/Output (I/O) modules. A new resource module (PX-RES) provides greater processing capacity, and an upgraded version of the Platinum TDM crosspoint module allows for twice the original matrix capacity.

The PX-FR-28 frame uses common, front-loadable, and hot-swappable input and output modules. The IP3 frame uses unique Video and Audio Crosspoint modules which are not compatible with Platinum frames. The frame has a passive module interconnect (MI) signal distribution module interconnecting the routing system.

The frame is accessible from the front via sectioned, removable doors. Status LEDs can be viewed through these doors; these LEDs indicate power supply presence (and status), resource module usage, and link light indicators for Ethernet communications ports. Four 1500 watt power supplies are present. Frames with conversion or advanced processing options may require additional power supplies; or additional power supplies may be added for redundancy.

Status LEDs on Power Supply units, Resource cards, and various I/O modules are visible when the door is open. Alarms on various modules are reported to the IP3 Controller to ease hardware management of the system.

The IP3 frame is designed to be compliant with NEBS certification requirements (for example, module retention doors, non-removable door option, locking power supplies, etc.). The frame is compatible with Harris' router control software products such as CCS Navigator and can also be controlled via a web based Controller.

IP3 Architecture

The IP3's flexible modular architecture accommodates standard definition, high definition, and 1080p digital video signals while keeping a versatile frame and control system. This combination allows high performance, multi-format video, audio, and embedded audio routing within a single, flexible frame. The IP3 can switch signals from 3 Mb/s to 3Gb. It can pass and reclock both standard SD (including 143, 177, 270, 360, and 540 Mb/s), HD (1.485 Gb/s), and SDI 3G signals, supporting routing of both SD and HD signals in the same router.

The Platinum wideband video and TDM audio switching fabrics (which allow for non-blocking audio processing) have been retained, and a third fabric for IP routing has been added. This switch supports faster module upgrades, faster control communication, and a packetized data switching infrastructure to facilitate metadata and hybrid switching and internal streaming.

To support audio matrix expansion between two IP3 frames, the internal Audio Time Division Multiplexed (TDM) buses are Time-division multiplexed onto a higher speed TDM bus operating at 3 Gbits/s each and carried over 16 DensiShield channels. This requires a minimum of two DensiShield cables – one for outputs distribution and a second for input distribution or four cables if redundancy is desired. With the IP3's Audio Expansion option, a two frame system is fully non-blocking, meaning that audio inputs (embedded or discrete) in frame one can be routed to any output in frame two.

Removing the Frame Door

Note: *While you can just open the front door of the Frame, you may want to remove it completely when you need better access to Modules.*

While pressing in the chrome locking pin (see **Figure 1-1**), lift the door off the hinge and remove.

Figure 1-1 IP3 Frame and close up of locking pin

Frame Architecture

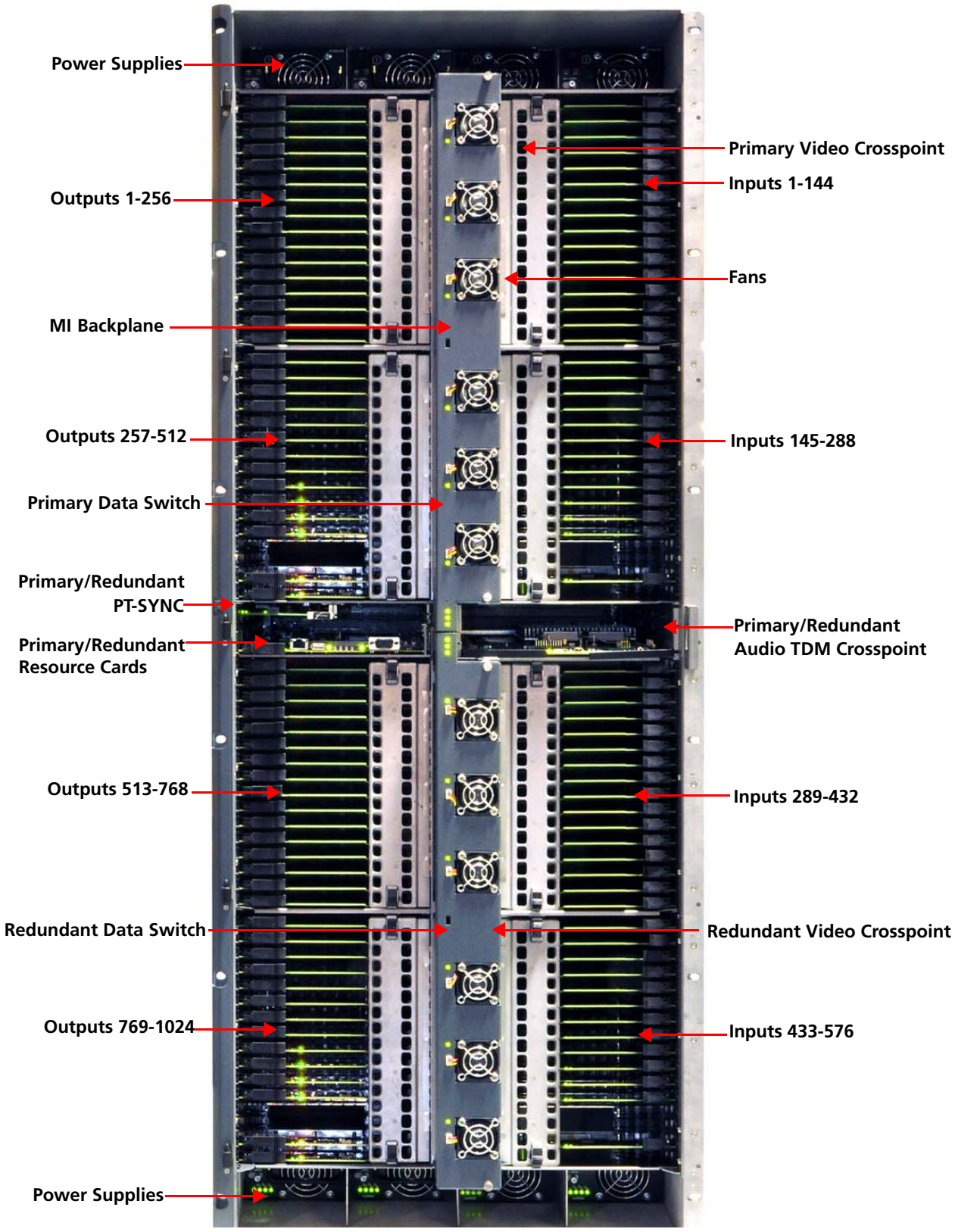


Figure 1-2 IP3 Frame viewed from the front

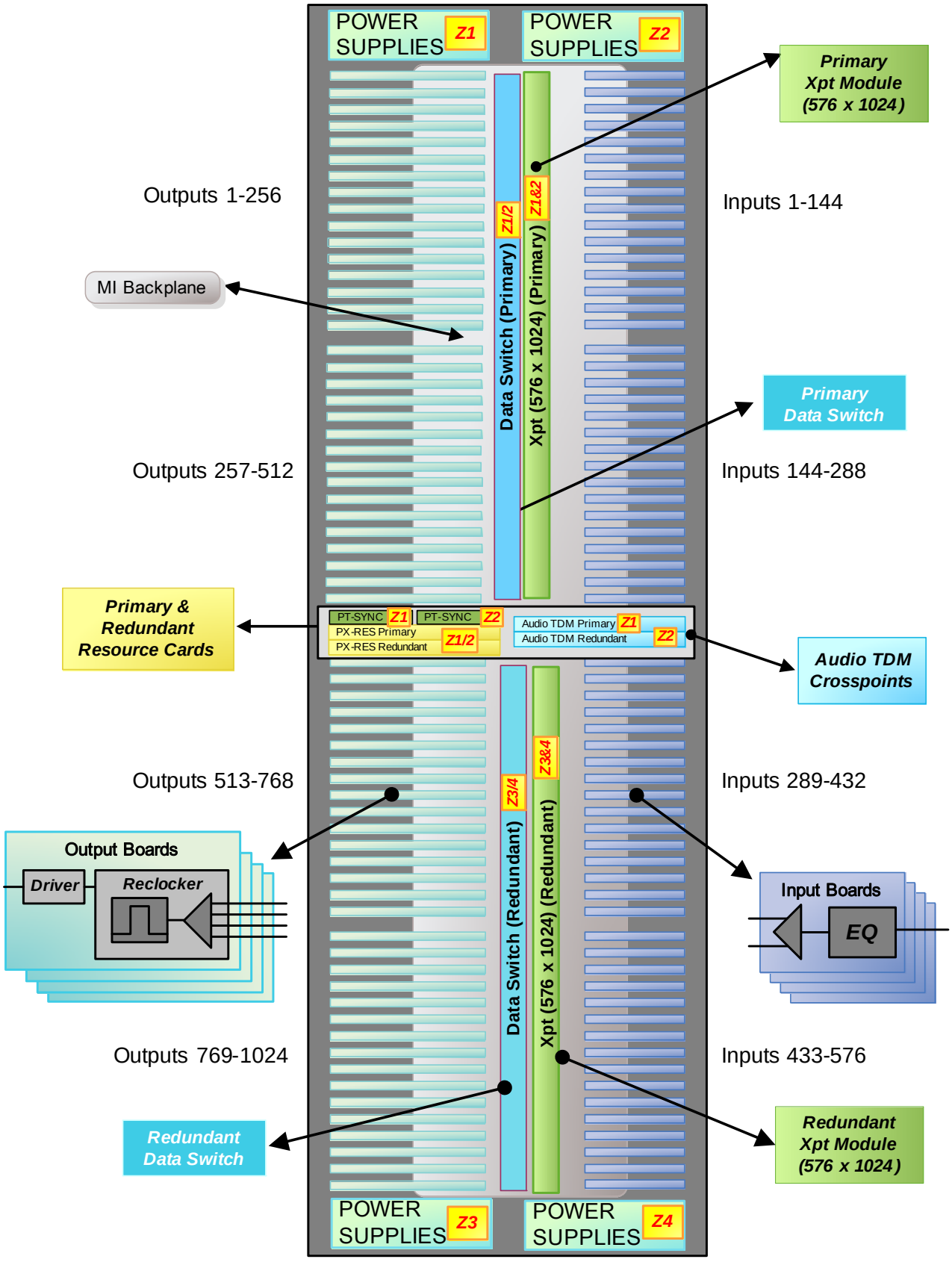


Figure 1-3 IP3 Frame Architecture

Table 1-1 IP3 Physical Specifications

Architecture	IP3	PLATINUM	
	28 RU PX-FR-28	**28 RU PT-FR-28**	**15 RU PT-FR-15**
Dimensions			
Width	17.5 in. (44.5 cm)	17.5 in. (44.5 cm)	17.5 in. (44.5 cm)
Depth	18.5 in.(46.7cm) 23.5 in. including rear fans	18.5 in.(46.7cm)	18.5 in.(46.7cm)
Height	49.0 in.(124.5 cm)	49.0 in.(124.5 cm)	26.25 in.(66.7 cm)
Weight fully loaded (approx)	172 kg	350 lb (159 kg)	210 lb (95 kg)
Matrix Size	576x1024	512x512	256x256
Matrix Module Capacity			
Input Slots	64	64	32
Output Slots	64	64	32
Video Crosspoint Slots	2		
Crosspoint Slots	8	8	4 (2 redundant)
Resource Slots	2 (1 redundant)	2 (1 redundant)	2 (1 redundant)
TDM Slots	2 (1 redundant)	2 (1 redundant)	2 (1 redundant)
Sync Slots	2 (1 redundant)	2 (1 redundant)	2 (1 redundant)
PSU Slots	8	8	4
Monitoring Slots	1	4	4
Alarm Slots	1	1	1
Streaming Slots	NA	1	1
Standard Equipment			
Power Supply	4	4	2
Fan Module (Rear, Front)	2	2	1
Upgrade Options			
Redundant Power Supply	Yes	Yes	Yes
Redundant Resource Module	Yes	Yes	Yes
Redundant Sync Options	Yes	Yes	Yes
Redundant Crosspoint	Yes	Yes	Yes

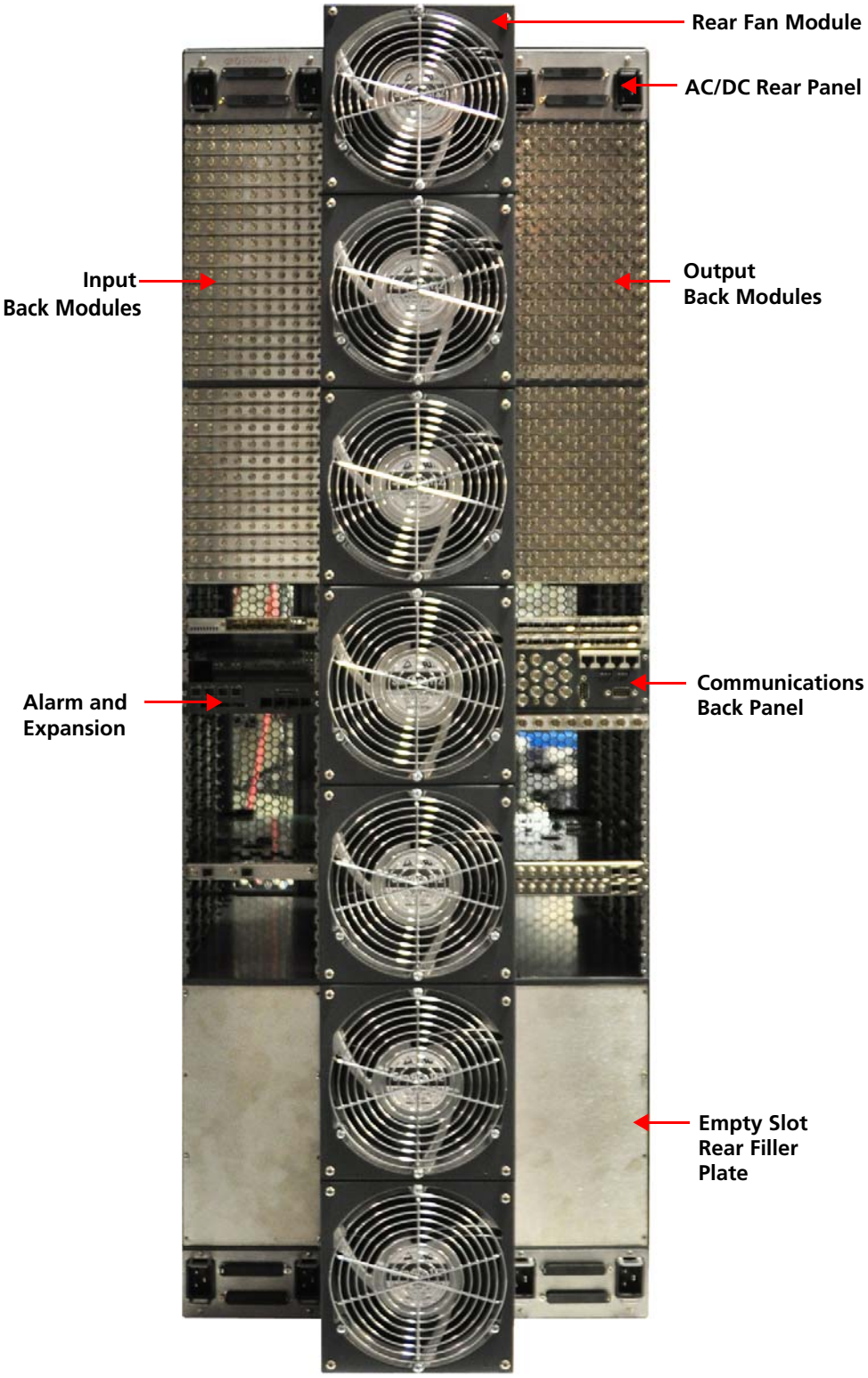


Figure 1-4 IP3 Frame Rear View

Note: *Rear Filler plates (required to maintain proper airflow in the frame and for Electro-Magnetic compliance) are installed by Harris Manufacturing to block the empty I/O slots. 1 slot, 8 slot, and 16 slot plates are available. If a Rear Filler plate is removed to install a new module, the empty slots should closed with a Filler plate.*

Frame Specific Components

Frame modular components include the following items:

Table 1-2 Frame Specific Components

Module	Description
PX-RES PX-CBP	**Resource Module** Provides control logic for an IP3 frame. See **Resource Module (PX-RES)**
	Communications Back Panel Interfaces between communications connectors and resource modules. See **Communications Back Panel (PX-CBP)**
PX-ALARM	**Alarm Module** Monitors power supplies and fans; provides LEDs and relay alarm contacts for both and allows custom alarm configurations based on parameters within a frame (for example, signal presence, etc.) See **Alarm Expansion Module (PX-ALARM)**
PX-PS	**Power Supply Module** Four Power Supplies supply the core components for each frame. Frames with conversion or advanced processing options may require additional power supplies; or additional power supplies may be added for redundancy. **See 1500 Watt Power Supply and External Power Supply Frame.**
PX-PD-TOP PX-PD-BOT	**Power Distribution Modules** Interfaces with Power Supplies and distributes power to an IP3 system. See **External Power Supply Frame (PX-FR-EXPS)**
PX-TOP-FAN	**Fan Module (Top)** Fan module to cool video crosspoint at top of IP3 frame. See **PX-FRONT-FAN and PX-REAR-FAN Modules**.
PX-BOT-FAN	**Fan Module (Bottom)** Fan module to cool video crosspoint at bottom of IP3 frame. See **PX-FRONT-FAN and PX-REAR-FAN Modules**.
PX-REAR-FAN	**Fan Module (Rear)** Rear fan module to cool modules in IP3 frame; 7 Rear fan modules are installed in the IP3 frame and provide front to rear cooling. See **PX-FRONT-FAN and PX-REAR-FAN Modules**.
PX-BP-28	**Module Interconnect (Backplane)** Provides central signal distribution module for the frame between input, output, and crosspoint modules. See **Module Interconnect (PX-BP-28)**
PX-SYNC-MI	**Sync Module Interconnect** The Sync (and optional redundant sync) module are located above the Resource Module. They are visible when the front panel door is opened. See **Sync Module Interconnect (PX-SYNC-MI)**
PX-AUX	Auxiliary board for providing power to Front Fan modules. See **Auxiliary Module (PX-AUX)**.
PX-PWR-ADPTR	Board used for connecting power from External Power Supply frame (PX-FR-EXPS) to boards within the IP3 frame. See **Power Adapter Module (PX-PWR-ADPTR)**.

Modules in the Frame (by Function)

The IP3 is a 28 RU frame, divided into sections for Input, Output, Crosspoint, and Control modules. The following is a representation of the division:

Table 1-3

Group	Module Types	Slots
Input	All Input Modules See **List of Supported Input and Output Modules**	64
Output	All Output Modules See **List of Supported Input and Output Modules**	64
Crosspoint	Video Crosspoint See **Video Crosspoint Module (PX-576x1024-3G)**	2
	ATDM Crosspoint See **Audio TDM Crosspoint Module (PX-ATDM64-X28)**	2
Control	PT-SYNC See **Sync Module Interconnect (PX-SYNC-MI)**	2
	Front Fan Modules See **PX-FRONT-FAN and PX-REAR-FAN Modules**	2
	Data Switch	1
	PX-ALARM-DATA See **Alarm Expansion Module (PX-ALARM)**	1
	PX-RES See **Resource Module (PX-RES)**	2
	Reserved (for future use)	2

Frame Specifications

The specifications in this section are for the IP3 frame and system-wide components.

Specifications for individual modules are listed with their detailed descriptions. Specifications and designs are subject to change without notice.

Table 1-4 Power Supply Specifications

Item	Specification
Power	Maximum 1500W power supply
Output	V1 = +5 VDC @ 10A V2 = +24 VDC @ 62A

Table 1-4 Power Supply Specifications

Item	Specification
Current sharing	FET Isolated Hot Swappable
Performance temperature	41°F (5°C) to 104°F (40°C) at 100% power rating
Operating temperature	32° F (0°C) to 122°F (50°C) at 100% power rating Efficiency = 80 Plus Gold (87% @ 20% and 100% load, 90% at 50% load)

Power Consumption

Power Consumption of Frame and Input/Output Modules

Table 1-5 Power Consumption

Module	24V Power Rail	5V Power Rail	Total Power
PX-RES	15W	0W	15W
PX-ALARM-ATDM	2W	0.35W	2.35W
PX-ALARM-DATA (No Expansion)	0.35W	0.35W	0.7W
PX-ALARM-DATA (Expansion)	6W	0.4W	6.4W
PX-576x1024-3G	236W	0.1W	236.1W
PX-ATDM64-X28	55W	0.8W	55.8W
PX-FRONT-FAN-TOP	55.2W	0.82W	56.02W
PX-FRONT-FAN-BOT	55.2W	0.82W	56.02W
PX-REAR-FAN-ADPTR	0	0.15W	0.15W
PX-REAR-FAN	67W	0	67W
PX-HSR9C-IBG	10.7W	0.43W	11.13W
PX-HSR9O-IBG	14W	0.43W	14.43W
PX-HSR9C1D-IBG	13W	0.43W	13.43W
PX-HSR9O1D-IBG	16.3W	0.43W	16.73W
PX-HSR16C-OBG	11.7W	0.43W	12.13W
PX-HSR16O-OBG	21.9W	0.43W	22.33W
PX-HSR8O2DS-OBG	18W	0.43W	18.43W
PX-HSR8C2DS-OBG	14.1W	0.43W	14.53W

Table 1-5 Power Consumption

Module	24V Power Rail	5V Power Rail	Total Power
PT-FSDMX-IBG	50W	0.15W	50.15W
PT-FSDMXO-IBG	52W	0.15W	52.15W
PT-FSDX8C1D-IBG	52W	0.15W	52.15W
LEGACY PLATINUM MODULES			
Module	**Consumption**		
PT-MADI4C-IBG	15W		
PT-MADI4O-IBG	18W		
PT-MADI4C-OBG	22W		
PT-MADI4O-OBG	25W		
PT-ADCT-IB	24.7W		
PT-DACT-OB	14.7W		
PT-AECT-IB PT-AEBT-IB	2.4W		
PT-AECT-OB PT-AEBT-OB	6.5W		
PT-DEC-IB	13W		
PT-ENC-OB	10W		

Video Matrix Expansion

Output Matrix Expansion

The IP3 Frame, when used in isolation, provides a **576x1024** matrix with 9 Inputs per Input Slot and 16 Outputs per Output Slot. The number of Outputs can be expanded by distributing Input signals to one or more Frames, as shown in figure **Figure 1-5**.

Matrix Expansion Input Modules help distribute input signals across multiple frames that are connected using DensiShield cables. For example, if you route the Inputs of one Frame to a second Frame, you have twice the original number of Outputs (**2048**). If you route the Inputs to 2 frames, you have three times the number of Outputs (**3072**).

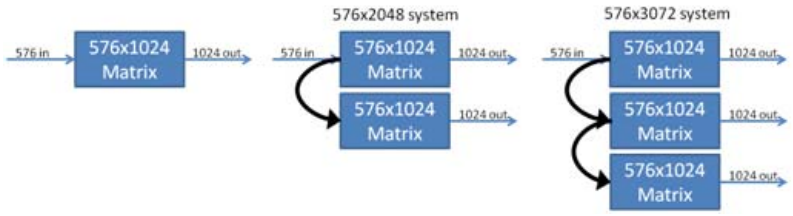


Figure 1-5 Matrix Expansion

Input Matrix Expansion

Input Matrix Expansion is achieved by cross-connecting Output Modules across frames. This allows for an increased number of Inputs available for routing to each Output. Through Input Matrix expansion, you can build:

- A **1152x1024** router across 2 frames
- A **1728x1024** router across 3 frames
- A **2304x1024** router across 4 frames

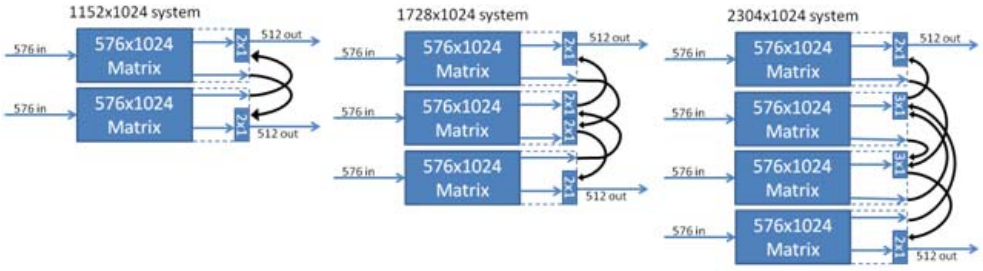


Figure 1-6 System Expansion

Combined Input and Output Matrix Expansion

The techniques of **Input and Output Matrix Expansion** can be combined to produce very large routing systems. Some of the possible configurations are detailed below.

Consult Harris Customer Support for specific configuration guidance on very large systems.

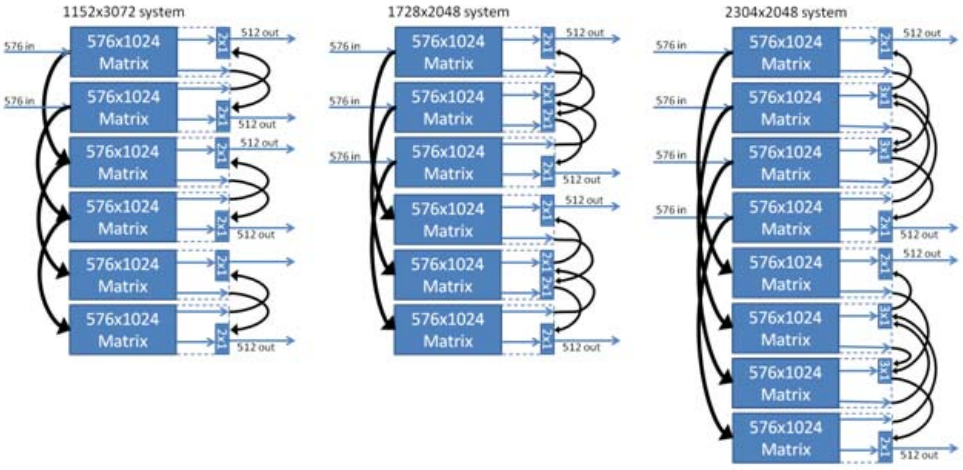


Figure 1-7 Combined Matrix and System Expansion

Note: *Audio Matrix Expansion, for fully non-blocking configurations, is only supported between two IP3 frames.*

Alarms and LEDs

Status LEDs on power supply units, resource cards, and various input/output modules are visible when the door is open.

Alarms on various modules are reported to the IP3 Controller to ease hardware management of the system.

LED indicators reflect the status of sub-systems inside the frame. The indicators for each power supply provide information on each voltage rail and the power supply's fan. The indicators from each resource module provide status information of the frame's resource module. These indicators are lit green when the system is functioning properly and red if a failure condition exists.

For details on Alarms and LEDs, see:

- **Module LEDs**
- **Alarm Expansion Module (PX-ALARM)**

Control Features

IP3 Controller

Your IP3 router makes use of the most innovative control systems available on the market today. The operating system used for the IP3 router is a real-time embedded operating system that uses an interrupt-driven and priority-based task scheduling algorithm to control the operations of the IP3 router. This means that switches will occur in a timely manner, which allows the router to be used in broadcast facilities where timing is crucial to the success of the facility.

The new Control System is the driving force behind the Platinum IP3 routing system. This new control system breaks the traditional constraints of hard levels and fixed partitions, enabling unmatched flexibility in grouping and routing signals according to signal attributes - a key need in complex multichannel audio facilities and mixed HD/SD workflows.

IP3 Modules can be accessed and controlled via the web-based IP3 Controller.

For details, see the **IP3 Controller User Manual**.

2 Modules

Modules Overview

The IP3 router's modular architecture consists of separate **Input** and **Output** modules - each of which contains **8 or 9 inputs** and **8 or 16 outputs** - and **Crosspoint** matrices (redundant crosspoint paths can be configured for robust operation).

Depending on the configuration, one or more modules may be present in the frame for various optional functions.

- **Input and Output Modules**
- **Rear Connectors**
- **Crosspoint Modules**
- **Monitoring Modules**

Input and Output Modules

Input and Output modules are front-loadable and hot-swappable. They utilize high-density BNCs (HD-BNC) through which, physical connections of 576 and 1024 are achieved in 28RU.

Video Frame expansion is achieved by utilizing the secondary switching capabilities of the output card. Expansion-enabled output cards transmit the required I/O via two DensiShield cables, each of which can transmit eight high speed (differential pair) signals.

Input modules are located on the right side of the frame, and Output modules are located on the left side, as viewed from the front when the front panel door is opened. Both module types are visible from the front when the front panel door is opened.

- See **PX-IB Input Module General Overview** for a **generic** description of Input Modules.
- See **PX-OB Output Module General Overview** for a **generic** description of Output Modules.
- See **List of Supported Input and Output Modules** for a **specific** list of modules.

Note: *IP3 modules can be damaged if they are plugged into the wrong back modules or wrong slot. Care should be exercised when plugging modules into the frame*

List of Supported Input and Output Modules

Table 2-1 IP3 Input and Output Modules

Functional Type	Input Module	Output Module
Multichannel Audio Digital Interface (MADI) Modules	**PT-MADI4C-IBG** MADI Electrical Input Module	**PT-MADI4C-OBG** MADI Output Module with 4 Coaxial Outputs
	PT-MADI4O-IBG MADI Optical Input Module	**PT-MADI4O-OBG** MADI Output Module with 4 Optical Outputs
Analog/Digital Audio Converter Modules with TDM	**PT-ADCT-IB** TDM conversion Input Module. 16 pairs to AES audio in TDM matrix (first 8 copied to wideband matrix)	**PT-DACT-OB** 32 Mono Balanced Analog Audio Output Module (16 stereo pairs) from TDM
AES Balanced/ Coaxial Modules with TDM Capability	**PT-AEBT-IB** 16 pairs with TDM Support (balanced)	**PT-AEBT-OB** 16 AES Stereo Pair Digital Audio Output Module. 16 stereo pairs from TDM (balanced)
	PT-AECT-IB 16 pairs with TDM Support (coaxial)	**PT-AECT-OB** 16 AES Stereo Pair Digital Audio Output Module. 16 stereo pairs from TDM (coaxial)
Frame Synchronizer and Multiplexer/ Demultiplexer Modules	**PT-FSDMX-IBG** 8 channel SD/HD/3G Input Module with Frame Synchronizer and Demux for TDM Audio. 8 BNC inputs.	**PT-HSRMX8X-OBG** 8 channel Frame Synchronizer and Mux Output Module. 8 BNC/Optical outputs.
	PT-FSDMXO-IBG 8 channel SD/HD/3G Input Module with Frame Synchronizer and Demux for TDM Audio. 8 Optical inputs through 4 SFP Optical Modules	
	PT-FSDX8C1D-IBG 8 channel SD/HD/3G Input Module with Frame Synchronizer. For Matrix Expansion.	
Analog Composite Video Modules	**PT-DEC-IB** 8 Composite signals to SDI.	**PT-ENC-OB** 8-channel Analog Composite Video output Modules.
Digital Video Modules	**PX-HSR9C-IBG** 9 channel SD/HD/3G digital video input module with 9 HDBNC connectors	**PX-HSR16C-OBG** 16-channel digital video SD/HD/3G output module. HDBNC connectors.
	PX-HSR9O-IBG 9 channel SD/HD/3G digital video optical input module with 9 fiber/5 SFP cages.	**PX-HSR16O-OBG** 16-channel digital video SD/HD/3G output module. 16 optical outputs through 8 SFP optical devices
	PX-HSR9C1D-IBG 9 channel SD/HD/3G digital video input module with 9 HDBNC connectors and DS.	**PX-HSR8O2DS-OBG** 8-channel digital video SD/HD/3G output module. 8 optical SFP outputs plus DS in and out for system expansion.
	PX-HSR9O1D-IBG 9 channel SD/HD/3G digital video input module with 9 optical connectors and DS.	**PX-HSR8C2DS-OBG** 8-channel digital video SD/HD/3G output module. HDBNC output connectors plus DS in and out for system expansion

Rear Connectors

Output Rear Connectors

Table 2-2 Output Rear Connectors

Module	Description
PX-HSR16C-OBP	16 HDBNC SD/HD/3G output back panel
PX-HSR8C2DS-OBP	8 HDBNC + 2 DensiShield SD/HD/3G output back panel

Input Rear Connectors

Table 2-3 Input Rear Connectors

Module	Description
PX-HSR9C-IBP	9 HDBNC SD/HD/3G input back panel
PX-HSR9C1D-IBP	9 HDBNC/1 HDBNC output SD/HD/3G Matrix Expansion back panel

Expansion Modules

The Platinum IP3 frame supports expansion modules to provide TDM and Data Fabric interconnect with a second frame when operating in expansion mode. Expansion is achieved using output modules. There must be corresponding output cards in the primary and expansion frames for inputs to be accessible. For cost effective input expansion, expansion-only output back modules are available.

The Expansion module serves as the physical interface to the DensiShield cable for TDM expansion. It also provides RJ-45 Jacks for GigE interfacing. The Expansion Module plugs in to the bottom two slots, formerly used for output monitoring in the Platinum frame.

Crosspoint Modules

The IP3 provides redundant crosspoint paths. By using redundant crosspoint modules, a fully redundant path through the system is available. See **Crosspoint Modules**.

The PX-FR-28 uses unique Video and Audio Crosspoint modules which are not compatible with Platinum frames.

Table 2-4 Crosspoint Modules

Module	Description
PX-576X1024-3G	**Video Crosspoint Module** See **Video Crosspoint Module (PX-576x1024-3G)**
PX-ATDM64-X28	**TDM Audio Crosspoint Module** See **Audio TDM Crosspoint Module (PX-ATDM64-X28)**

Monitoring Modules

Output Monitoring Modules

The IP3 router supports one optional Output Monitoring module. Output Monitoring modules are not available for the first release of the IP3 router.

The Output Monitoring module is used for monitoring SDI video (SD/HD/3G) and digital audio (AES) signals within the IP3 router. SDI signals from any Output slot and any SDI output can be monitored on any one of four SDI monitoring outputs. AES signals from the Audio TDM Crosspoint can be monitored on any one of four AES monitoring outputs. The SDI monitoring outputs can also be used for monitoring non video signals such as MADI and ASI, and the AES outputs can output non-PCM audio such as Dolby. Also, there are four external SDI inputs and four AES inputs which allow signals to be cascaded from one IP3 frame to another for centralized monitoring.

Multiviewer Modules

Table 2-5 Multiviewer Modules

Module	Description
HV-SXP-16×3	Single-slot HView SX Pro with 16 input channels, three HDMI outputs, and three SDI outputs
HV-SXP-16×3-O	Single-slot HView SX Pro with 16 input channels, three SDI outputs, and three (fiber) optical SDI outputs
HV-SXP-32×6	Two-slot HView SX Pro with 32 input channels and HDMI outputs and six SDI outputs

Table 2-5 Multiviewer Modules

Module	Description
HV-SXP-32×6 -O	Two-slot HView SX Pro with 32 input channels, six SDI outputs, and six optical SDI outputs
HV-SXP-64×6	Four-slot HView SX Pro with 64 input channels, six HDMI outputs, and six SDI outputs
HV-SXP-64×6-O	Four-slot HView SX Pro with 32 input channels, six SDI outputs, and six (fiber) optical SDI outputs

3 Resource Module (PX-RES)

Resource Module (PX-RES) Overview

The **PX-RES** Resource Module serves as the central control point for the IP3 frame and all modules that reside in the frame. The PX-RES is a control module with software and hardware components that control communications between the different processing modules (Input, Output, Crosspoint, Fans, Power Supplies) in an IP3 frame. It also enables communication with the IP3 Controller for configuration, control, monitoring, and routing.

The PX-RES module provides the sync processing necessary to determine the switch timing for the frame. The control system reports the presence and type of sync signal detected on each of the four SYNC inputs. The PX-RES module distributes the synchronization signals to all the crosspoint, and output monitoring modules in the frame. It also automatically generates and distributes an internal synchronization signal when no external sync input is present.

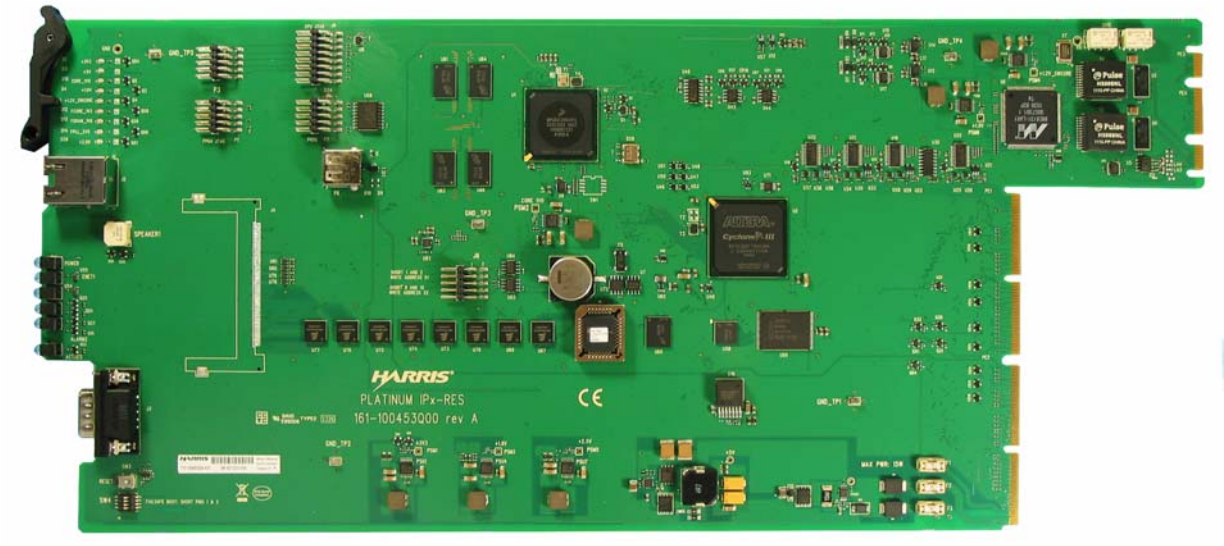


Figure 3-1 PX-RES Resource Module

PX-RES Parameters and Upgrades

For details, refer the **IP3 Controller User Manual**.

PX-RES Redundancy

Each IP3 frame can have up to two PX-RES modules operating redundantly. If one module detects failure of the other, it switches over control and continues router operation.

The Resource module and optional Redundant Resource module are located in the middle of the frame. Resource modules are visible when the front panel door is opened.

The PX-RES module is divided into three main areas:

- **User Interfaces**
- Processing
- System Interfaces

Communications Back Panel (PX-CBP)

The **PX-CBP** communications back panel provides an interface between communications connectors and Resource Modules. All control ports remain inactive until, and only if, the router has fully booted and has established communications.

Even in a powered-down state, a router connected to any communications system must not interfere with that system, and therefore must not violate the communications standard (RS-232, RS-422, IEEE 802, etc.) when in this state.

A temperature sensor on the PX-CBP monitors the external ambient temperature.

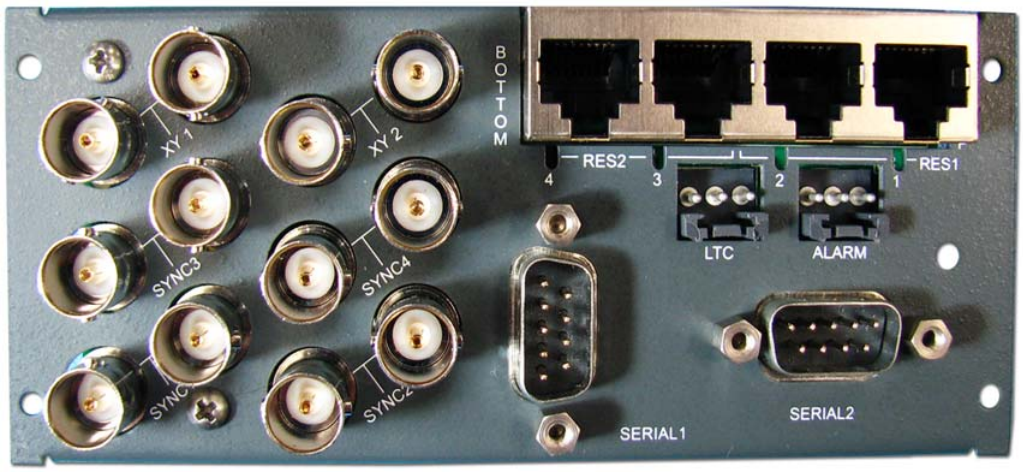


Figure 3-2 PX-CBP Communication Back Panel

The following connector types are available on the **PX-CBP** module:

- Four **Ethernet Ports**
- Four **Sync Ports** with looping connectors
- One **Alarm Port**
- Two **Serial Ports**
- Two **XY Ports** with loop through
- One **LTC Bi-Directional Port**

User Interfaces

Ethernet Ports

There are 4 Ethernet connectors available to users on the Communication Backplane (PX-CBP), labeled from 1 to 4:

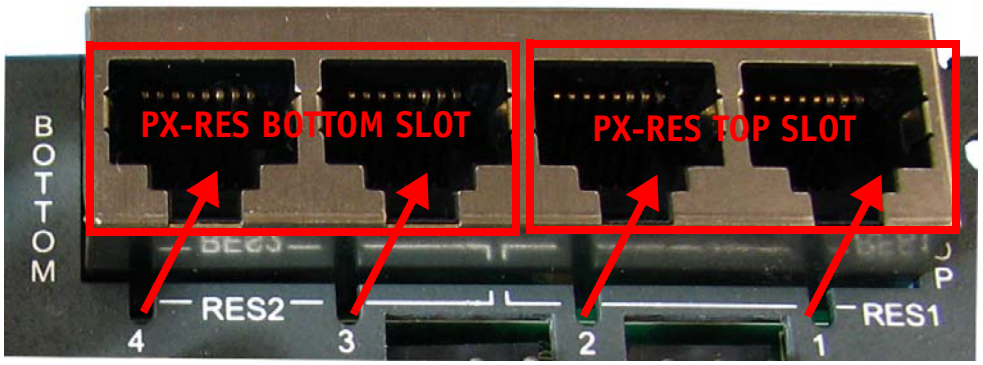


Figure 3-3 Ethernet Ports on the PX-CBP Back Panel

- Ethernets 1 and 2 are connected to the PX-RES in Slot 1 (Top slot)
- Ethernets 3 and 4 are connected to the PX-RES in Slot 2 (Bottom slot)
- Only the Active PX-RES Module's Ethernet ports are active.
- Ethernet ports on standby PX-RES modules are disabled but still physically connected (link LEDs function correctly).

Rear Ethernet Ports

IP Address 1	192.168.100.250
IP Address 2	192.168.101.250

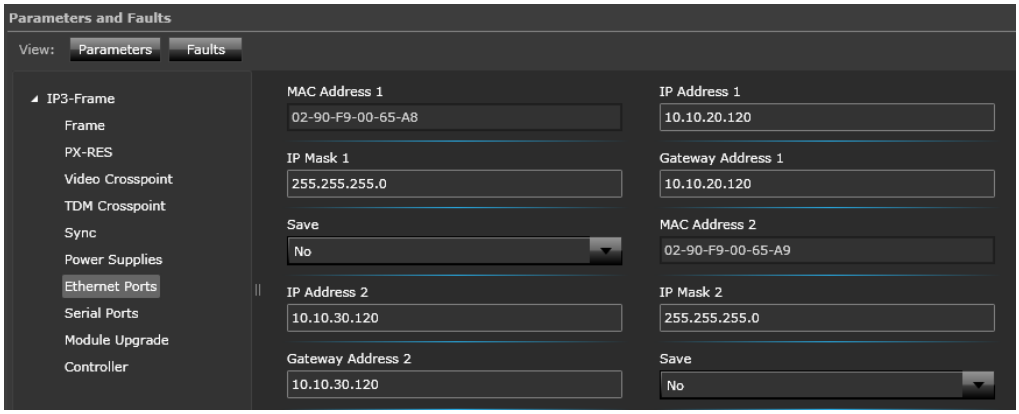
Changing the Default IP Address of the Rear Ethernet Ports

Ethernet settings can be changed via the Controller. To do this:

1. Launch the Controller UI in a web browser, select your IP3 Frame, and click **Go to Device**.
2. Click the **Configure Frame** link in the top right hand corner.
3. Select Ethernet Ports from the menu on the left and make changes on the right.

Note: *Ethernet parameters suffixed with "1" refer to PX-RES 1, and parameters suffixed with "2" refer to PX-RES 2. Both PX-RES modules use the same IP addresses. However, the Ethernet ports of the standby PX-RES are disconnected internally to avoid address collision with the active PX-RES.*

4. Select **Yes** against **Save**.



Front Ethernet Ports

There is an Ethernet port on the front of each Resource Module (PX-RES). This Ethernet port can be used for configuring each Resource Module. The default (hard coded) IP addresses are listed in **Table 3-1**.

Table 3-1 Front Ethernet Ports

PX-RES 1 (Primary)	
IP Address 1	169.254.3.126
IP Mask 1	255.255.255.0
Gateway Address 1	169.254.3.1
PX-RES 2 (Secondary/Redundant)	
IP Address 2	169.254.3.127
IP Mask 2	255.255.255.0
Gateway Address 2	169.254.3.1

Sync Ports

Each **PX-CBP** module includes four looping sync inputs. Each sync input automatically detects and locks to NTSC, PAL, analog HD Tri-Level, or AES signals. The control system reports the presence and type of sync signal detected on each of the four inputs. These synchronization signals are made available to and are distributed by the Resource Modules to every crosspoint and output monitoring I/O module in the frame.

Sync signals distributed from the Resource Module remain undisturbed when switching over to a redundant Resource Module. In addition, Resource Modules automatically generate and distribute an internal synchronization signal when no external sync input is present.

If needed, optional Sync Distribution Modules may be added to the frame to distribute external and internal sync signals to all Input/Output modules. These Sync Distribution Modules also support redundant operation, and have the capability to seamlessly switch over when the redundant module is removed.

- For user configurable references, 4 discrete syncs or 2 syncs with redundant inputs are supported
- Sync triggering supported based on reference detection
- If no sync signals present, switches occur asynchronously after a reasonable time-out period (<0.1 seconds from reception of command)
- For Sync references that are present but then removed or lost, the router maintains relative vertical interval switching until a reference is detected

Also See **Switch Triggering**.

Alarm Port

Reserved for future use.

LTC Bi-Directional Port

Reserved for future use.

LEDs

The following LEDs are present on the module:

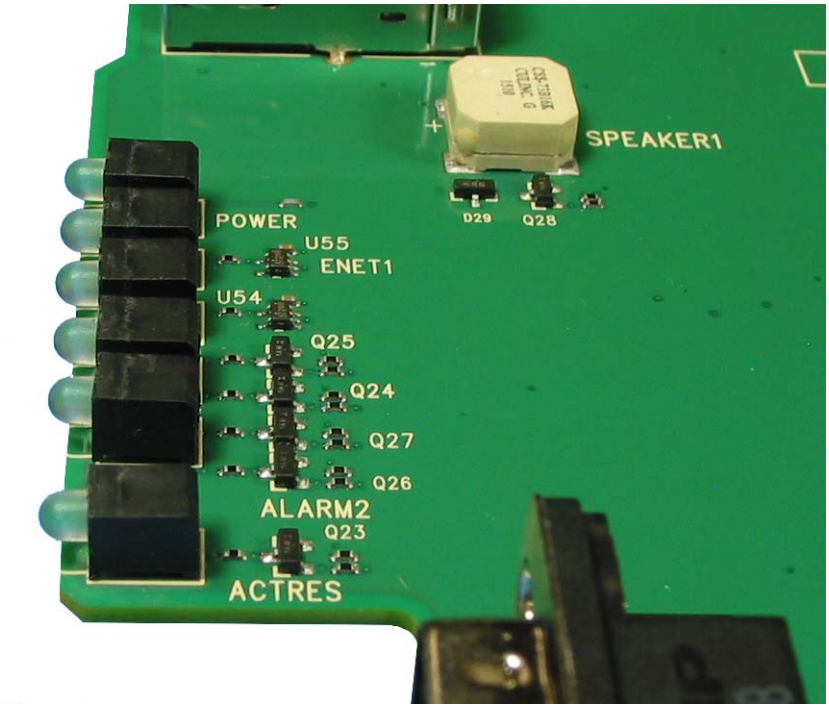
- Power
- Active Card
- Ethernet 1 Activity LED
- Ethernet 2 Activity LED
- 2 Alarm LEDs

Table 3-2 LEDs on the Resource Module

LED	DESCRIPTION	
POWER	**Power Supply Indicator**	
	Green	When lit, this indicates that 24V is enabled on this board.
ENET1 (LINK)	Green	Indicates there is an active connection on Ethernet Port #1

Table 3-2 LEDs on the Resource Module

LED	DESCRIPTION	
ENET2 (LINK)	Green	Indicates there is an active connection on Ethernet Port #2
ALARM1 **ALARM2**	Off Red Amber Flashing Red Flashing Amber	■ ALARM2 LED blinks amber when synchronization between the active and standby PX-RES is in progress. ■ ALARM2 LED turns red if the synchronization process fails ■ ALARM1 LED blinks amber when a user sets the frame identifying LLDC parameter ■ ALARM1 is lit amber when the PX-RES is in fail-safe mode
ACTRES		This module is the Active Resource Module controlling the frame and communicating to the Ethernet ports.



There are nine LEDs behind the Card-edge Ejector handle. All of these LEDs should be ON when the **POWER LED** is ON. If any one of them is OFF, it indicates a problem with a power circuit on the module.

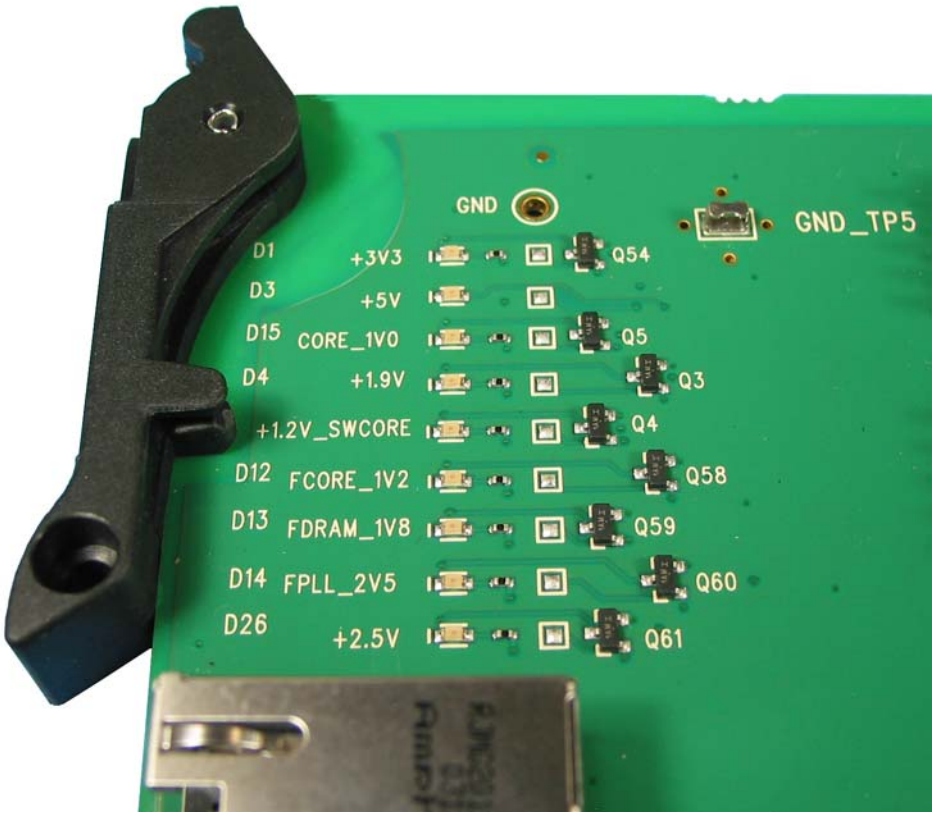


Figure 3-4 Power LEDs

Fuses

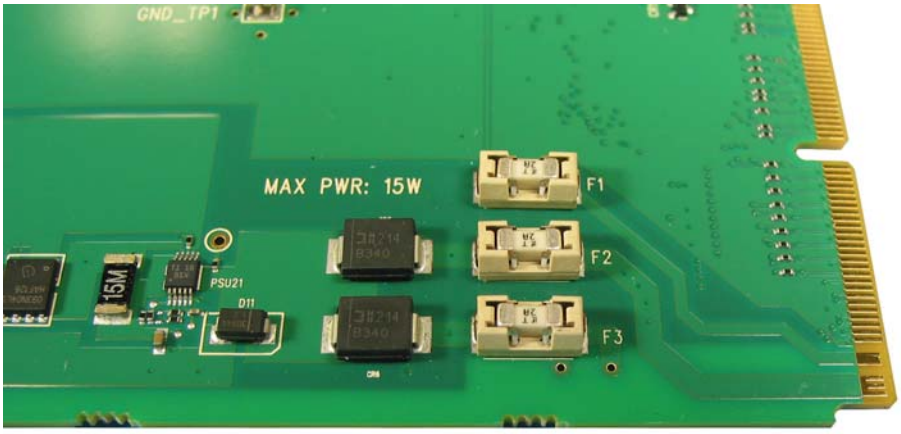


Figure 3-5 Fuses on the PX-RES Resource Module

Table 3-3 Fuses on the PX-RES Resource Module

Fuse Name	Fuse Type	Fuse Rating	Part Number
F1	Slowblow	2 Amps	127-100001Q00
F2	Slowblow	2 Amps	127-100001Q00
F3	Slowblow	2 Amps	127-100001Q00

DIP Switches

- The RESET push button is a system reset.
- On SW4, pins 1 and 2 are used to force the module to failsafe boot.

XY Ports

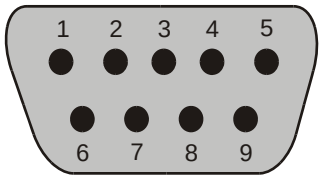
Note: *The two XY ports on the rear of the IP3 Frame are not used or supported in the IP3 System Release 1.0. If coaxial XY protocol is required in a system, the Harris EDGE Router Protocol Translator can be used to interface coaxial XY networks with the IP3 Control System.*

Serial Ports

Note: *The rear of the IP3 frame has 2 RS232 / RS422 Ports that do not support the XY protocol in the IP3 System Release 1.0. If Serial XY protocol is required in a system, the Harris EDGE Router Protocol Translator can be used to interface serial XY with the IP3 Control System*

RSS-232 Pin Assignments

Table 3-4 RS-232 Signal Format Pin Assignments

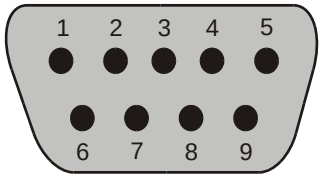


Pin	Function
1	Frame Ground
2	RxD (Data received by router)
3	TxD (Data sent by router)
4	Data Terminal Ready*
5	Ground
6	Data Set Ready (DSR)*
7	Request to Send (RTS)**
8	Clear to Send (RTS)**
9	Frame Ground

* Pins 4 and 6 connected internally.
** Pins 7 and 8 connected internally

RSS-422 Pin Assignments

Table 3-5 RS-422 Signal Format Pin Assignments



Pin	Signal (Tributary)	Description	Connection to Remote Computer (Controller)
1	FG	Frame ground	Frame ground
2	Ta (Tx-)	Transmitted data (twisted pair)	Ra (Rx-)
7	Tb (Tx+)		Rb (Rx+)
6	Tc	Received data shield	Received data shield
8	Ra (Rx-)	Received data (twisted pair)	Ta (Tx-)
3	Rb (Rx+)		Tb (Tx+)
4	Rc	Transmitted data shield	Transmitted data shield
9	FG	Frame ground	Frame ground
5	SP	(Not connected)	(Not connected)

Resource Card Synchronization

In normal operating mode, all parameter and route changes are synchronized from the Active/Master PX-RES to the Standby PX-RES.

When upgrading PX-RES firmware, images are also synchronized. If the alternate firmware image is activated on the active PX-RES, the alternate image on the standby PX-RES also becomes active.

If there is only a single PX-RES in the frame, the **PX-RES Synchronization** parameter is set to **Yes** and disabled (grayed out).

If a new PX-RES is inserted into the spare slot, the active PX-RES transfers all its content to the new standby PX-RES and the **PX-RES Synchronization** parameter is then enabled.

If the **PX-RES Synchronization** parameter is set to **No**, all the synchronization stops. Routes and parameter information of the standby PX-RES will remain as is.

Active and Standby Determination

- Active and Standby states are non-volatile.
- An active PX-RES remains active after a power cycle.
- The standby PX-RES only becomes active if the active PX-RES is removed or in case of manual failover.
- If two PX-RES modules are inserted into a frame and powered up at the same time, the PX-RES in the top slot will have higher priority.

Sync Notes

- There are 4 available sync references that can each be turned on or off by **Sync Enable** parameters.
- The **Sync Mode** parameter (set to **Auto** by default) allows for configuration of switching point settings. In **Auto** mode, the output switches relative to the detected sync reference assigned to the module.
- If **Sync Mode** is set to **Standard**, the **Sync Reference** parameter can be used to specify the sync standard to use as the reference signal. The output switches relative to the specified reference.
- If **Sync Mode** is set to **Advanced**, the **Sync Pulse Delay** parameter can be used to specify where the output switching point is relative to the reference signal. The delay is in units of microseconds.

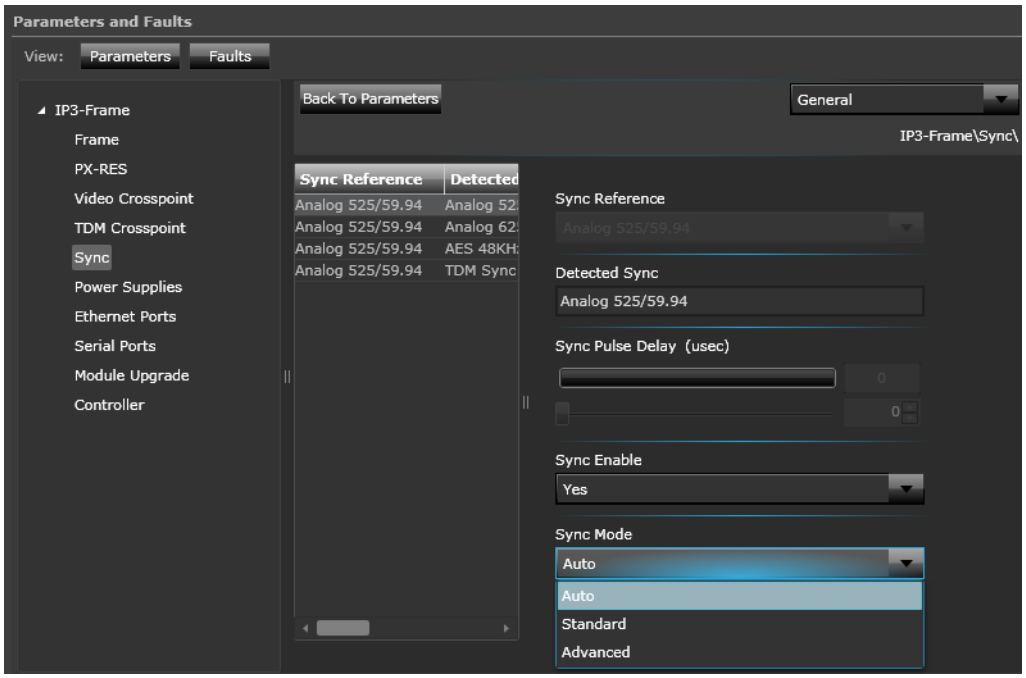


Figure 3-6 Sync Mode Parameter (IP3 Controller GUI)

Switch Triggering

Switch triggering supports the use of independent AES, NTSC, PAL, and tri-level HD references.

The following reference types are supported:

Table 3-6 Switch Triggering: Supported Reference Types

0	Unknown or Missing Reference	Line 10
1	Analog 525/60	Line 10
2	Analog 525/60 /1.001	Line 6
3	Analog 625/50	Line 7

Table 3-6 Switch Triggering: Supported Reference Types

4	1920x1080/60I	Line 7
5	1920x1080/60I /1.001	Line 7
6	1920x1080/50I	Line 7
7	1920x1080/30P	Line 7
8	1920x1080/30P /1.001	Line 7
9	1920x1080/25P	Line 7
10	1920x1080/24P	Line 7
11	1920x1080/24PsF	Line 7
12	1920x1080/24P /1.001	Line 7
13	1920x1080/24PsF /1.001	Line 7
14	1280x720/60P	Line 7
15	1280x720/60P /1.001	Line 7
16	1280x720/50P	Line 7
17	1280x720/30P	Line 7
18	1280x720/30P /1.001	Line 7
19	1280x720/25P	Line 7
20	1280x720/24P	Line 7
21	1280x720/24P /1.001	Line 7
22	720x483/60P	Line 10
23	720x576/50P	Line 6
24	720x483/60P /1.001	Line 10
25	1920x1080/60P	Line 7
26	1920x1080/60P /1.001	Line 7
27	1920x1080/50P	Line 7

The following reference types are supported but need to be manually configured since they are not automatically detected because of the Horizontal and Vertical rates.

Table 3-7 Switch Triggering: Reference Types that need to be manually configured

28	720x576/50I	Line 6 (alias of Analog 625/50)
29	960x576/50I	Line 6 (alias of Analog 625/50)
30	720x483/60I	Line 10 (alias of Analog 525/60)
31	720x483/60I /1.001	Line 10 (alias of Analog 525/60 /1.001)
32	960x483/60I	Line 10 (alias of Analog 525/60)
33	960x483/60I /1.001	Line 10 (alias of Analog 525/60 /1.001)

Table 3-7 Switch Triggering: Reference Types that need to be manually configured

34	1920x1080/30PsF	Line 7 (alias of 1080/60I)
35	1920x1080/30PsF /1.001	Line 7 (alias of 1080/59.94I)
36	1920x1080/25PsF	Line 7 (alias of 1080/50I)

Alarms

All alarms are off by default, except for critical temperature alarms. Individual alarms can be turned on or off. The following error conditions can trigger an alarm:

- Loss of input or output signal
- Power supply failure
- Fan failure or missing front fan modules
- Video crosspoint reaching critical temperature
- PX-RES synchronization failure

Power Consumption

Table 3-8 PX-RES Power Consumption

24V Power Rail	15W
5V Power Rail	0W
Total Power	15W each
Modules in Frame	2 (Primary and Redundant)

Installation

All communications back panel modules are installed at Harris' manufacturing facility

The module is replaceable, however, all control and communication with the frame will be lost when it is replaced. If you need to upgrade or replace this module, please contact our Customer Service Department.

4 Alarm Expansion Module (PX-ALARM)

PX-ALARM Overview

The Alarm Expansion module (**PX-ALARM**) controls and monitors the Front and Rear Fan modules and monitors the GPI Inputs and Power Supplies. Additionally, the PX-ALARM has Densishield connectors for Audio matrix expansion (to connect to a second IP3 frame).

The PX-ALARM module reports the status of the Fans (Tachometer reading), Internal and External Power Supply Alarms, and GPI Inputs, to the IP3 Controller via the Resource Module (PX-RES), and to LEDs and possibly to GPI Outputs on the PX-ALARM (back of the IP3 frame).

The PX-ALARM can control four GPI Outputs.

The module is located to the mid-left of the IP3 frame, and is accessible from the rear of the frame. The module is hot-swappable but when unplugged from the frame, the Front and Rear Fans speed will increase to 100%. The PX-ALARM controls the speed of the fans based on power supply loading.

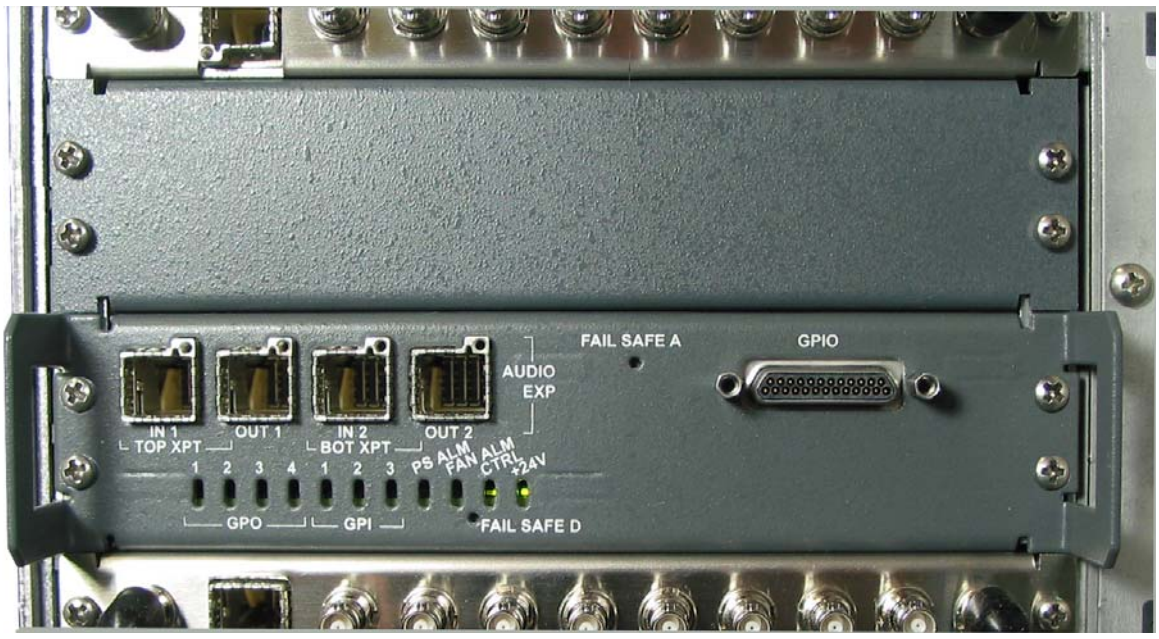


Figure 4-1 PX-ALARM Module in IP3 Frame

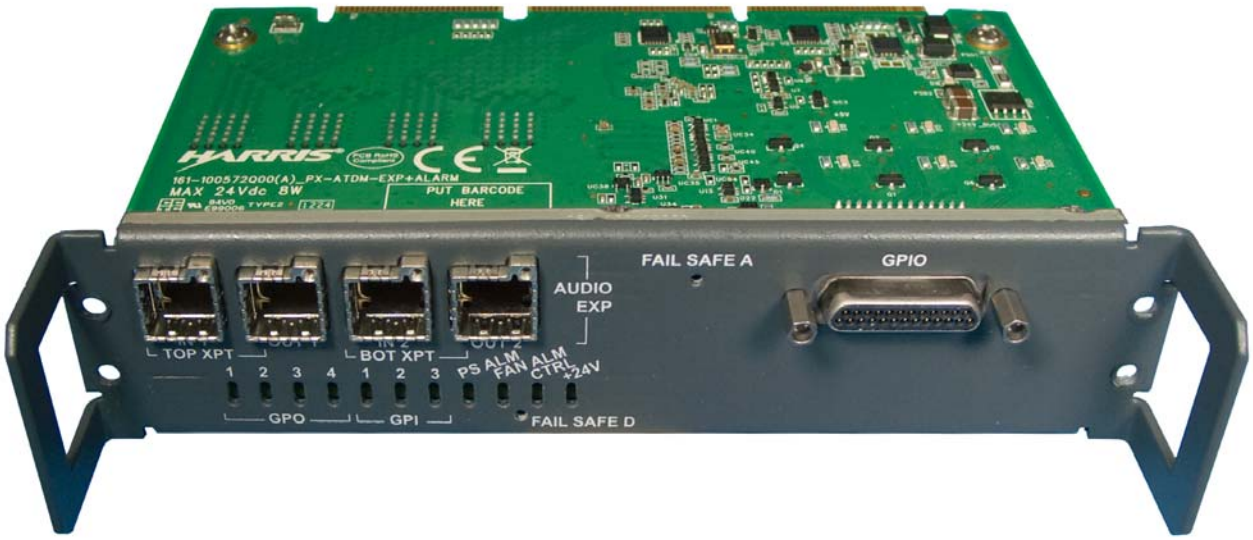


Figure 4-2 PX-ALARM Module

PX-ALARM Components

The PX-ALARM module consists of two cards assembled together as a single module (PX-ALARM), and plugged into the rear of the IP3 frame.

PX-ALARM-ATDM	Audio TDM Expansion and Alarm Card
PX-ALARM-DATA	Data Expansion and Alarm Card

The IP3 frame has two rows of connectors for the PX-ALARM module. Each slot consists of one 60-pin and one 140-pin Samtec card-edge connector. The **PX-ALARM-DATA** card goes into one slot, and the **PX-ALARM-ATDM** card goes into the other one. Both are assembled as a single module and inserted into the frame.

Audio Expansion

A single IP3 frame has **64 input slots** and **8SDI inputs per slot**. If you assume 16 embedded audio channels per SDI signal, that is a total of **8192** mono audio channels. The size of the Audio and Data Routing matrix can be further increased through expansion.

Audio Channels from one IP3 frame can be made available to a second IP3 frame. The audio channels are sent from the Audio TDM Crosspoint module to the PX-ALARM module's DensiShield outputs.

Note: *When interconnecting two IP3 frames for Audio Expansion, the Audio TDM Crosspoints in the Top slots of both Frames must be connected together and like wise the Crosspoints in the Bottom slots must be connected together. The 'TOP XPT' 'OUT1' Densishield connector on IP3 frame #1 is connected to the 'TOP XPT' 'IN1' Densishield connector on IP3 cable and visa-versa.*

Controlling Fan Speed

Under normal operating conditions fan speed is controlled by power consumption of the frame (which directly corresponds to heat generated in the frame), and ambient temperature. The more cooling that is required the faster the fans will spin.

The following conditions will trigger the fan speeds to increase:

- Failure of a Rear Fan Module
- Loss of communication to the Resource module (PX-RES)
- PX-ALARM Module failure
- Unplugging the PX-ALARM module from the IP3 frame
- Upgrading the PX-ALARM Module's firmware

Reporting Alarms and Fan Failures

PX-ALARM monitors the status signal of core components and reports any instance of a critical failure. Reporting is done to the IP3 Controller via the Resource card (PX-RES) and to the GPI Outputs and LEDs.

Table 4-1 Summary of GPIs on the PX-ALARM module

Alarm Type	Alarm Details	Number of Alarms
User-Definable (GPI Output) Alarms (Outputs 1-4)	The alarm module communicates directly to the resource module via the proprietary PIPE (single-wire serial) interface. This communication provides access to any status signal reported in the entire frame.	4
User-Definable (GPI Input) Alarms (Inputs 1-3)	Ability to monitor legacy equipment alarm/failures and report these failures through control software such as Navigator	3
Fan Failure Alarm	Fan (Module) Fail	1
Power Supply Failure Alarm	PS Fail	1

User-Definable (GPI Output) Alarms

On user-defined GPI outputs 1 through 4, the Resource Module (PX-RES) communicates the status of any alarm conditions within the IP3 frame to the PX-ALARM module, to assert/trigger the GPI Outputs. When a GPI Output is asserted, the corresponding GPO LED is lit on the PX-ALARM module.

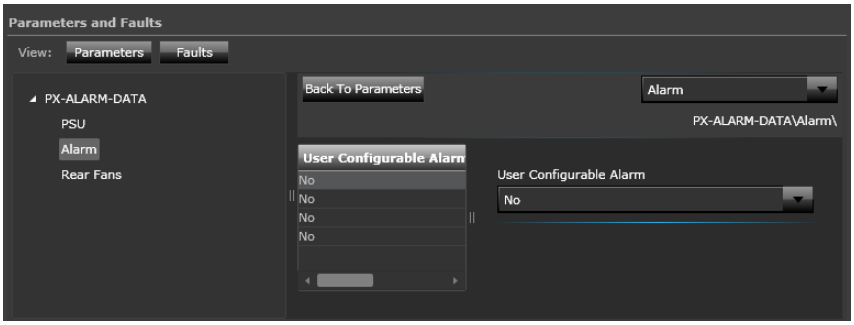


Figure 4-3 User Definable Alarms

User-Definable (GPI Input) Alarms

User-defined inputs 1 to 3 provide the ability to monitor legacy equipment alarm/ failures and to report these failures to the Controller via the Resource card (PX-RES). If any GPI Input is asserted, the corresponding GPI Input LED on the PX-ALARM module will be lit.

Fan Failure Alarm

If any of the Front or Rear fan modules have a failure:

- This alarm condition is reported to the IP3 Controller via the Resource card
- The **FAN ALM** LED on the PX-ALARM module is illuminated
- The **Fan Alarm** GPI Output is asserted/triggered.

Power Supply Failure Alarm

Each power supply provides a Power Supply Present signal and three critical alarms: +24V, +5V, and FAN Failure. All three alarms are critical to power supply and frame operation. If any of these alarms are asserted:

- The IP3 Controller is notified via the Resource card
- The **PS ALM** LED on the PX-ALARM is illuminated red
- The dedicated **Power Supply Alarm** GPI Output is asserted/triggered.

If no alarm conditions exist, the **PS ALM** LED is not illuminated and GPI Output is not asserted.

Power Supply Status Monitoring

PX-ALARM reports status of all internal and external power supply alarms and power consumption and internal power supply temperature reported over an I2C interface. The I2C signals from the power supplies within the IP3 frame are connected to the **PX-ALARM-ATDM** board.

Two External Power Supply frames can be connected to the IP3 frame via DC power cables. The DC power cables are connected to the Power Adapter boards. The Alarm and I2C signals from the External Power Supplies, are routed through the BackPlane/MI to the **PX-ALARM-DATA** board.

General Purpose Interface (GPI)

GPI connections to the PX-ALARM module are via a Micro DB25 connector on the front card edge of the PCB. The GPI Inputs are non-isolated inputs. A contact closure to ground asserts/triggers the GPI Input.

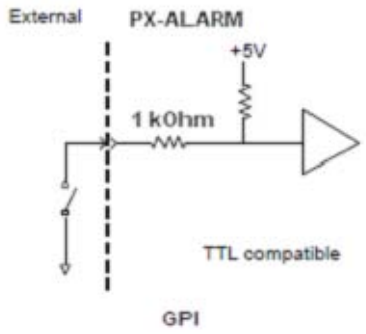


Figure 4-4 GPI Inputs

A 1k Ohm series resistor and clamping diode are connected to each Input, to protect the Input from over voltage.

The GPI Outputs are electrically isolated using a Relay with 3 contacts. Access to all 3 contacts of the relay have been provided to allow for defining the preferred method of signaling critical faults. The 3 relay connections are identified in **Table 4-2**.

Table 4-2 GPI Output Descriptions

NC	Normally closed; contact shorted with common when alarm condition exists or frame not powered.
NO	Normally open; contact shorted with common when alarm does not exist and frame is powered
COMMON	Reed (Return of the Relay)

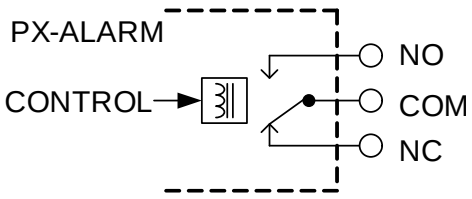


Figure 4-5 GPI Outputs

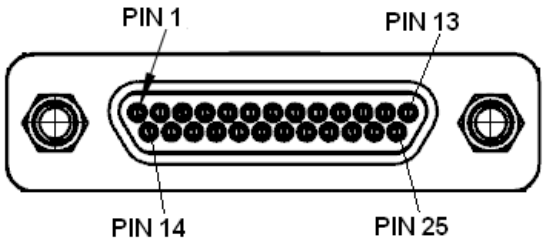


Figure 4-6 Micro DSUB connector pin numbering

Micro-Dsub Connector Pinouts

Table 4-3 GPI Pinout

Pin	Description	Pin	Description
1	Remote in 3	14	Normally closed (Power supply alarm)
2	Common (User-defined 1)	15	Normally open (Power supply alarm)
3	Normally closed (User-defined 1)	16	Common (Power supply alarm)
4	Normally open (User-defined 1)	17	Normally closed (Fan alarm)
5	Common (User-defined 2)	18	Normally open (Fan alarm)
6	Normally closed (User-defined 2)	19	Common (Fan alarm)
7	Normally open (User-defined 2)	20	Floating
8	Common (User-defined 3)	21	Remote in 1
9	Normally closed (User-defined 3)	22	GND (Common in 1)
10	Normally open (User-defined 3)	23	Floating
11	Common (User-defined 4)	24	Remote in 2
12	Normally closed (User-defined 4)	25	GND (Common in 2 and 3)
13	Normally open (User-defined 4)		

Parameters

PX-ALARM-DATA Parameters

Table 4-4 PX-ALARM-DATA Parameters

Category	Name	Description	Type	Options
Root	Power Good	Informs the user if board is experiencing any power issues	RO	No Yes
	PS Alarm	Reports if any of the power supplies have failed or if there is a loss of power redundancy.	RO	No Yes
PSU	PS Zone Redundancy *(Table Parameter)*	Power zone can supply sufficient power if half the active supplies fail	RO	No Yes
PSU > Power Supply *(Table Parameter)*	PS Status			
	PS Zone	The Zone the power supply provides power to. ■ Zone 1 powers IO card slots 1-16 and control cards. ■ Zone 2 powers IO card slots 17-32 and control cards. ■ Zone 3 powers IO card slots 33-48. ■ Zone 4 powers IO card slots 49-62.	RO	None Zone 1 Zone 2 Zone 3 Zone 4
	PS +5VL Failed	Reports if the power supply is providing 5VL power.	RO	No Yes
	PS +24VL Failed	Reports if the power supply is providing 24VL power.	RO	No Yes
	PS Fan Failed	Reports if the power supply fan is in working order.	RO	No Yes
	PS Ambient Temperature	Reports the temperature of the air coming into the PSU Fan.	RO	-55~125C
	PS Secondary Temperature	Reports the temperature of the air coming out of the PSU Fan.	RO	-55~125C
	PS +5VL Current	5V current is being drawn from the power supply.	RO	0~100Amps
	PS +24VL Current	24V current is being drawn from the power supply.	RO	0~100Amps
Alarm *(Table Parameter)*	External Alarm Trigger	External Alarm Trigger	RW	Low High
	External Alarm	Set based on whether the alarm is enabled, GPI status, and trigger value	RO	No Yes

Table 4-4 PX-ALARM-DATA Parameters

Category	Name	Description	Type	Options
	External Alarm Enable	External Alarm Enable	RW	No Yes
	User Configurable Alarm *(Table Parameter)*	Triggers a GPO to an external system	RW	No Yes
Rear Fans	Rear Fan Speed	Reports the speed in RPM of the fan	RO	0-7000rpm
	Rear Fan Failed	Set to yes if there is a loss of communication to the fan or fan is spinning too slow.	RO	No Yes

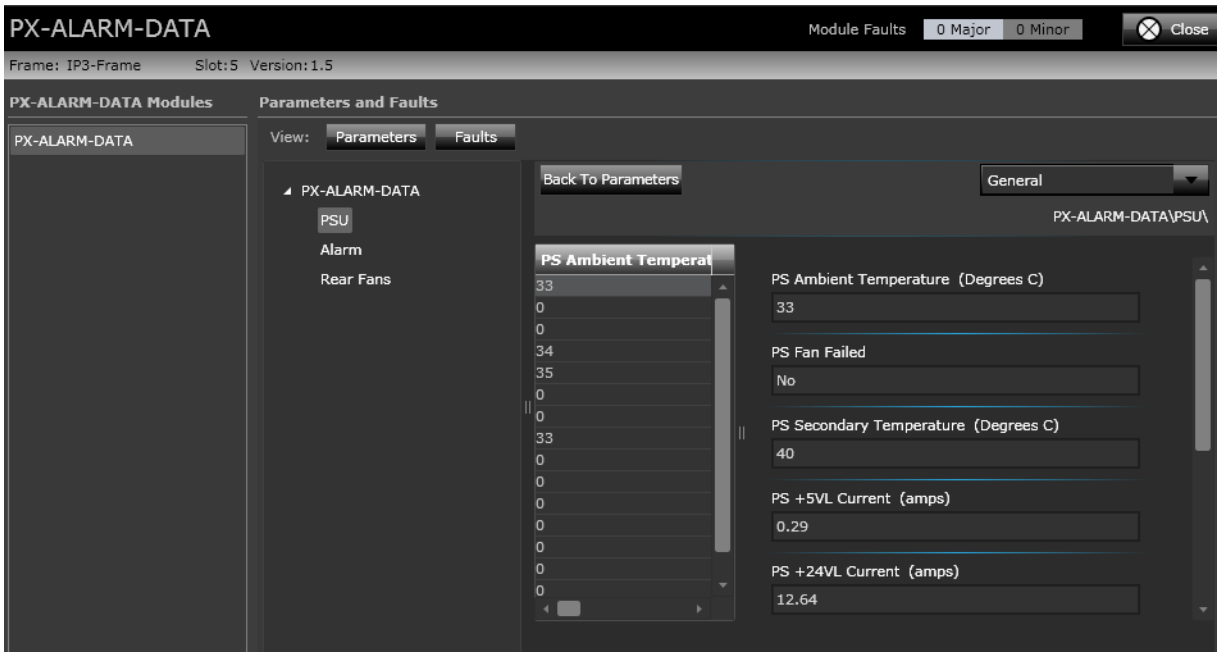


Figure 4-7 PX-ALARM-DATA Parameters

PX-ALARM-ATDM Parameters

Table 4-5 PX-ALARM-ATDM Parameters

Name	Description	Type	Options
Power Good	Informs the user if board is experiencing any power issues	RO	No Yes
TDM Cable Present *(Table Parameter)*	Set to yes if there is a densishield cable plugged in.	RO	No Yes

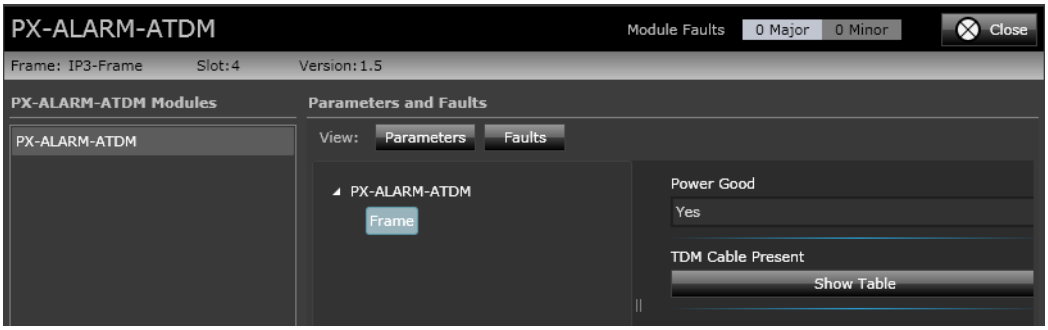


Figure 4-8 PX-ALARM-ATDM Parameters

LED Indicators

Status and Alarm LEDs

The PX-ALARM maintains standard reporting LEDs in addition to the status of alarms. All LEDs are visible from the rear of the frame.

Table 4-6 Status and Alarm LEDs

LED Reference	Function
D1	**GPO 1**: turn reds when GPO output (condition defined by user is asserted true)
D2	**GPO 2**: turns red when GPO output (condition defined by user is asserted true)
D3	**GPO 3**: turns red when GPO output (condition defined by user is asserted true)
D4	**GPO 4**: turns red when GPO output (condition defined by user is asserted true)
D5	**GPI Input 1**: turns red when GPI Input1 is asserted (contact closure to ground)
D6	**GPI Input 2**: turns red when GPI input 2 is asserted (contact closure to ground)
D7	**Power supply Alarm (PS ALM)**: turns red when any present power supply's alarm is asserted/triggered.

Table 4-6 Status and Alarm LEDs

LED Reference	Function
D8	**Fan Alarm (FAN ALM)**: turns red when any fans fail
D9	**Control LED (CTRL)**: Initializes red, turns green when communication with the Resource card (PX-RES) is working.
D10	**+24V Power Supply (+24V)**: turns green when either power is present from either Zone 1 or 2
D11	**GPI Input 1**: turns red when GPI Input 3 is asserted (contact closure to ground)

There are LED indicators on the Resource Module and the Power Supply Modules

- **Status LEDs** indicate power supply status, resource module usage, and link light indicators for Ethernet communication ports.
- **Alarm LEDs** indicate user defined alarm conditions.

LED indicators reflect the status of subsystems inside the frame. The indicators for each power supply provide information on each voltage rail and the power supply's fan. The indicators from each resource module provide status information of the frame's resource module. These indicators are lit green when the system is functioning properly and red if a failure condition exists.

Failsafe Upgrade

Should the PX-ALARM module get corrupted and the IP3 Controller cannot update the firmware:

- Press and hold the **Fail Safe A** and **Fail Safe D** for 3 seconds.
- Use a paper clip to Press the button on the back of the Alarm module.
- Use the IP3 Controller to update the firmware on the PX-ALARM module.

Power Consumption

Table 4-7 PX-ALARM Power Consumption

	PX-ALARM-ATDM	PX-ALARM-DATA (No Expansion)	PX-ALARM-DATA (Expansion)
24V Power Rail	2W	0.35W	6W
5V Power Rail	0.35W	0.35W	0.4W
Total per Module	2.35W	0.7W	6.4W

5 Video Crosspoint Module (PX-576x1024-3G)

Video Crosspoint Module (PX-576x1024-3G) Overview

The **PX-576x1024-3G Video Crosspoint Module** is the core switching matrix that enables 576x1024 switching within a single IP3 frame. You can switch any of the 576 input signals to any of the 1024 outputs based on commands from the system control. The module supports AES, SDI (up to 3 Gb/s), and other serial digital signals. The **PX-576x1024-3G** module also reports on current Crosspoint configuration status.

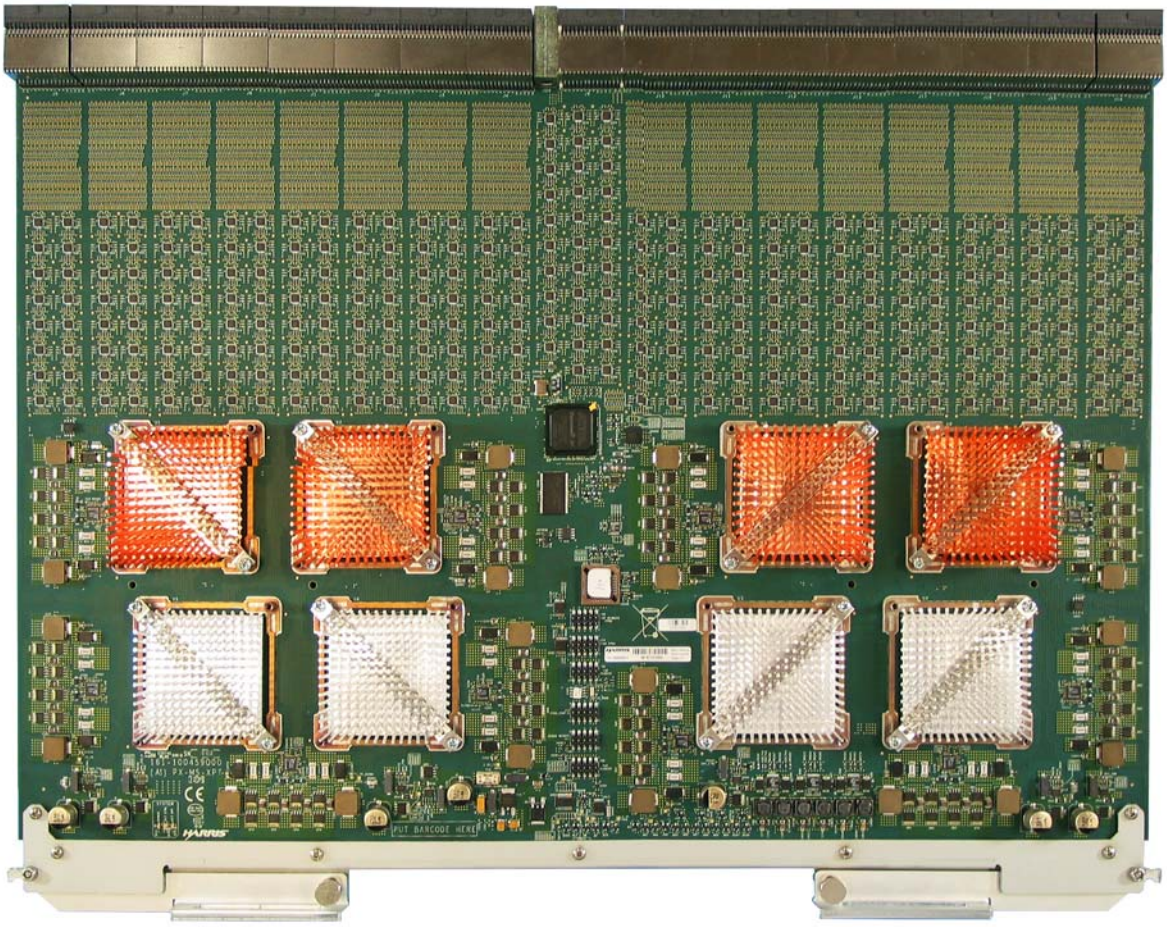
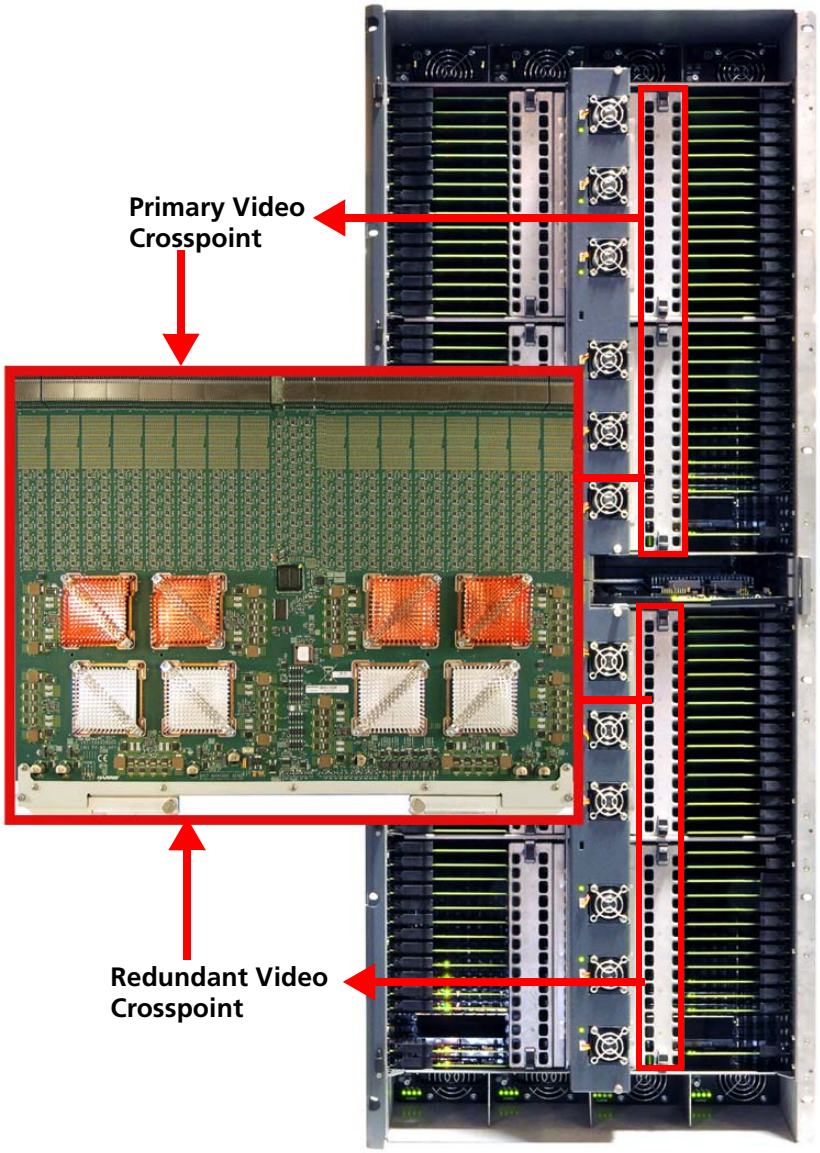


Figure 5-1 PX-576x1024-3G Video Crosspoint Module

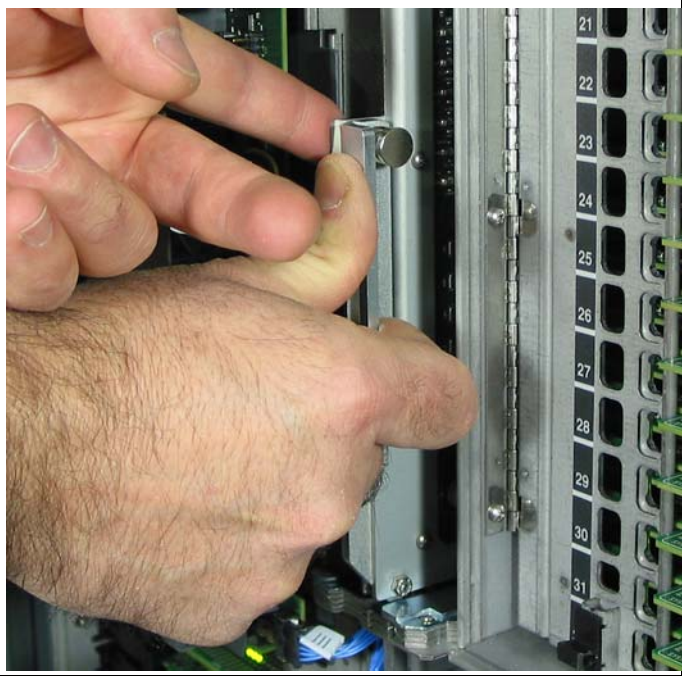
Video Crosspoint Module (PX-576x1024-3G) Location in the IP3 Frame

The Platinum IP3 frame includes two slots for Video Crosspoint modules. One slot holds the **Primary/Active** Video Crosspoint Module. The second slot holds an optional **Redundant/ Shadow** module, which shadows all operations of the active module, so as to allow it to become active in case the active module is removed or halted due to error. The shadow module's outputs are disabled until it becomes active, but otherwise performs all operations in parallel with the primary crosspoint module.

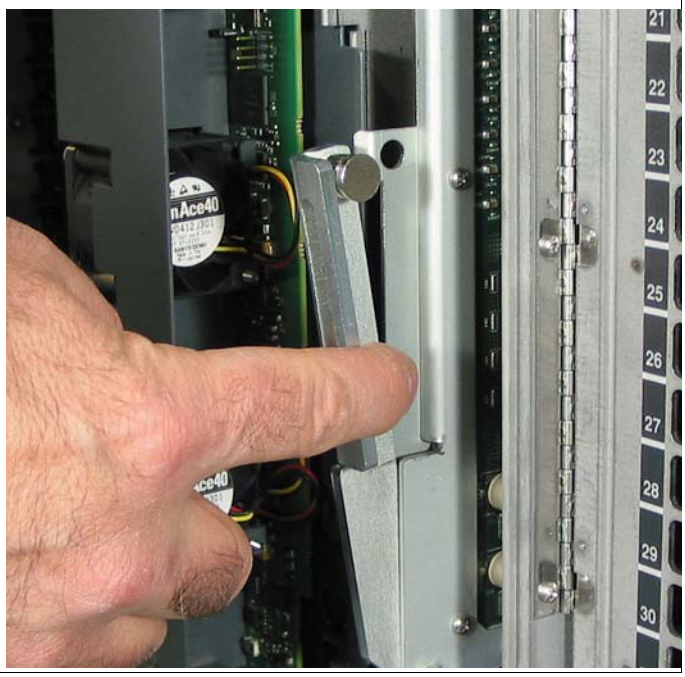


Extracting the Video Crosspoint from the Frame

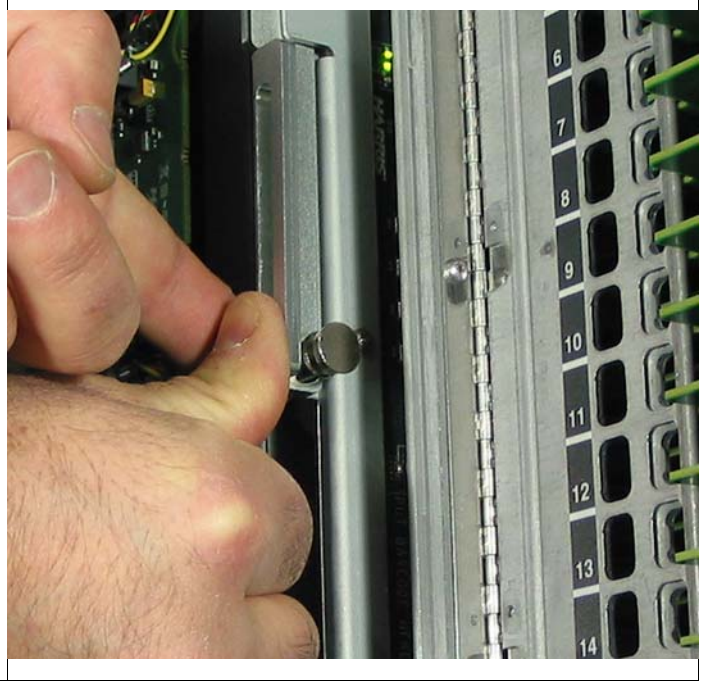
1. On the **lower** extractor, press the back side of the locking pin while pushing the extractor in.



2. After the extractor releases, pull it down.



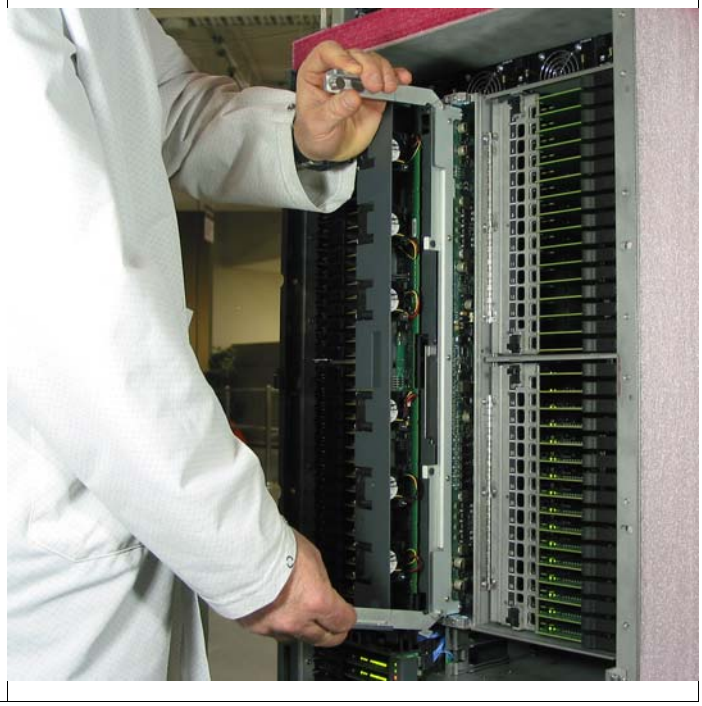
3. On the **upper** extractor, **press the back side of the locking pin while pushing the extractor in.**



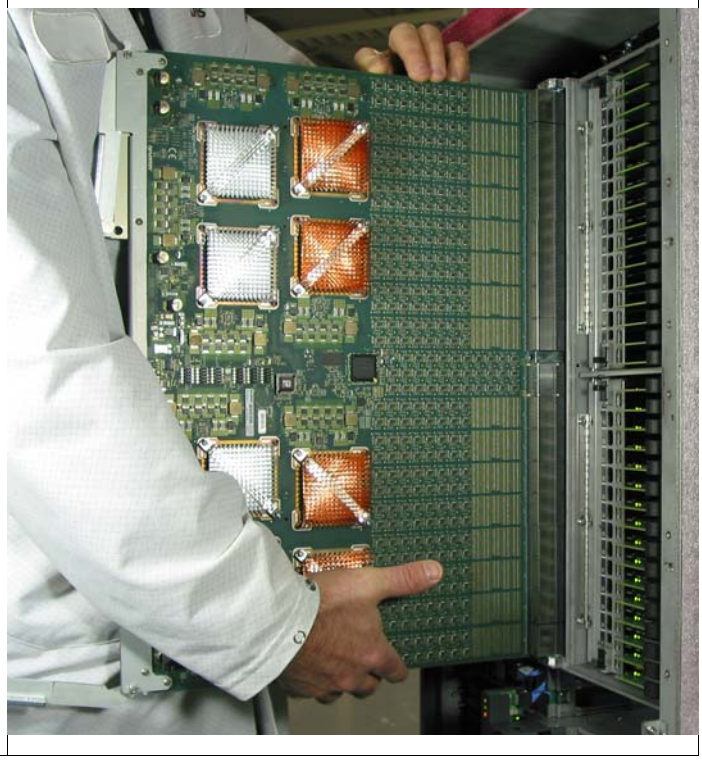
4. After the extractor releases, pull it down.

5. While holding back the Fan Module, grasp the upper and lower extractors and pull outward.

6. With the extractor handles horizontal, begin sliding the crosspoint module out.

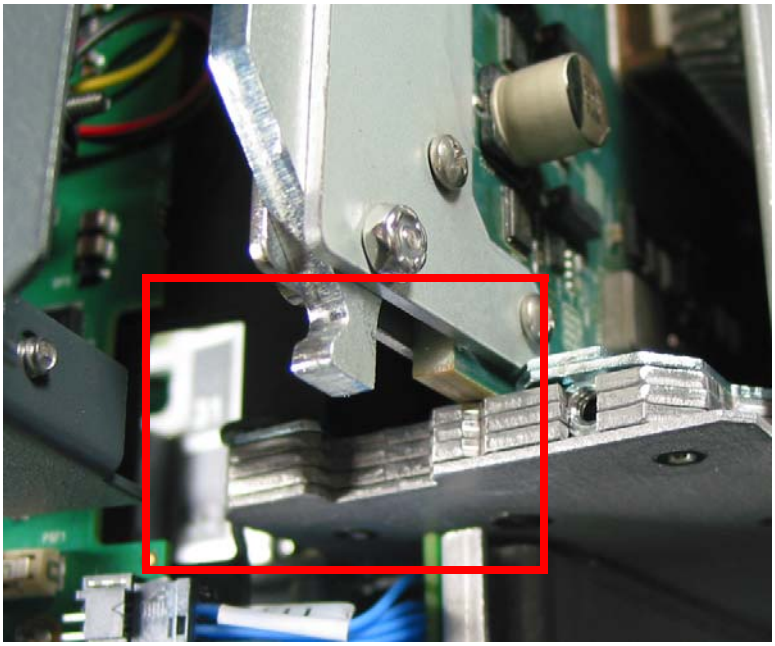
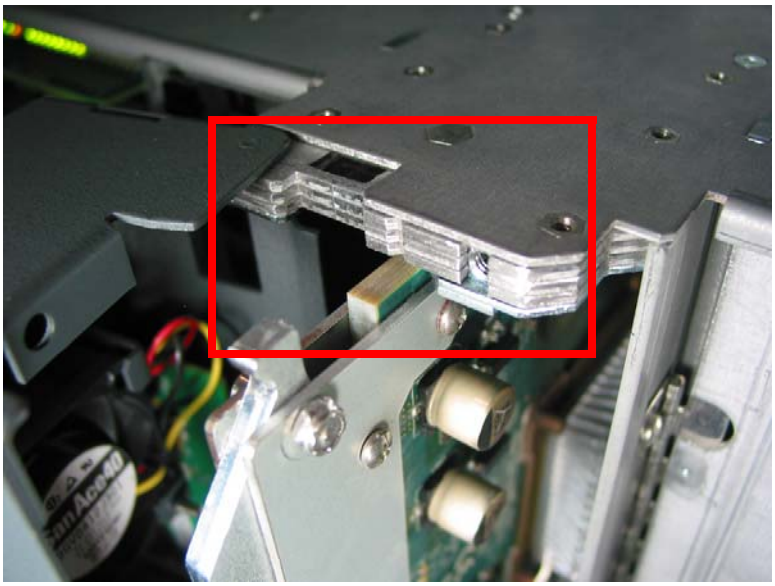


7. Gently remove the Crosspoint Module ensuring that you support it from the middle rather than the front of the module.



Putting the Video Crosspoint back into the Frame

Table 5-1 Putting the Video Crosspoint Module back into the Frame

When you need to put the Video Crosspoint Module back into the Frame, note the notch at the bottom that the card should slide into.	
Also note the notch at the top.	

Video Crosspoint Module Parameters

The Video Crosspoint Module can be accessed and controlled via the web-based IP3 Controller.

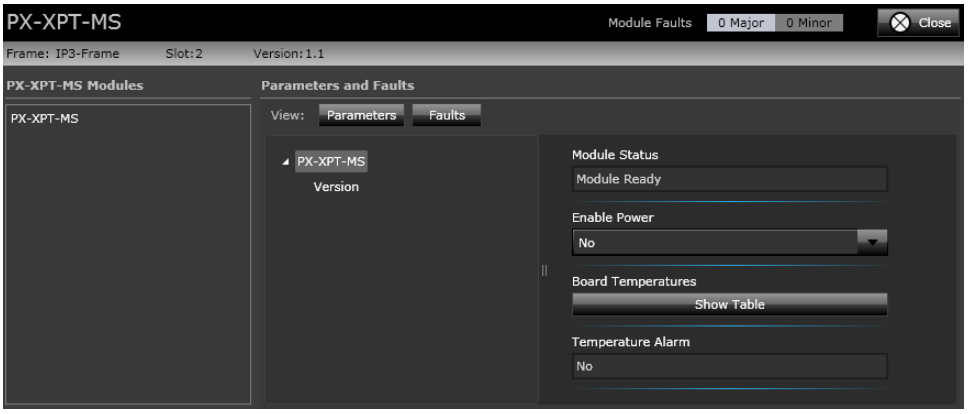


Figure 5-2 Video Crosspoint Module Parameters

Table 5-2 PX-576x1024-3G Parameters

Name	Description	Type	Options
Module Status	Displays current status of module.	RO	■ Module Ready ■ Firmware Upgrade Required ■ Module Power Failure ■ Module Over Temperature
Enable Power	This parameter is used to turn the power to the board back on if the board had shutdown due to over temperature.	RW	No Yes
Board Temperature (1-2) *(Table Parameter)*	Board Temperature in degrees Celsius.	RO	-40 ~ +140 deg C
Temperature Alarm	Indicates if there is a temperature alarm on this board.	RO	Yes No
Software Version	Software version of micro controller	RO	<String>
FPGA Version	Version of FPGA	RO	<String>

LED Indicators on Video Crosspoint Module

The following system indicator LEDs are present on the front edge of the **PX-576x1024-3G** module:

Table 5-3 Module System LEDs

LED	DESCRIPTION	
POWER	**Power Supply indicator**	
	Green	When lit, this indicates that 24V is enabled on this board.
ACT CTRL	**Active Control**	
	Red	Initializing
	Solid Green	FPGA has configured and the Resource Module (PX-RES) is communicating with the card.
	Flashing Green	Alarm condition on the card
ACT XPT	**Active Crosspoint**	
	Yellow	When lit, this indicates that this is the Main Crosspoint.

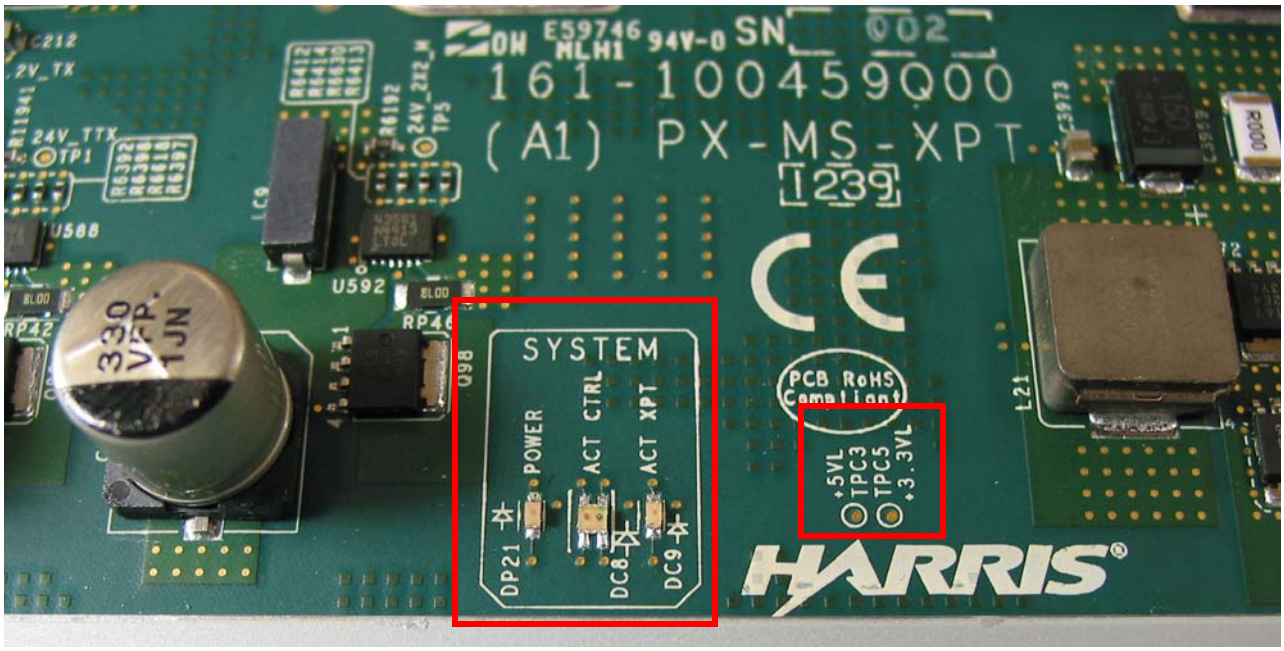


Figure 5-3 LEDs on the PX-576x1024-3G Video Crosspoint Module

Note that these LEDs are not directly visible on the Video Crosspoint when it is in normal operation since the Front Fan module is in front of the Video Crosspoint. The **ACT XPT** (Active Crosspoint) LED on the Front Fan module indicates which Video Crosspoint is the Active (Primary) Crosspoint. The **ACT XPT** LED will be off on the Front Fan module in front of the Redundant Crosspoint.

Fuses on Video Crosspoint Module

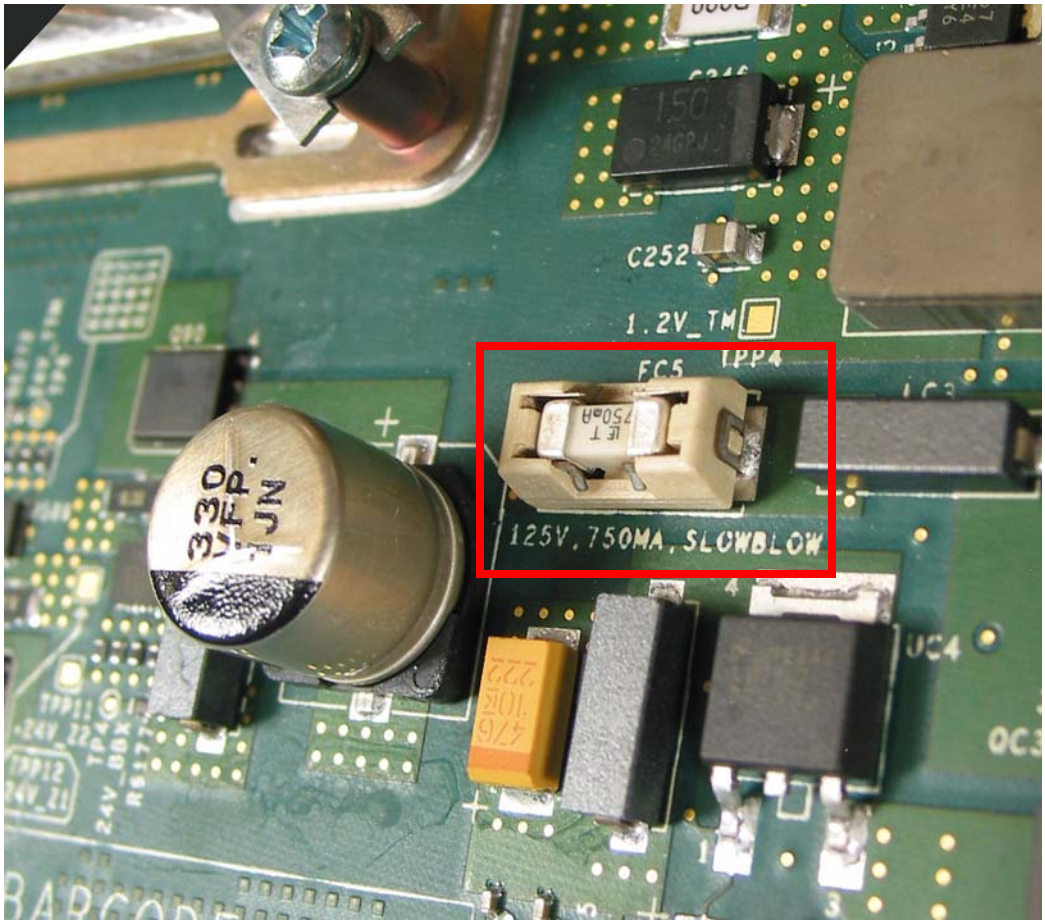


Figure 5-4 Fuses on the Video Crosspoint Module

Table 5-4 Fuses on the Video Crosspoint Module

Fuse Name	Fuse Type	Fuse Rating	Part Number
FC5	Slowblow	750 mA	127-100004Q00

Power Consumption

Table 5-5 PX-576x1024-3G Power Consumption

24V Power Rail	236W
5V Power Rail	0.1W
Total Power	236.1W
Modules in Frame	2 (Primary and Redundant)

6 Audio TDM Crosspoint Module (PX-ATDM64-X28)

Overview

The **PX-ATDM64-X28** Audio TDM Crosspoint (ATDM) module routes/switches audio signals from Input modules to Output modules, via a proprietary time-division multiplexed (TDM) transport scheme.

The Audio TDM Crosspoint module supports different types of audio transitions when switching from one audio source to another. Transition types such as Quiet switching, V-fade, fade-cut, cut-fade and synchronous switching. The cut associated with the fade-cut and cut-fade transitions are minimum duration fades to eliminate audible switching artifacts. It also allows for certain audio effects for a given destination.

Platinum and Platinum IP3 Routers support all types of audio including Dolby E and AC3. Since audio processing such as quiet switching and gain controls can cause data corruption with non-PCM audio, Platinum routers support a pass-through mode for these non-PCM sources.

When using the Mux/Demux modules within the router, the audio packets are analyzed when they are demultiplexed. When the system identifies a non-PCM audio source, all processing functionality is disabled. This allows the non-PCM audio data to pass through the router without being corrupted.

The quiet switch capability of the ATDM module is active by default. Since the quiet switch capability can cause corruption for non-PCM audio at the switchpoint, the capability can be turned off for each output of the router using the Controller GUI.

When incoming audio is embedded within a video source, that audio is routed through the Video (wideband) crosspoint without any processing. The embedded audio, and all ancillary data, is presented at the output exactly as it entered the router.

Audio TDM Crosspoint Module (PX-ATDM64-X28) Location in the IP3 Frame

The Platinum IP3 frame includes two slots for Audio TDM Crosspoint modules. One slot holds the **Primary/Active** Audio TDM Crosspoint Module. The second slot holds an optional **Redundant/Shadow** module, which shadows all operations of the active module, so as to allow it to become active in case the active module is removed or halted due to error. The shadow module sets its outputs to a high-impedance state until it becomes active, but otherwise performs all operations in parallel with the primary crosspoint module.

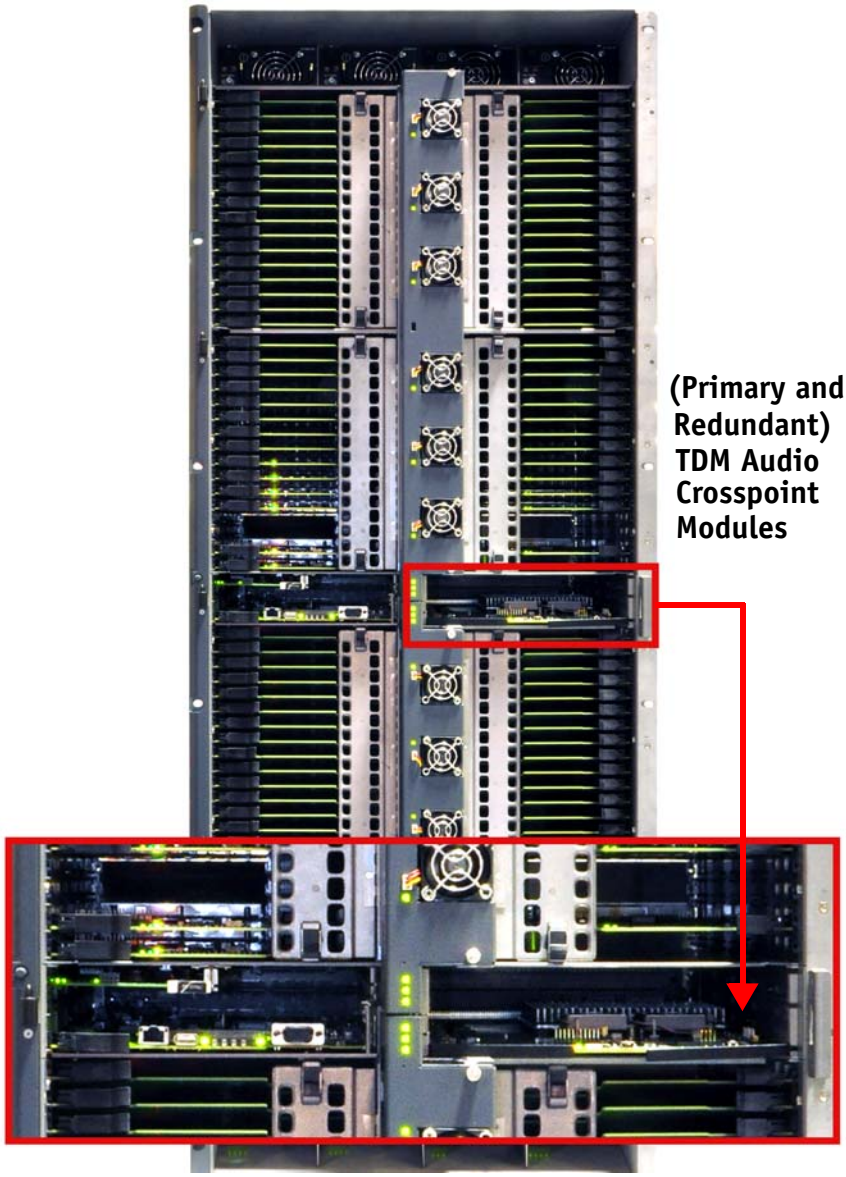


Figure 6-1 TDM Audio Crosspoint Module In IP3 frame

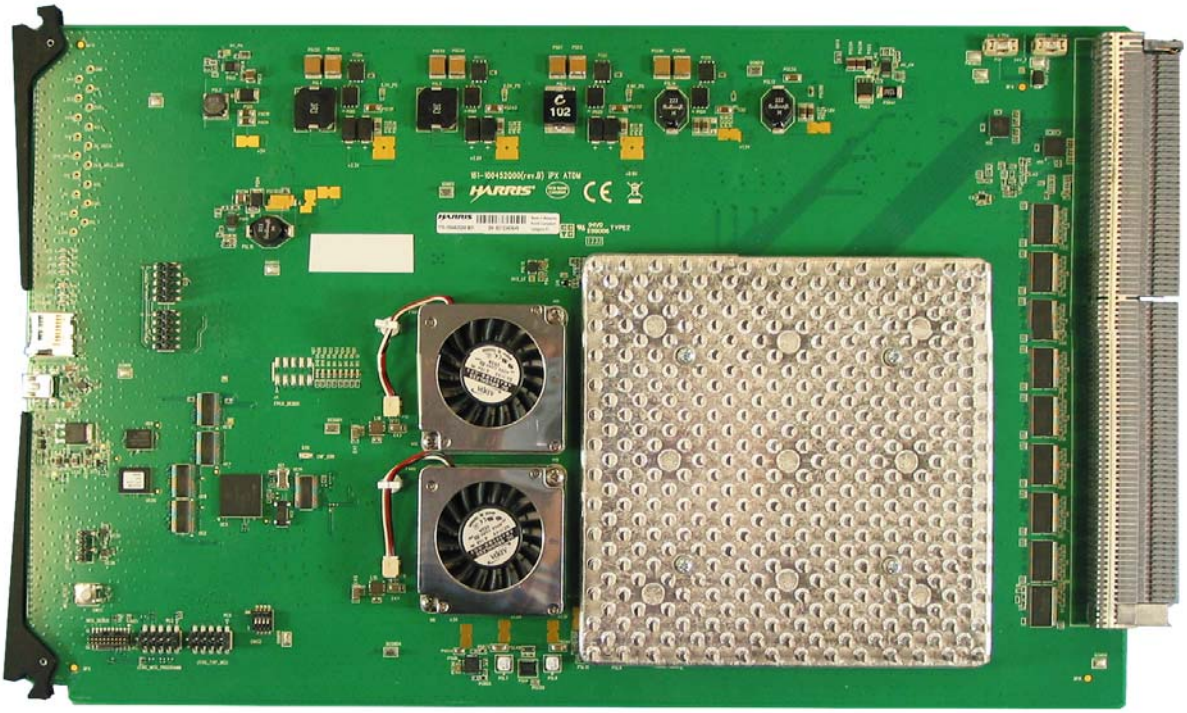


Figure 6-2 PX-ATDM64-X28 Audio Crosspoint Module

Fuses on the PX-ATDM64-X28

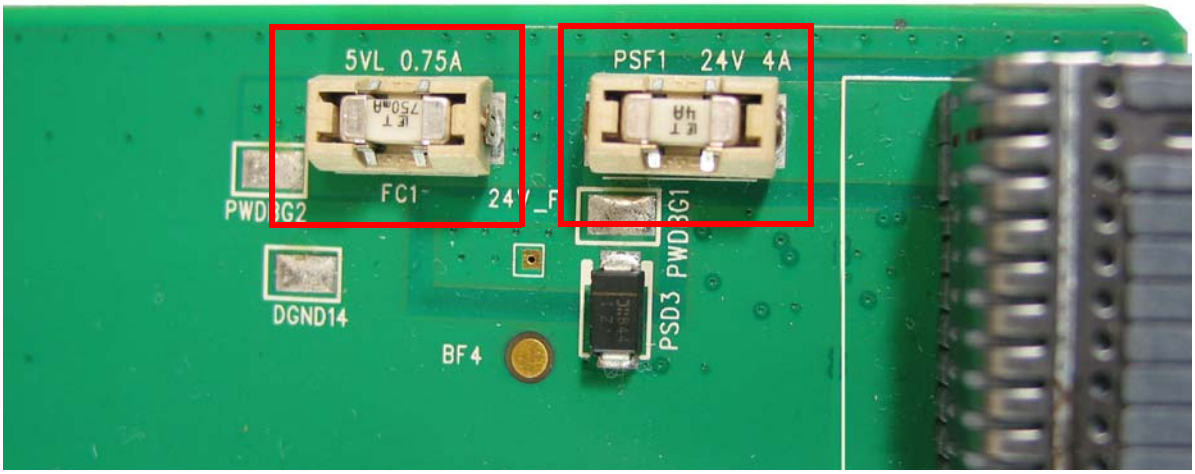


Figure 6-3 Fuses on the PX-ATDM64-X28

Table 6-1 PX-ATDM64-X28 Fuses

Fuse Name	Fuse Type	Fuse Rating	Present on	Part Number
PSF1	Slowblow	4 Amps	24V power rail	127-100006Q00
FC1	Slowblow	0.75 Amps	5V power rail	127-100004Q00

DIP Switches on the PX-ATDM64-X28

DIP switch **SWC2** switch **1**, puts the Freescale Kinetis processor into Failsafe mode. To enable Failsafe, move **SWC2** switch **1** to the ON position.

After you put the board into Failsafe mode, push the Reset button, **SWC1**, or power cycle the board by unplugging/plugging the board from the frame. Use the Controller's GUI to upgrade the application.

Figure 6-4 shows switch 1,2,3 and 4 in the OFF position. This is the setting that should be used for normal operation. Make sure the jumpers are restored to this position after performing a failsafe upgrade. Switch 2, 3 and 4 are reserved for future use

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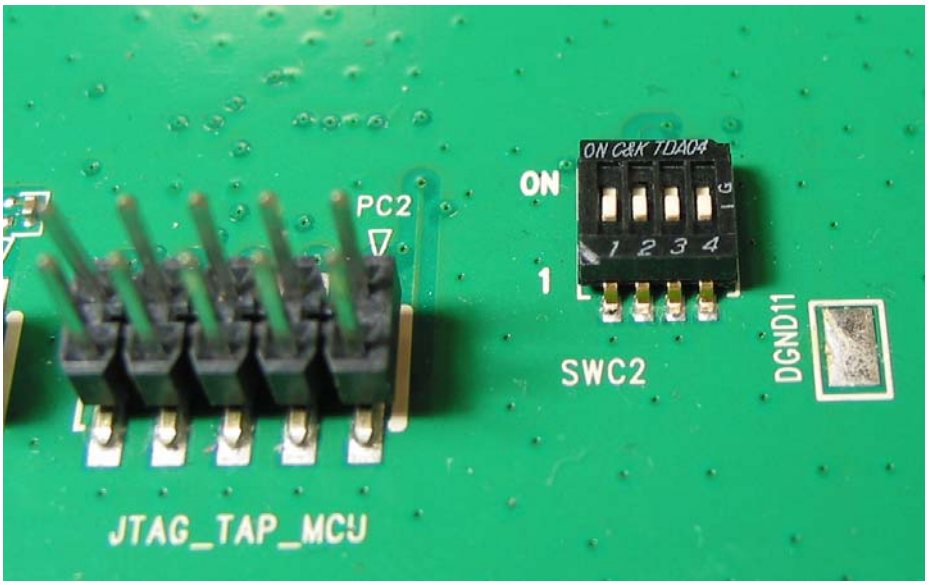


Figure 6-4 DIP Switches on the PX-ATDM64-X28 Module

Fans on the TDM Audio Crosspoint Module (PX-ATDM64-X28)

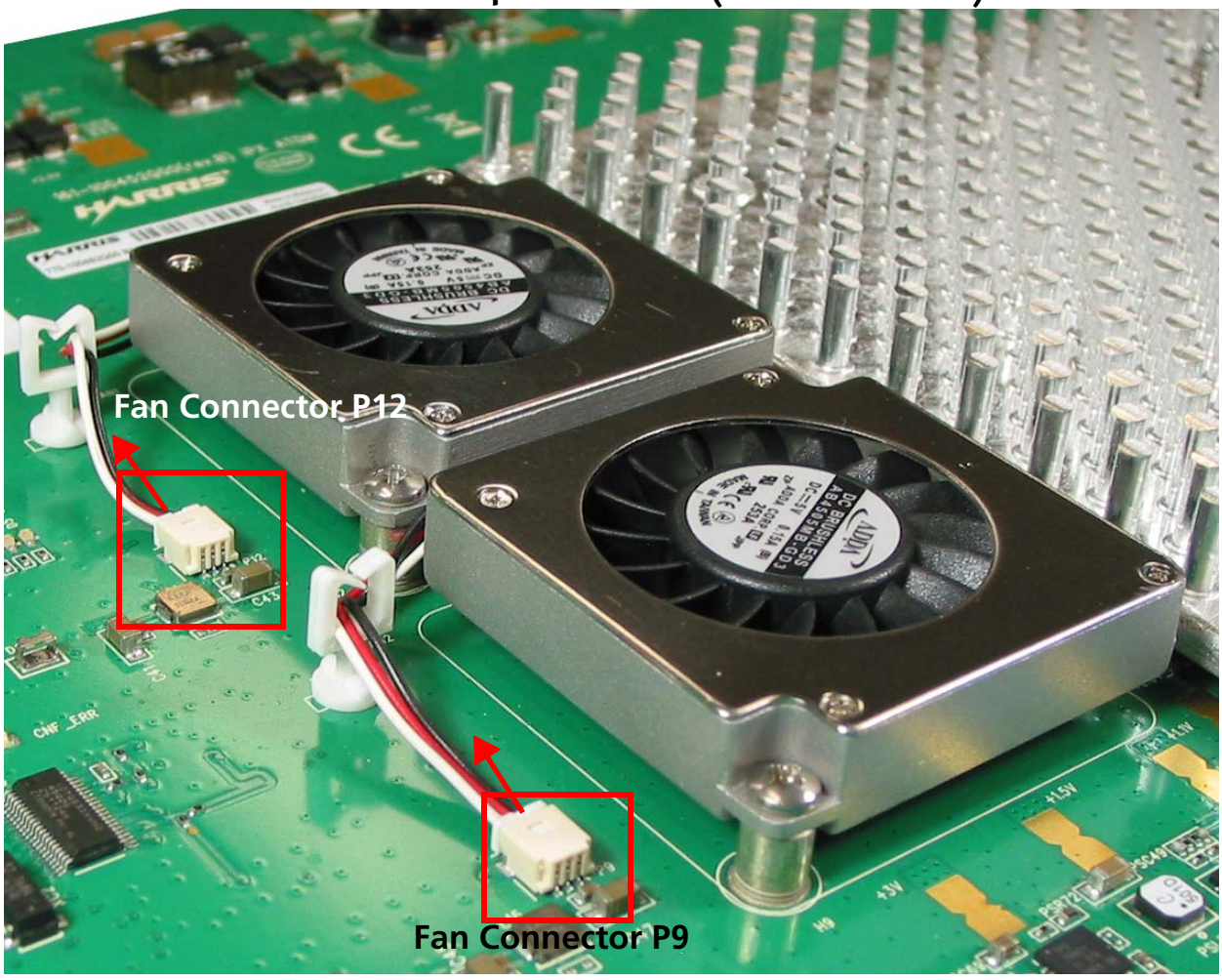


Figure 6-5 Fans on the PX-ATDM64-X28

Table 6-2 PX-ATDM64-X28 Fan Components

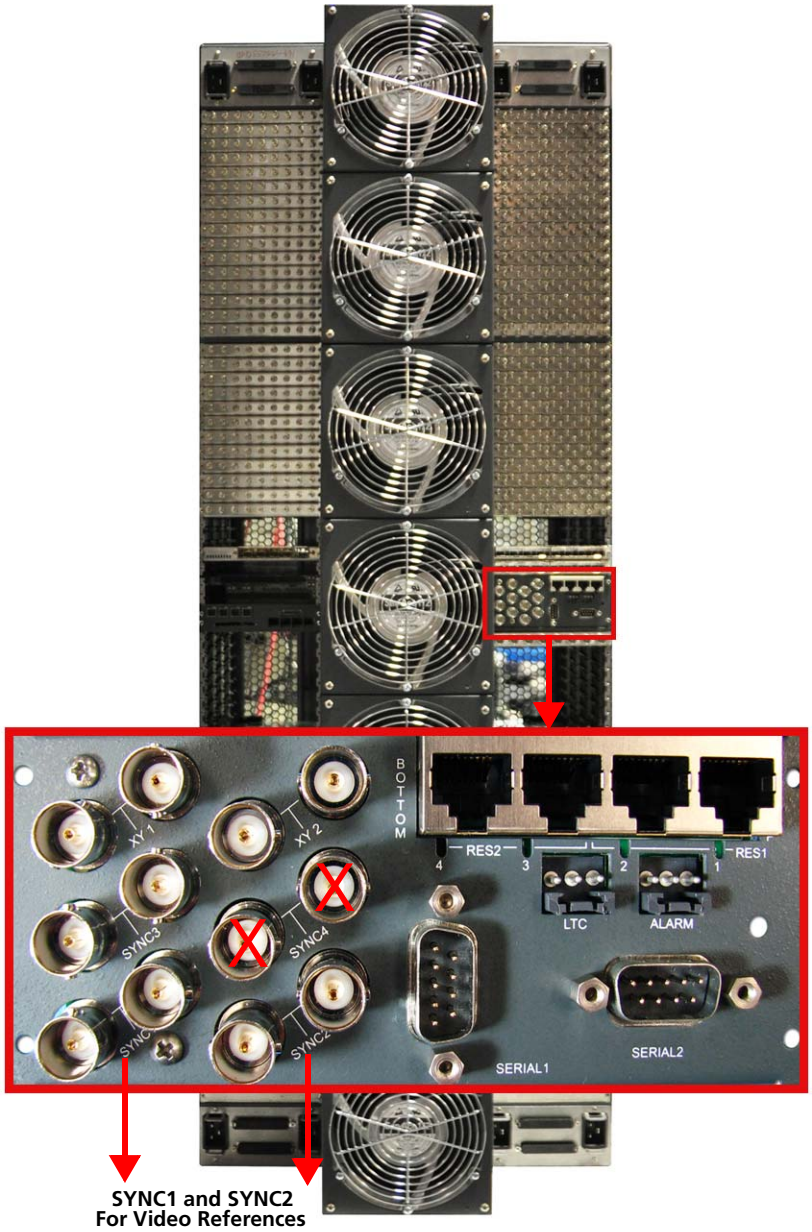
Fan Component	Part Number
Fan Blower	131-100006Q00
Fan Mounting Screws (4-40 3/16)	4-40X3/16 PH_Q
Fan Connector P9	
Fan Connector P12	

Instructions to Replace the Fan Blowers

1. Using needle-nosed pliers, carefully lift the Fan Connector off the board, taking care not to twist or bend it. Carefully remove the clip that the wire runs through.
2. Remove the wire than runs through the clip.
3. Remove the 2 Phillips mounting screws and gently lift the fan blower off the board.
4. Replace the Fan blower.
5. Attach the Fan Connector and wires.

Sync References

- The ATDM module requires a **PT-SYNC** module to be installed in the frame for distribution of an internal sync signal, which uses up the **SYNC4** distribution path.
- **SYNC1** and **SYNC2** are used for connecting Video References.



PX-ATDM64-X28 Block Diagram

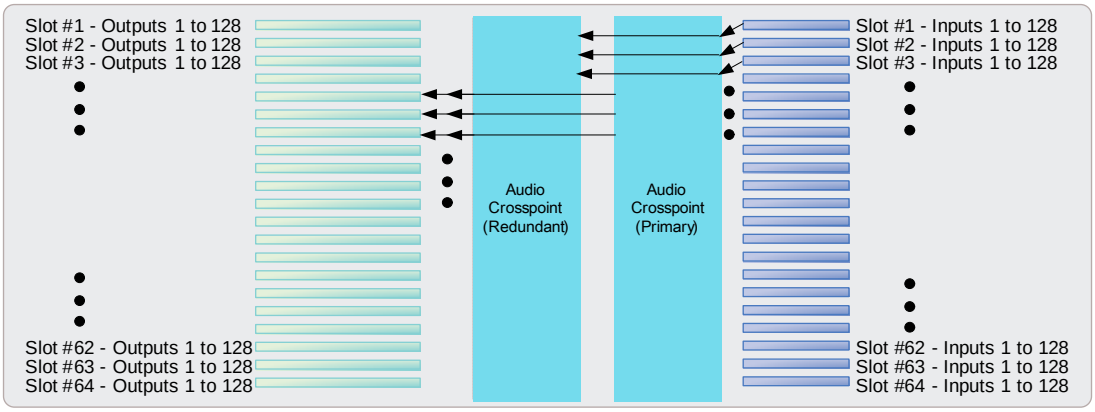


Figure 6-6 PX-ATDM64-X28 Block Diagram

Audio from each Input slot is routed to both ATDM Crosspoints and Outputs from the ATDM Crosspoints are routed to each Output Slot. Both ATDM Crosspoint receive and process audio signals simultaneously.

Functionality

The **TDM Audio Crosspoint Module** provides the following functionality:

16/20/24 bit Audio Processing

The Audio TDM architecture supports processing of 16-bit, 20-bit, and 24-bit audio samples. Bits per sample are automatically detected by the TDM architecture

Transitions

When switching between 2 audio signals, transitions such as V-Fade, Fade Cut, Cut Fade, and Synchronous are supported. Transition type and duration are assigned on a per-output basis.

Quiet Switching

Quiet switching between two audio signals is supported as a predefined transition type. Quiet switching is implemented as a v-fade of two signals with minimum duration.

Synchronous Switching

AES streams are switched synchronously, at the AES frame boundary, with respect to a DARS.

Asynchronous Signals

Asynchronous inputs are re-sampled to a common reference frequency to avoid periodic adding/dropping of samples.

Level Adjustment

TDM Input/Output Modules support audio level adjustment from -30dBFS to +3dBFS. From -30dBFS to 0, adjustments will occur in 0.5dBFS increments and adjust in 0.33dBFS increments from 0 to +3dBFS.

Sample rate Conversion (SRC)

The Audio TDM Crosspoint does not Sample Rate Convert (SRC) the audio signals. SRC is done on the Input Audio TDM modules. Audio sampled at 32 kHz to 96 kHz can be Sample Rate Converted to 48 kHz and locked to the Digital Audio Reference Signals (DARS) connected to the IP3 frame.

Tone Generator

Audio TDM Input/Output Modules can generate valid AES silence, 500Hz tone, and 1KHz tone.

Polarity Reversal

Audio TDM Input/Output Modules provide a means to correct inverted audio polarity due to incorrect wiring in the analog domain.

Channels Swapping and Summing

Audio TDM Input/Output Modules provide the ability to exchange Left for Right or vice versa of an AES stereo pair. They also provide the ability to average two stereo pairs into a single mono channel.

Redundancy

There are 2 slots in the IP3 frame for TDM Audio Crosspoint Modules. One is the primary, and the second (redundant) shadows all operations of the primary board. The redundant module becomes active within one video frame of an error occurring or with removal of the active board.

The ATDM modules, in conjunction with the Resource Module (PX-RES), determine which slot contains the Active module. The modules report their current status (primary or secondary) to the control system. Appropriate watchdog circuitry on the module and/or status monitoring on the Resource Module will monitor the status of the primary module. It is not necessary to remove the primary module to cause the secondary module to become active.

Frame Expansion

The Audio TDM architecture enables interconnectivity between two Platinum IP3 frames, expanding to matrix sizes up to 16384x16384, including four AES output monitoring outputs per frame. Each crosspoint send its inputs to the second frame via Densishield cables. The Audio TDM Crosspoints in the top slots in each frame must be connected to each other using Densishield cable. The Crosspoints in the bottom slots must also be connected together.

LED Indicators

The following indicator LEDs are present on the front edge of the **PX-ATDM64-X28** module:

Table 6-3 Module System LEDs

LED	DESCRIPTION	
POWER	**Power Supply indicator**	
	Green	When lit, this indicates that 24V is enabled on this board.
ACT CTRL	**Active Control**	
	Red	Initializing
	Solid Green	FPGA has configured and the Resource Module (PX-RES) is communicating with the card
	Flashing Green	Alarm condition on the card
ACT XPT	**Active Crosspoint**	
	Yellow	When lit, this indicates that this is the Main Crosspoint
PRIMARY	Green	When lit, this indicates the Audio TDM Crosspoint is driving audio outputs.

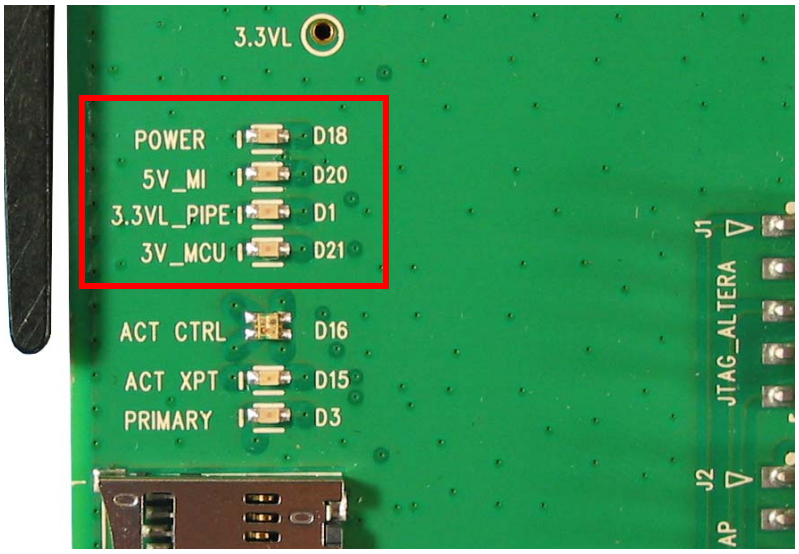


Figure 6-7 LEDs on the PX_ATDM64_X28 Crosspoint Module

Below the **POWER** LED are three other LEDS:

- 5V_MI
- 3.3VL_PIPE
- 3V_MCU

All of these LEDs should be **Green** when the frame is powered up. If any one of them is not lit, it indicates a power problem on the board or the frame. Check **Fuse FC1** (See **FC1**) to see if its open.

PX-ATDM64-X28 Parameters

Category	Name	Description	Type	Options
Module	Power Status	Indicates power status.	RO	Good Bad
	PCB Rev	The PCB Revision. Note: 1-3 are Prototype revisions. 4 is the first released revision.	RO	1 2 3 4
	Fan Alarm *(Table Parameter)*	Indicates if Fan Alarm has been set	RO	Set
	Fan Running *(Table Parameter)*	Indicates whether fans are running	RO	Disabled Enabled
	Upgrade from USB	Enabling or Disabling USB Upgrades	RW	Yes No
	Upgrade State	The state of any current upgrades		No activity
FPGA	FPGA Rev	The FPGA Revision	RO	<String>
	FPGA Temp	The FPGA Temperature	RO	<String>
	FPGA Temp Alarm	FPGA Temperature Alarm	RO	<String>

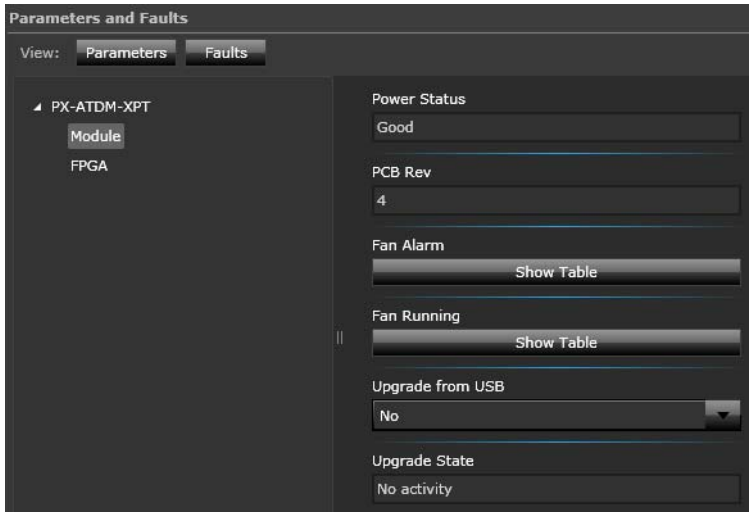


Figure 6-8 PX-ATDM64-X28 parameters

Firmware Upgrade

Follow this procedure to upgrade firmware from USB:

1. Extract the **IpxAtdmXpt** and **atdm_board_app.bin** files from the ZIP upgrade package (**px-atdm-xpt_1_6.zip**) to a folder on the Windows computer (host) being used for the upgrade.
2. Rename **atdm_board_app.bin** to **atdm_board_app**.
3. Attach a USB cable from the host to the USB connector on the front of ATDM Crosspoint board.
   - The first time the USB cable is connected from the host to the ATDM Crosspoint, make sure the ATDM Crosspoint board shows up as a **Portable device (disk)** without any warning in the Window device manager.
4. After a generic USB disk driver is installed, the Windows host will pop up a window prompting for a quick disk format.
5. After the disk is formated, create a folder **ATDM** on the disk (ATDM crosspoint board)
6. Copy the files **IpxAtdmXpt** and **atdm_board_app** from the folder on the host to the **ATDM** folder in the ATDM Crosspoint
7. After copying the files to the ATDM Crosspoint board, disconnect the USB cable from the ATDM Crosspoint
8. Re-attach to verify the files were transferred and saved correctly by checking the file sizes match the file sizes on the host.

Power Consumption

Table 6-4 PX-ATDM64-X28 Power Consumption

24V Power Rail	55W
5V Power Rail	0.8W
Total Power	55.8W

7 Input Modules (PX-IB)

PX-IB Input Module General Overview

The **PX-IB** is a generic Video Input Module designed for the IP3 Frame. It supports signals up to 3 Gbps.

The **PX-IB** Input Module accepts digital video signals, equalizes and retimes data streams, detects standards and formats, and distributes signals to the MI backplane to be switched by the crosspoint matrix. **PX-IB** input modules are hot-swappable.

The **PX-IB** accepts an input data stream for each of the nine channels. Cable losses are automatically compensated for, if the cable length is within the maximum length limitation. The maximum cable length is a system specification, not solely dependent on the input card. It is measured by bit error limitation (not jitter).

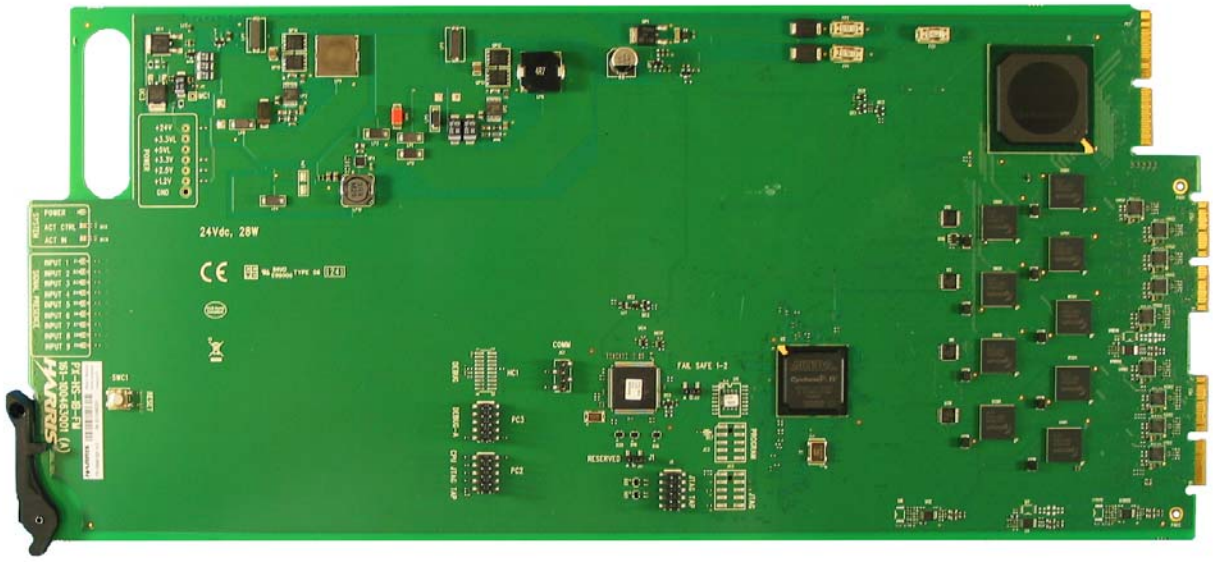


Figure 7-1 PX-IB Generic Output Module

PX-IB Input Options

The **PX-IB** is designed in front module plus back module structure. A single common front module (FM) combines with different back modules to provide several IO variations.

The **PX-IB** Input Module combines with the following back modules:

- **PX-HSR9C-IBG Input Module**
- **PX-HSR9O-IBG Input Module**
- **PX-HSR9C1D-IBG Input Module**
- **PX-HSR9O1D-IBG Input Module**

The **PX-IB** module accepts the following inputs:

Table 7-1 PX-IB Input Options

Back Module Type	Number of Inputs
HD-BNC	Nine Electrical Inputs
SFP (optical)	Nine Optical Inputs

PX-IB Expansion

The **PX-IB** module can also be used with specific back modules intended for expansion. It provides the following for extension:

- Looping output of all inputs to extend the routing system to:
  - More than 512 outputs (Platinum)
  - More than 1024 outputs (IP3), in multiple frames form factor.

See:

- **PX-HSR9C1D-IBG Input Module**
- **PX-HSR9O1D-IBG Input Module**

Inserting Input Modules into the IP3 frame

Each Input Module may be inserted into, or extracted from, a IP3 frame while the frame is powered and functioning. The system Controller will recognize the addition or removal of an Input Module from any of the Input Module slots, and will update the change automatically.

When the Controller recognizes the addition of an Input Module, it will allow the user to control the additional inputs to the matrix.

When inserted into the IP3 frame, each Input Module mates with a passive connector assembly (back module), mounted in the rear of the frame. This assembly allows a high integrity interconnect between the input cables and the input module, without requiring any active components. Frames that are not fully populated with input modules when shipped from the factory contain blank covers over the non-populated slots. If an Input Module is added to the frame at a future time, the blank cover must be replaced with the corresponding back module.

Failsafe Mode

To put an Input Module in Failsafe Mode:

1. Unplug the board
2. Set the Failsafe jumper.
3. Wait 10 seconds
4. Insert the board again

The above procedure applies to the following Input Modules

- **PX-HSR9C-IBG Input Module**
- **PX-HSR9O-IBG Input Module**
- **PX-HSR9C1D-IBG Input Module**
- **PX-HSR9O1D-IBG Input Module**

Signal Presence and LEDs

Each of the nine input channels on the Input Module provides signal presence reporting via card edge LEDs and the control software. Both have the ability to be disabled or enabled through the control software, along with a user-selectable hysteresis period.

Module LEDs

See **Module LEDs**.

System LEDs

There are also three system indicator LEDs on the front edge of the module:

Table 7-2 Module System LEDs

LED	**DESCRIPTION**	
INPUT 1-9	**Signal Presence**	
	Green	Signal Present
	Slow Flash	Valid Signal present but not locked
	Solid On	Valid Signal present and locked
POWER	**Power Supply indicator**	
	Green	+24V power rails are operational
ACT CTRL	**Active Control**	
	Red	Initializing
	Solid Green	FPGA has configured and the control system is communicating with the card

Table 7-2 Module System LEDs

LED	DESCRIPTION	
	Flashing Green	Alarm condition on the card
ACT IN	**Active Input Warning**	
	Yellow	Input on card being used by one or more outputs

Note: *PX-IB can lock to 270Mbps, 1.5Gbps and 3Gbps video SDI signals.*

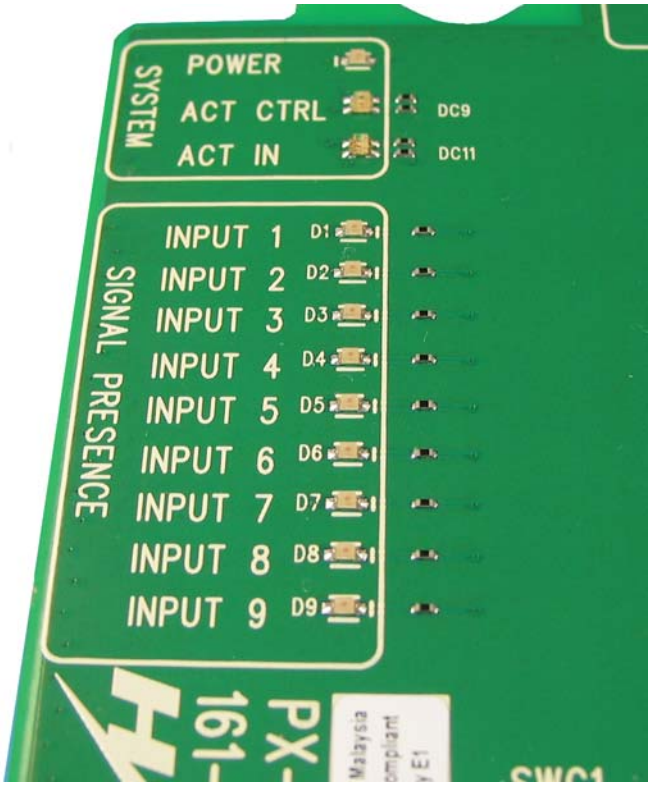


Figure 7-2 LEDs on PX-IB Input Module

Controllable Parameters

For Input Modules, the Controllable Parameters List is a multilevel structure that includes all of the available parameters, arranged into the following groupings:

- **(Module) Root Level Parameters**
- **Inputs Parameters**
- **Advanced Parameters**

Parameter Notes

- Parameters can be enabled and/or changed via CCS Navigator or the IP3 Controller.
- Parameters marked with the [RO] designator are "read-only."
- Parameters marked **Modules with SFPs Only** apply only to optical modules such as **PX-HSR9O-IBG Input Module**.

(Module) Root Level Parameters

The following parameters are displayed at the root level (when you click the Module) in the parameter menu list:

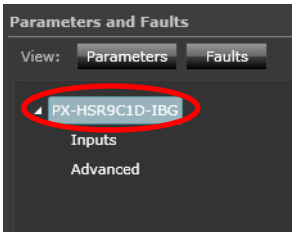


Table 7-3 Module Parameters

Name	Description	Type	Options
Software Version	Software version of micro controller	RO	<String>
Sync Select	Selects which physical sync port the module uses as a reference (Note: Actual signals are not synchronized to the reference. This parameter only affects control timing)	RW	0 (Default) 1 2 3
Temperature	Monitor module temperature Unit: deg C	RO	-40 ~ +140 deg C

Table 7-3 Module Parameters

Name	Description	Type	Options
Control FPGA Version	Version of FPGA	RO	<String>
Module Status			
SFP Type *(For Modules with SFPs only)*	Reports the type of SFP	RO	Invalid SFP OP+SFP+TT+13+13 OP+SFP+TT+27+29 OP+SFP+TT+31+33 OP+SFP+TT+35+37 OP+SFP+TT+39+41 OP+SFP+TT+43+45 OP+SFP+TT+47+49 OP+SFP+TT+51+53 OP+SFP+TT+55+57 OP+SFP+TT+59+61 NO SFP

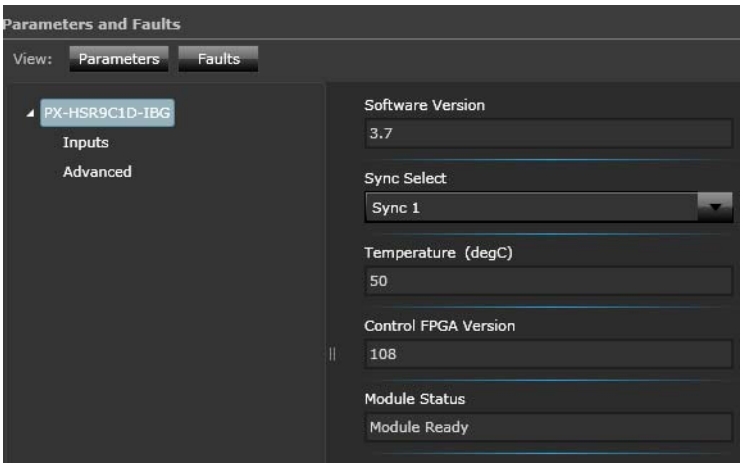
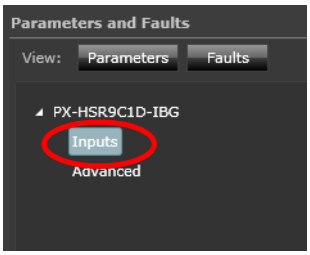


Figure 7-3 Module Parameters

Inputs Parameters

Input Parameters are accessed by clicking the **Inputs** option below the Module in the parameter menu list.



Input parameters are grouped into a Table and can be accessed by clicking the **Show Table** button.

The following parameters are displayed:

Table 7-4 Input Parameters

Name	Description	Type	Options
Signal Presence	Reports presence or absence of valid signal	RO	Yes No
Video Standard	Detects video standard		Unknown 525i 59.94 625i 50 1035i 60 1035i 59.94 1080i 60 1080i 59.94 1080i 50 1080psf 24 1080psf 23.98 1080p 30 1080p 29.97 1080p 25 1080p 24 1080p 23.98 720p 60 720p 59.94 1080p 60 1080p 59.94 1080p 50 1080i 50 295M 720p 50 720p 25 720p 24 720p 23.98 720p 30 720p 29.97 1080p 60 DL 1080p 59.94 DL 1080p 50 DL
Video Error	Detects video error in input signal	RO	Yes No N/A
EQ Bypass	Sets the EQ mode	RW	On Off (Default)
Reclocker Mode	Sets the reclock mode to automatic or bypass or to one of three manual fixed rates	RW	Auto (Default) 3G HD SD Bypass

Table 7-4 Input Parameters

Name	Description	Type	Options
Lock Detect	Reports if data is relocked by reclocking stage	RO	Yes No
Rate Detect	Detects data rate	RO	Unknown SD HD 3G
Mute	Mutes the output of the board	RW	Yes No (Default)
EDH Presence	EDH package present in input SD signal	RO	Yes No N/A
Input EDH Error	EDH error present in input SD signal	RO	Yes No N/A
Input Optical Power *(Modules with SFPs only)*	Reports input optical signal power level	RO	Too Low -32 - 1 dBm Too High
CRC/EDH Error Fields	Shows CRC/EDH errors	RO	0 ~ 65535
CRC Counter Control	Sets CRC detection mode for HD signal	RW	Enable (Default) Disable
EDH Counter Control	Sets EDH detection mode for SD signal	RW	Enable (Default) Disable
CRC/EDH Error Clear	Clear CRC/EDH error counter	RW	Yes No (Default)
Signal Input Range	In normal operation, input EQ is set to compensate cable loss where at the other end of the cable, the driver outputs 800mVpp. If a passive splitter is inserted between the cable driver and the EQ, set this parameter to Small Range for proper compensation.		Normal (800mVpp) Small (400mVpp)
EQ Power Save Mode	Puts equalizer into power save mode	RW	Auto (Default) Disable Force

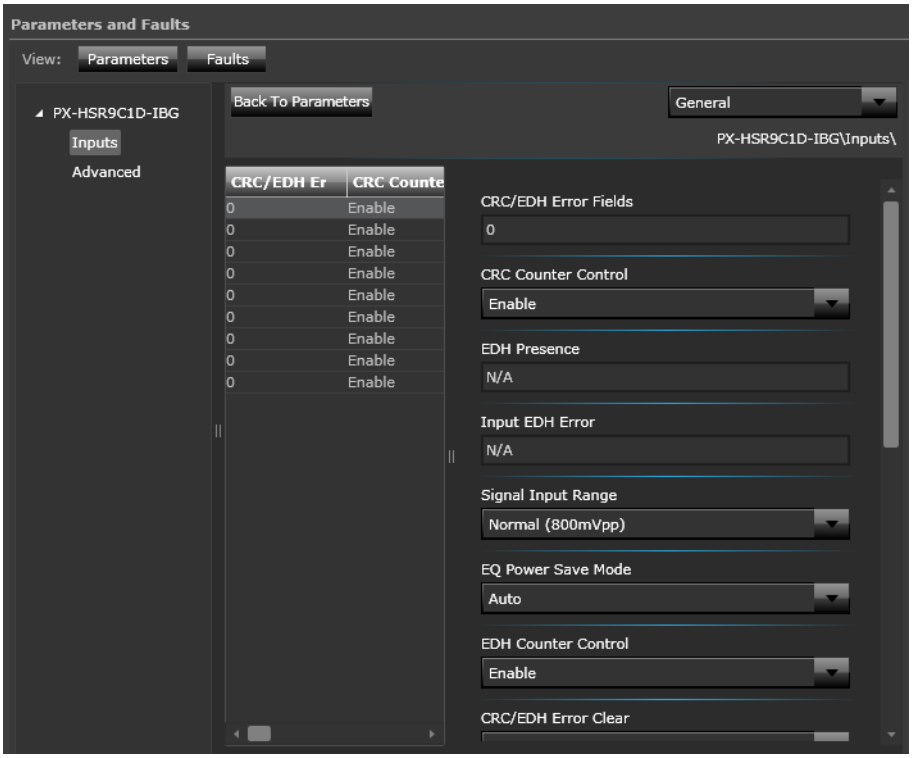


Figure 7-4 Inputs Parameters

Advanced Parameters

Advanced Parameters are accessed by clicking the **Advanced** option in the parameter menu list.

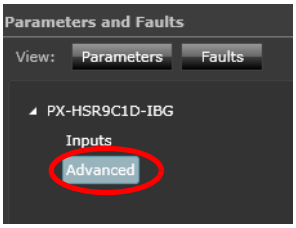


Table 7-5 Input Modules - Advanced Parameters

Name	Description	Type	Options
Parameter Hysteresis	Sets hysteresis for parameters needing it. This parameter works as time constant of low pass filter of status reporting, to ease CCS communication in case there is a flickering status report. It can be changed as required.	RW	0 - 10000000 (**2000000**)

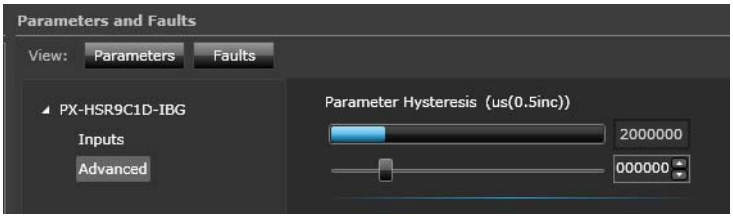


Figure 7-5 Input Modules - Advanced Parameters

Specifications

Technical Specifications

Table 7-6 Input Module - Technical Specifications

Item	Description
Input Connector	■ 75 Ohm BNC per IEC 169-8 ■ 75 Ohm HD-BNC ■ LC optical ■ DensiShield
Impedance	■ 75 Ohms (BNC, HD-BNC) ■ 100 Ohms differential (DensiShield)
Signal type	■ SMPTE 424M, SMPTE 292M, SMPTE 259M, ■ SMPTE 344M, DVB-ASI ■ Most other < 1Vpp digital signals, 3Mb/s to 3.0Gb/s
Maximum input level	■ 880mV (BNC, HD-BNC) ■ Optical 0dBm typical (based on GO2927/2917)
Return loss (BNC, HD-BNC)	■ > 15dB, up to 1.485GHz ■ > 10dB, 1.485GHz to 2.97GHz
Equalization (BNC, HD-BNC)	■ Automatic ■ 400m Belden 1694A for 270Mb/s data rate ■ 200m Belden 1694A for 1.485Gb/s data rate ■ 150m Belden 1694A for 2.97Gb/s data rate
Optical input sensitivity	■ -20dBm (based on OP+SFP+RR/OP+SFP+R)

Capacity

Table 7-7 Input Module - Capacity

Number of Inputs	
From rear edge of module	9
Number of Outputs	
To MI connector	18
To rear edge of module	9 (optional)

Control

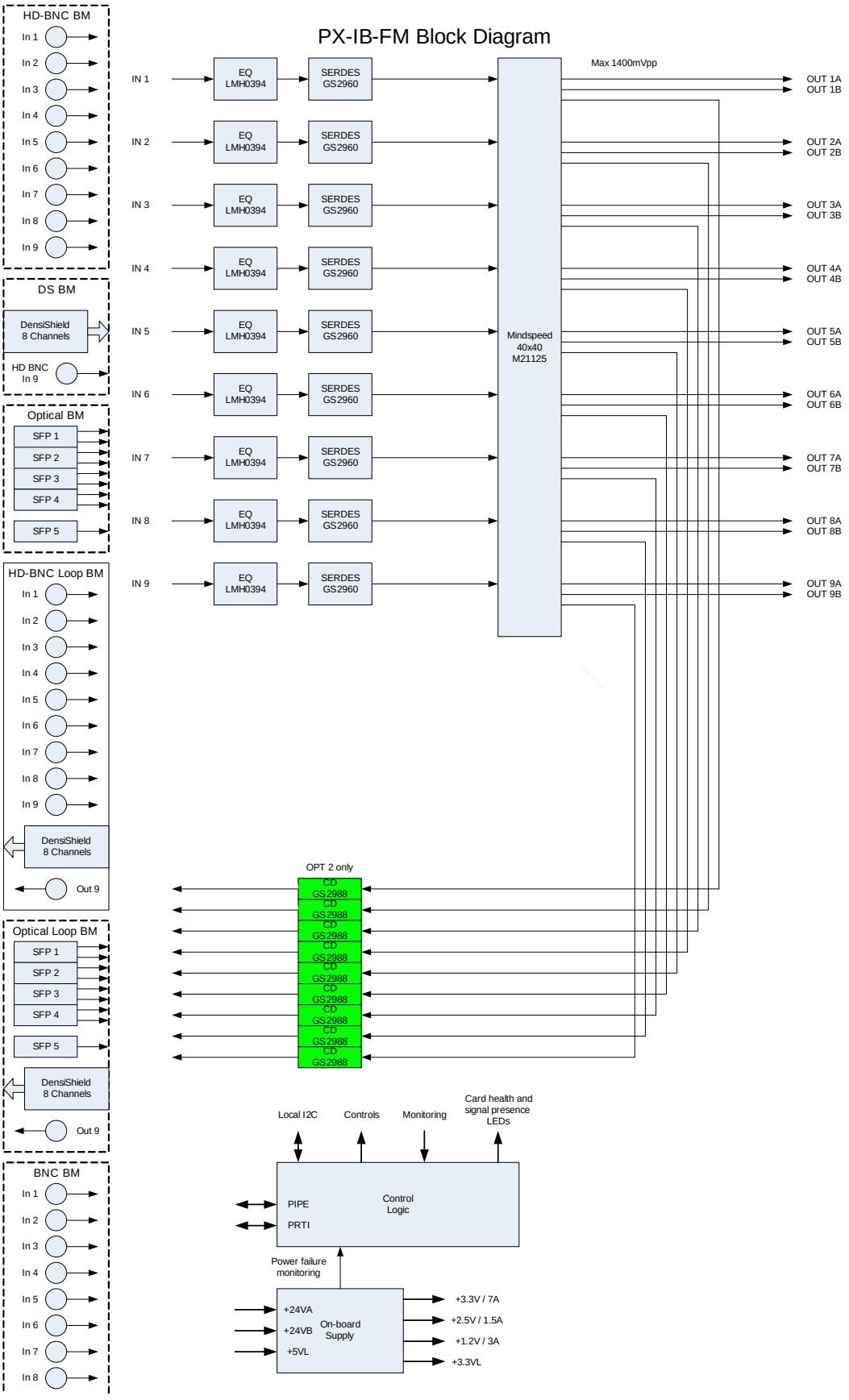
Control Requirements

All settings for the input circuitry are reset to the input slot's configuration on module insertion. Settings follow module location, not modules themselves. This way, modules can be moved from slot to slot without the need to reconfigure the input parameters.

Applications Integration

The CCS Control System supports each input module via the Navigator architecture with the router module installed, and is available for control and monitoring from any Harris- or SNMP-supported control application.

Block Diagram



8 Output Modules (PX-OB)

PX-OB Output Module General Overview

The **PX-OB** is a generic, Video Output Module designed for the IP3 Frame.

PX-OB modules recondition SDI video received from crosspoint modules before distributing to various output interfaces - such as standard BNC coaxial cables, HD-BNC coaxial cables, and SFP optical fiber. **PX-OB** output modules are hot-swappable.

Each **PX-OB** output module provides a maximum of16 output signal channels.Output modules accept 32 signals from the crosspoint matrix. Each output channel also contains an output monitoring path which feeds the output signal seen on any channel back to an optional rear-mounted output monitoring card.

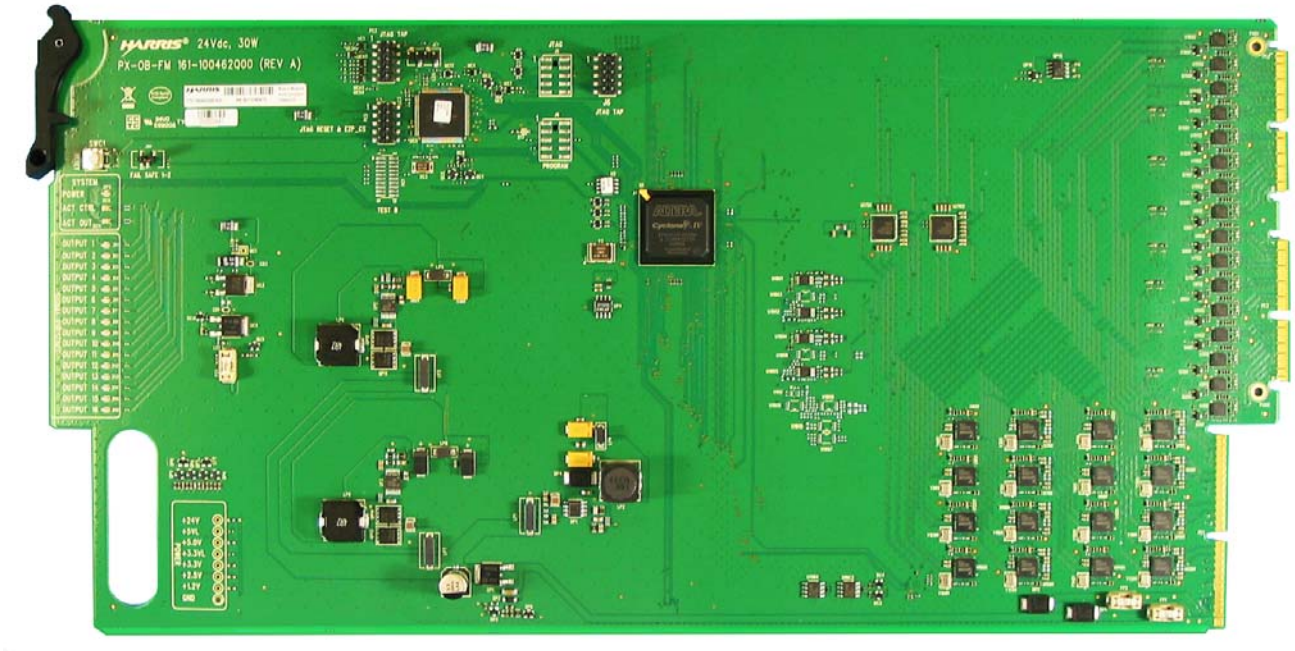


Figure 8-1 PX-OB Generic Output Module

PX-OB Output Options

The **PX-OB** is designed in front module plus back module structure. A single common front module (FM) combines with different back modules to provide several IO variations.

The **PX-OB** Output Module combines with the following back modules:

- **PX-HSR16C-OBG Output Module**
- **PX-HSR16O-OBG Output Module**
- **PX-HSR8C2DS-OBG Output Module**
- **PX-HSR8O2DS-OBG Output Module**

Table 8-1 PX-OB Output Options

Back Module Type	Number of Outputs
HD-BNC	Sixteen Electrical Outputs
SFP (optical)	Sixteen Optical Outputs

PX-OB Expansion

PX-OB also provides a router expansion (8 input channels) interface using DensiShield. See **PX-HSR8C2DS-OBG Output Module** and **PX-HSR8O2DS-OBG Output Module**.

Inserting Output Modules into the IP3 frame

Each Output Module may be inserted into, or extracted from, a IP3 frame while the frame is powered and functioning. The system Controller will recognize the addition or removal of an Output Module from any of the Output Module slots, and will update the change automatically. When the Controller recognizes the addition of an Output Module, it allows the user to control the additional inputs to the matrix.

When inserted into the IP3 frame, each Output Module mates with a passive connector assembly (back module), mounted in the rear of the frame. This assembly allows a high integrity interconnect between the input cables and the input module, without requiring any active components. Frames that are not fully populated with modules when shipped from the factory contain blank covers over the non-populated slots. If an Output Module is added to the frame at a future time, the blank cover must be replaced with the corresponding back module.

Note: *IP3 modules can be damaged if they are plugged into the wrong back modules or wrong slot. Care should be exercised when plugging modules into the frame.*

Failsafe Mode

To put an Output Module in Failsafe Mode:

1. Unplug the board
2. Set the Failsafe jumper.
3. Wait 10 seconds
4. Insert the board again

The above procedure applies to the following Output Modules

- **PX-HSR16C-OBG Output Module**
- **PX-HSR16O-OBG Output Module**
- **PX-HSR8C2DS-OBG Output Module**
- **PX-HSR8O2DS-OBG Output Module**

Signal Presence and LEDs

Each of the channels on the Output Module provide signal presence reporting via card edge LEDs and the control software. Both have the ability to be disabled or enabled through the control software, along with a user-selectable hysteresis period.

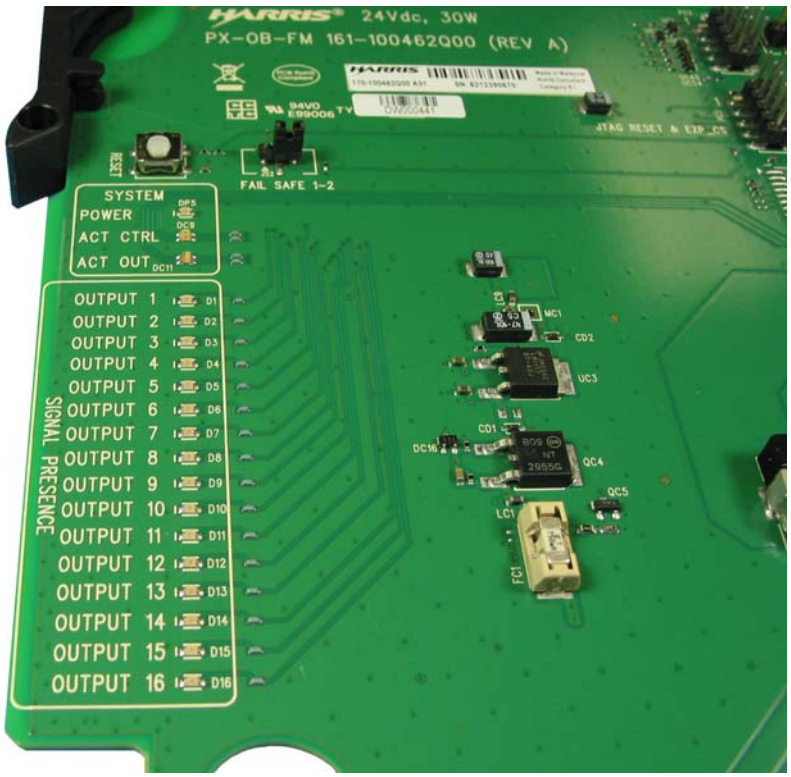


Figure 8-2 System LEDs on PX-OB Output Module

System LEDs

There are 3 system indicator LEDs on the front edge of the module:

Table 8-2 Module System LEDs

LED	**DESCRIPTION**	
OUTPUT 1-16	**Signal Presence**	
	Green	Signal Present
POWER	**Power Supply indicator**	
	Green	+24V power rails are operational

Table 8-2 Module System LEDs

LED	DESCRIPTION	
ACT CTRL	**Active Control**	
	Red	Initializing
	Solid Green	FPGA has configured and the control system is communicating with the card
	Flashing Green	Alarm condition on the card
ACT OUT	**Active Output Warning**	
	Yellow	Output on card being used by one or more outputs

Module LEDs

See **Module LEDs**.

Controllable Parameters

For Output Modules, the Controllable Parameters List is a multilevel structure that includes all of the available parameters, arranged into the following groupings.

- **(Module) Root Level Parameters**
- **Output Parameters**
- **Advanced Parameters**

Parameter Notes

- Parameters can be enabled and/or changed via CCS Navigator or the IP3 Controller.
- Parameters marked with the [RO] designator are "read-only."
- Parameters marked **Expansion Modules Only** apply only to expansion modules such as **PX-HSR8O2DS-OBG Output Module** and **PX-HSR8C2DS-OBG Output Module**
- Parameters marked **Modules with SFPs Only** apply only to optical modules such as **PX-HSR16O-OBG Output Module**.

(Module) Root Level Parameters

The following parameters are displayed at the root level (when you click the Module) in the parameter menu list:

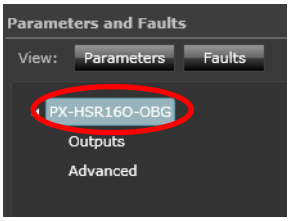


Table 8-3 Output Modules - Root Parameters

Name	Description	Type	Options
Software Version	Software version of micro controller	RO	<String>
Control FPGA Version	Version of FPGA	RO	<String>
SFP Type (Table Parameter) *(Modules with SFPs only)*	Reports the type of SFP	RO	Invalid SFP OP+SFP+TT+13+13 OP+SFP+TT+27+29 OP+SFP+TT+31+33 OP+SFP+TT+35+37 OP+SFP+TT+39+41 OP+SFP+TT+43+45 OP+SFP+TT+47+49 OP+SFP+TT+51+53 OP+SFP+TT+55+57 OP+SFP+TT+59+61 NO SFP
Module Status			
Sync Select	Selects which physical sync port the module uses as a reference	RW	0 (Default) 1 2 3

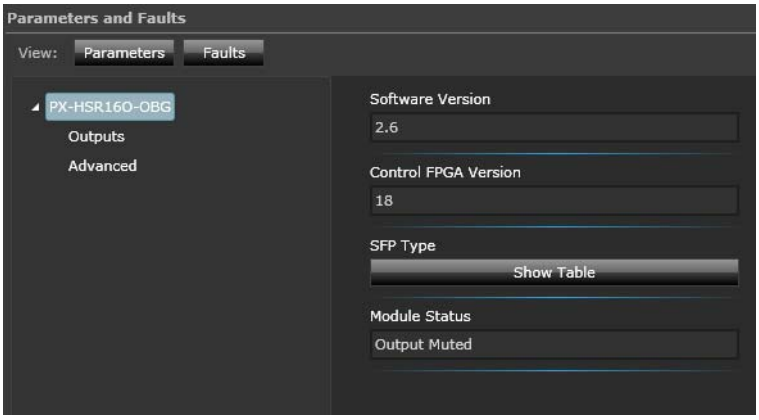
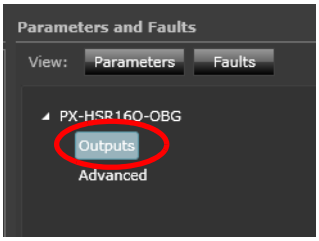


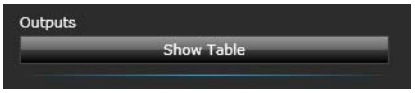
Figure 8-3 Root Level Parameters

Output Parameters

Output Parameters are accessed by clicking the **Output** option below the Module in the parameter menu list.



Output parameters are grouped into a Table and can be accessed by clicking the **Show Table** button.



The following parameters are displayed:

Table 8-4 Output Modules - Output Parameters

Name	Description	Type	Options
Enforced Slew Rate	Sets output slew rate in bypass mode	RW	SD (Default) HD
Mute	Mutes individual board outputs	RW	Yes No (Default)
Laser Enable *(Modules with SFPs only)*	Enables or disables fiber optical output	RW	Auto Enable Disable
Wavelength *(Modules with SFPs only)*	Reports wavelength of fiber optical output	RO	
Laser Status *Modules with SFPs only)*	Reports laser status	RO	Enabled Disabled N/A Normal Failed
Reclocker Mode	Sets the reclock mode to automatic or bypass or to one of three manual fixed rates	RW	Auto (Default) 3G HD SD Bypass
Data Rate	Detects data rate	RO	Unknown SD HD 3G

Table 8-4 Output Modules - Output Parameters

Name	Description	Type	Options
Autobypass	Sets automatic reclocker bypass mode. When set to Yes, if incoming video is not locked in the reclocker, the signal will be passed through as is. When set to No, if incoming video is not locked in the reclocker, signal output from the reclocker will be invalid.	RW	Yes (Default) No
Lock Detect	Reports if data is relocked by reclocking stage	RO	Yes No
Exp Reclocker Mode (*Expansion Modules only)*	Sets the reclock mode	RW	Auto (Default) 3G HD SD Bypass
Expand Signal Present (*Expansion Modules only)*	Reports signal presence	RO	Yes No
Exp Auto Bypass (*Expansion Modules only)*	Sets automatic reclocker bypass mode	RW	Yes No
Exp Lock Detect (*Expansion Modules only)*	Reports if data is relocked by reclocking stage	RO	Yes No
Exp Data Rate (*Expansion Modules only)*	Detects data rate	RO	Unknown SD HD 3G

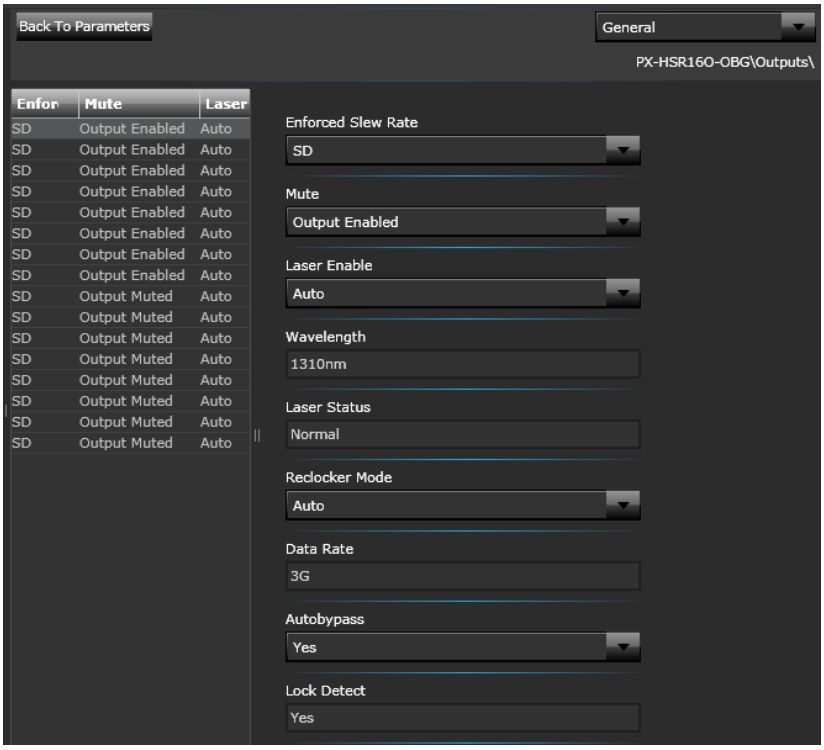


Figure 8-4 Output Parameters

Advanced Parameters

Advanced Parameters are accessed by clicking the **Advanced** menu option in the parameter menu list.

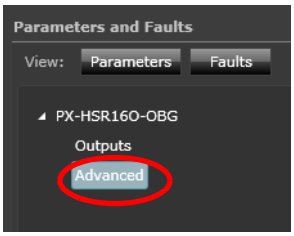


Table 8-5 Output Modules - Advanced Parameters

Name	Description	Type	Options
Parameter Hysteresis	Sets hysteresis for parameters needing it. This parameter works as time constant of low pass filter of status reporting, to ease CCS communication in case there is a flickering status report. It can be changed as required.	RW	0 - 10000000 (**2000000**)

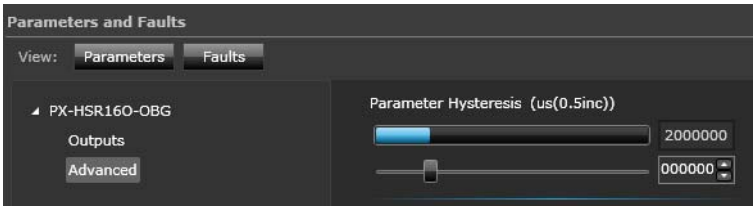


Figure 8-5 Output Modules - Advanced Parameters

Specifications

Technical Specifications

Table 8-6 Output Module - Technical Specifications

Item	Description
Output Connector	■ 75 Ohm BNC per IEC 169-8 ■ 75 Ohm HD-BNC ■ LC optical ■ DensiShield
Impedance	■ 75 Ohms (BNC, HD-BNC) ■ 100 Ohms differential (DensiShield)
Signal type	■ SMPTE 424M, SMPTE 292M, SMPTE 259M, ■ SMPTE 344M, DVB-ASI ■ Most other < 1Vpp digital signals, 3Mb/s to 3.0Gb/s
Return loss (BNC, HD-BNC)	■ > 15dB, up to 1.485GHz ■ > 10dB, 1.485GHz to 2.97GHz
Amplitude	■ 800mV +/- 10%
Overshoot	■ <10%
DC Offset	■ 0V +/- 0.5V
Rise Time	■ **270Mb/s**: 400-800pS ■ **1.485Gb/s**: < 135pS ■ **2.97Gb/**s: < 135pS
Fall Time	■ **270Mb/s**: 400-800pS ■ **1.485Gb/s**: < 135pS ■ **2.97Gb/**s: < 135pS

Table 8-6 Output Module - Technical Specifications

Item	Description
Jitter	■ **270Mb/s, 1.485Gb/s**: <0.2UI reclocked ■ **2.97Gb/s:** <0.3UI reclocked
Optical Output Power	■ -2 dBm (based on OP+SFP+TT+13+13)
Optical Output Extinction Ratio	■ 7 dB (based on OP+SFP+TT+13+13)

Capacity

Table 8-7 PX-OB Output Module Capacity

Number of Inputs	
From rear edge of module	8 (optional DensiShield inputs)
From MI connector	32 (16 main + 16 redundant)
Number of Outputs	
To rear edge of module	16 (16 single ended or 16 differential or 8 single ended + 8 differential)

Control Requirements

All settings for the output circuitry are reset to the Output slot's configuration on module insertion. Settings follow module location, not modules themselves. This way, modules can be moved from slot to slot without the need to reconfigure the parameters.

Applications Integration

The CCS Control System supports each Output module via the Navigator architecture with the router module installed, and is available for control and monitoring from any Harris- or SNMP-supported control application.

9 Digital Video Modules

Digital Video Modules Overview

The following Digital Video Input and Output Modules for the IP3 Frame are covered in this chapter:

Table 9-1 Digital Video Back Module Options

Module	Description	Use With
DIGITAL VIDEO INPUT MODULES		
PX-HSR9C-IBG Input Module	9 Channel Electrical Back Module with 9 HDBNC connectors.	**PX-IB Input Module** See **Input Modules (PX-IB)**
PX-HSR9O-IBG Input Module	9 Channel Optical Back Module with 5 SFP connectors.	
PX-HSR9C1D-IBG Input Module	9 Channel Electrical Back Module with 9 HDBNC connectors and 1 Densishield port for expansion.	
PX-HSR9O1D-IBG Input Module	9 Channel Optical Back Module with 5 SFP connectors and 1 Densishield port for expansion.	
DIGITAL VIDEO OUTPUT MODULES		
PX-HSR16C-OBG Output Module	16 Channel Electrical Back Module with 16 HDBNC connectors.	**PX-OB Output Module** See **Output Modules (PX-OB)**
PX-HSR16O-OBG Output Module	16 Channel Optical Back Module with 8 SFP connectors.	
PX-HSR8O2DS-OBG Output Module	16 Channel Optical Back Module with 4 SFP connectors and 2 DensiShield ports for Expansion.	
PX-HSR8C2DS-OBG Output Module	16 Channel Electrical Back Module with 8 HDBNC connectors and 2 DensiShield ports for Expansion.	

PX-HSR9C-IBG Input Module

The **PX-HSR9C-IBG** is a 9 channel SD/HD/3G Digital Video Input Module with 9 HDBNC connectors.

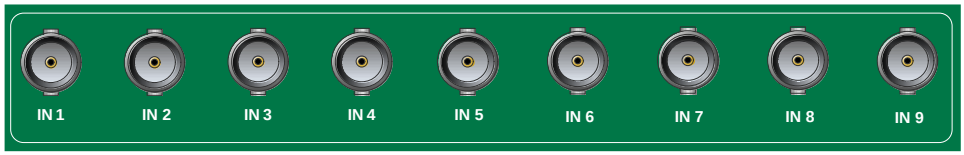


Figure 9-1 PX-HSR9C-IBG Back Module

This Back Module interfaces with the **PX-IB** Input module to accept 9 electrical inputs. See **Input Modules (PX-IB)** for details on the **PX-IB** Input module.

Power Consumption

Table 9-2 PX-HSR9C-IBG Power Consumption

24V Power Rail	10.7W
5V Power Rail	0.43W
Total Power	11.13W

PX-HSR9O-IBG Input Module

The **PX-HSR9O-IBG** is a 9 channel SD/HD/3G Digital Video Input Module with 5 SFP connectors.

The **PX-HSR9O-IBG** has 5 dual channel SFP modules mounted on the metal back panel of the back module, each containing two channels. The second channel of the last connector is not currently used.The OP+SFP+RR and OP+SFP+R accept fiber optical signals within wavelength range of 1260nm ~ 1620nm.

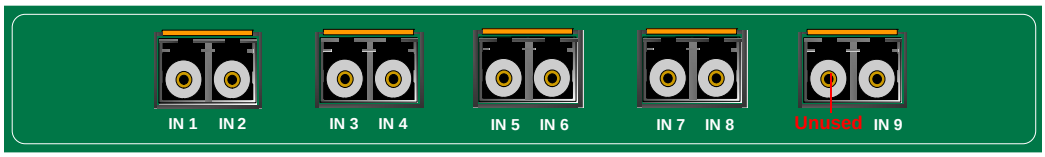


Figure 9-2 PX-HSR9O-IBG

The Back Module interfaces with the **PX-IB** Input module to accept 9 optical inputs. See **Input Modules (PX-IB)** for details on the **PX-IB** Input module.

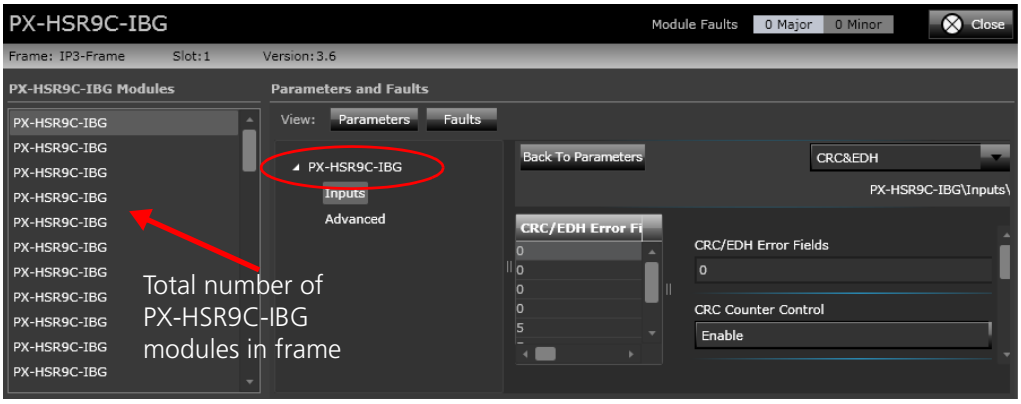
Power Consumption

Table 9-3 PX-HSR9O-IBG Power Consumption

24V Power Rail	14W
5V Power Rail	0.43W
Total Power	14.43W

PX-HSR9C-IBG/PX-HSR9O-IBG Parametric Control

The **PX-HSR9C-IBG/PX-HSR9O-IBG** Module can be controlled via the **Controller**. When you access a PX-HSR9C-IBG/PX-HSR9O-IBG module (by clicking on it in the list of Input Modules), its parameters are displayed. The total number of PX-HSR9C-IBG/9O modules in the frame is also displayed on the left



PX-HSR9C1D-IBG Input Module

The **PX-HSR9C1D-IBG** is a 9 channel SD/HD/3G Digital Video Input Module with 9 HDBNC connectors and one DensiShield port for expansion.

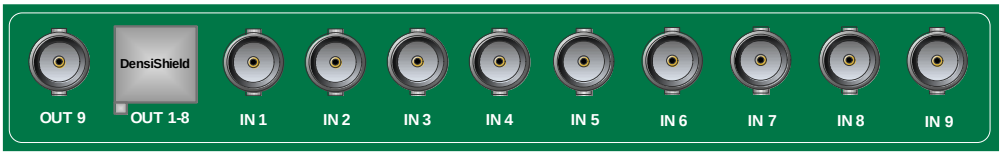


Figure 9-3 PX-HSR9C1D-IBG

Via the DensiShield port, inputs received can be routed to another module in the same frame or another frame.

This Back Module interfaces with the **PX-IB** Input module to accept 9 electrical inputs. See **Input Modules (PX-IB)** for details on the **PX-IB** Input module.

Power Consumption

Table 9-4 PX-HSR9C1D-IBG Power Consumption

24V Power Rail	13W
5V Power Rail	0.43W
Total Power	13.43W

PX-HSR9O1D-IBG Input Module

The **PX-HSR9O1D-IBG** is a 9 channel SD/HD/3G Digital Video Input Module with 5 SFP connectors.

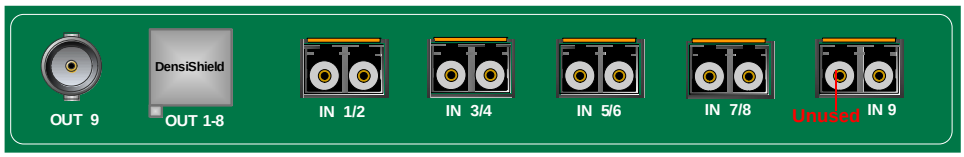


Figure 9-4 PX-HSR9O1D-IBG

The **PX-HSR9O-IBG** has 5 dual channel SFP modules mounted on the metal back panel of the back module, each containing two channels. The first channel of the last connector is not currently used. The receivers accept fiber optical signals within wavelength range of X nm ~ X nm.

Via the DensiShield port, inputs received can be output/routed to another module in the same frame or another frame.

The Back Module interfaces with the **PX-IB** Input module to accept 9 optical inputs. See **Input Modules (PX-IB)** for details on the **PX-IB** Input module.

Power Consumption

Table 9-5 PX-HSR9O1D-IBG Power Consumption

24V Power Rail	16.3W
5V Power Rail	0.43W
Total Power	16.73W

PX-HSR16C-OBG Output Module

The **PX-HSR16C-OBG** is a 16 channel SD/HD/3G Digital Video Output Module with 16 HDBNC connectors.

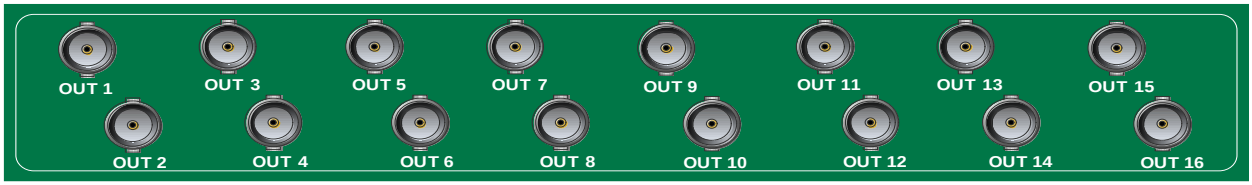


Figure 9-5 PX-HSR16C-OBG

This Back Module interfaces with the **PX-OB** Output module to output16 electrical outputs. See **Output Modules (PX-OB)** for details on the **PX-OB** Output module.

Power Consumption

Table 9-6 PX-HSR16C-OBG Power Consumption

24V Power Rail	11.7W
5V Power Rail	0.43W
Total Power	12.13W

PX-HSR16O-OBG Output Module

The **PX-HSR16O-OBG** is a 16 channel SD/HD/3G Digital Video Output Module with 8 SFP connectors.

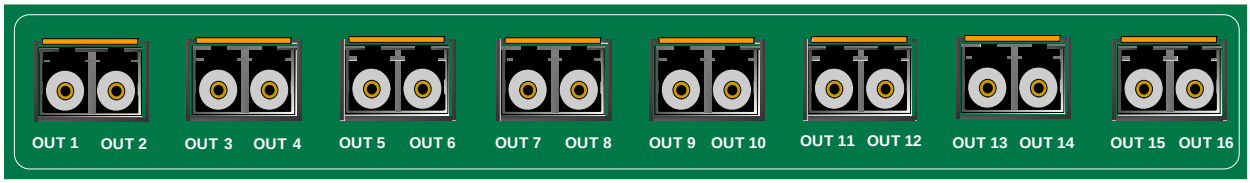


Figure 9-6 PX-HSR16O-OBG

The **PX-HSR16O-OBG** has 8 SFP modules mounted on the metal back panel of the back module, each containing two channels.

The PX-HSR16O-OBG interfaces with the **PX-OB** Output module to output up to **16 optical outputs**. See **Output Modules (PX-OB)** for details on the **PX-OB** Output module.

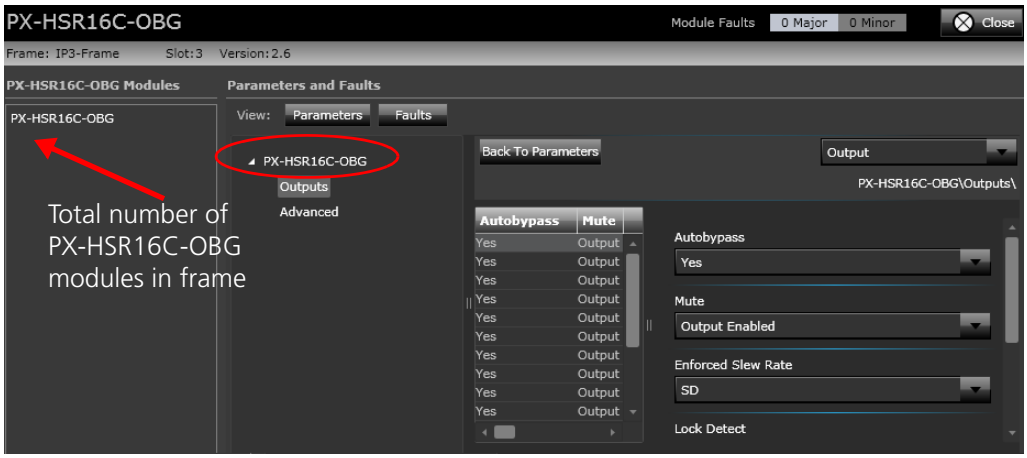
Power Consumption

Table 9-7 PX-HSR16O-OBG Power Consumption

24V Power Rail	21.9W
5V Power Rail	0.43W
Total Power	22.33W

PX-HSR16C-OBG/PX-HSR16O-OBG-IBG Parametric Control

The **PX-HSR16C-OBG/PX-HSR16O-OBG** Module can be controlled via the **Controller**. When you access a PX-HSR16C-OBG/PX-HSR16O-OBG module (by clicking on it in the list of Output Modules), its parameters are displayed. The total number of PX-HSR16C-OBG/ PX-HSR16O-OBG modules in the frame is also displayed on the left.



PX-HSR8O2DS-OBG Output Module

The **PX-HSR8O2DS-OBG** is a 16 channel SD/HD/3G Digital Video Output Module.

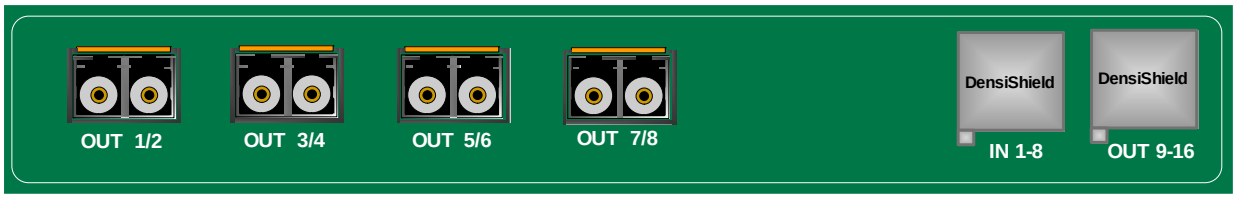


Figure 9-7 PX-HSR8O2DS-OBG

Figure 9-8 PX-HSR8O2DS-OBG

The PX-HSR8O2DS-OBG has 4 SFP connectors mounted on the metal back panel of the back module, each containing 2 channels.

There are 2 DensiShield ports on the module - one of them accepts up to 8 electrical inputs and the other can output op to 8 electrical outputs. The DensiShield ports are intended for expansion.

The PX-HSR8O2DS-OBG interfaces with the **PX-OB** Output Module to output up to **16 outputs** (8 optical and 8 optical/electrical). See **Output Modules (PX-OB)** for details on the **PX-OB** Output module.

Power Consumption

Table 9-8 PX-HSR8O2DS-OBG Power Consumption

24V Power Rail	18W
5V Power Rail	0.43W
Total Power	18.43W

PX-HSR8C2DS-OBG Output Module

The **PX-HSR8C2DS-OBG** is a 16 channel SD/HD/3G Digital Video Output Module.

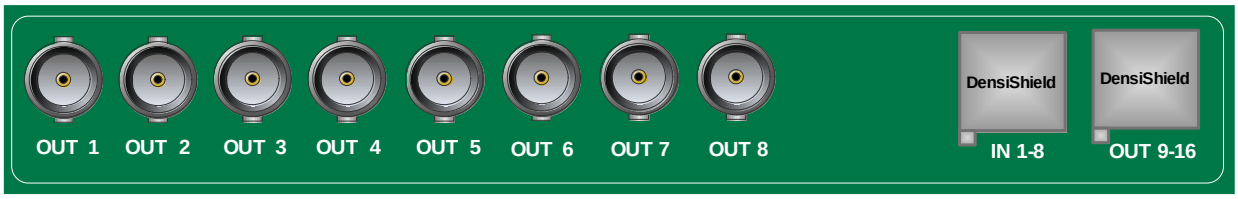


Figure 9-9 PX-HSR8C2DS-OBG

Figure 9-10 PX-HSR8C2DS-OBG

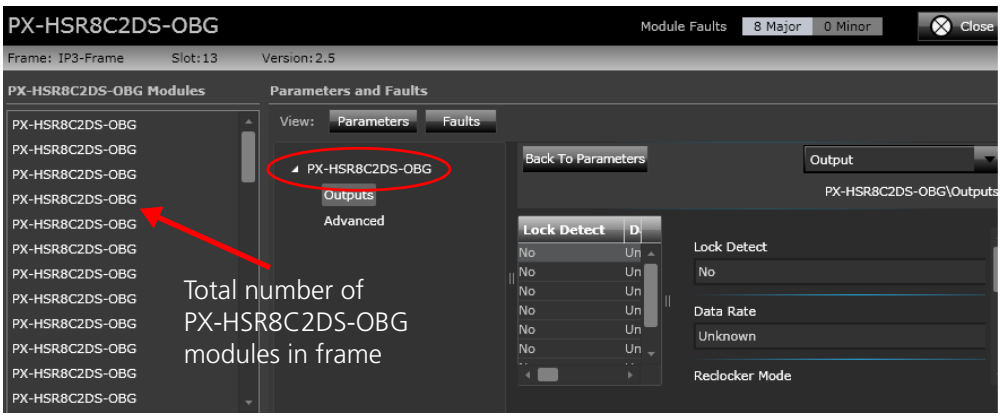
The **PX-HSR8C2DS-OBG** has 8 HD-BNC connectors mounted on the metal back panel of the back module.

There are 2 DensiShield ports on the module - one of them accepts up to 8 electrical inputs and the other can output up to 8 electrical outputs. The DensiShield ports are intended for expansion.

The PX-HSR8C2DS-OBG interfaces with the **PX-OB** Output Module to output up to **16 outputs**. See **Output Modules (PX-OB)** for details on the **PX-OB** Output module.

PX-HSR8C2DS-OBG/PX-HSR8O2DS-OBG Parametric Control

The **PX-HSR8C2DS-OBG/PX-HSR8O2DS-OBG** Module can be controlled via the **Controller**. When you access a PX-HSR9C-IBG/PX-HSR9O-IBG module (by clicking on it in the list of Output Modules), its parameters are displayed. The total number of PX-HSR8C2DS-OBG/PX-HSR8O2DS-OBG modules in the frame is also displayed on the left.



Power Consumption

Table 9-9 PX-HSR8C2DS-OBG Power Consumption

24V Power Rail	14.1W
5V Power Rail	0.43W
Total Power	14.53W

10 Frame Synchronizer and Multiplexer/Demultiplexer Modules

Overview

The following **Frame Synchronizer Demux Input Modules** are available:

Table 10-1 Frame Synchronizer Demux Input Modules

Module	Description
PT-FSDMX-IBG	8 Channel Frame Synchronizer and Demux Input Module with BNC connectors. See **PT-FSDMX-IBG/PT-FSDMXO-IBG Frame Synchronizer and Demultiplexing Input Modules**
PT-FSDMXO-IBG	8 Channel Frame Synchronizer and Demux Input Module with SFP connectors See **PT-FSDMX-IBG/PT-FSDMXO-IBG Frame Synchronizer and Demultiplexing Input Modules**
PT-FSDX8C1D-IBG	8 Channel Matrix Expansion Frame Sync Input Module See **PT-FSDX8C1D-IBG Frame Sync Input Module with Matrix Expansion**

The following **Frame Synchronizer Mux Output Modules** are available:

Table 10-2 Frame Synchronizer Mux Output Modules

Module	Description
PT-HSRMX8X-OBG	8 Channel Frame Synchronizer and Mux Output Module with BNC/ Optical connectors. See **PT-HSRMX8C/PT-HSRMX8O-OBG Frame Synchronizer and Mux Output Module**

PT-FSDMX-IBG/PT-FSDMXO-IBG Frame Synchronizer and Demultiplexing Input Modules

The **PT-FSDMX-IBG** and **PT-FSMDXO-IBG** 8 Channel Frame Synchronizer and Demux Input Boards add Video and Audio processing to input boards in the IP3 Frame.

- The **PT-FSDMX-IBG** back module provides BNC connectors.
- The **PT-FSDMXO-IBG** back module provides optical inputs through SFP fiber optical receiver modules.

Each SDI path is processed independently, and supports SD, 1.5Gb/s HD, 3Gb/s HD and Dual Link formats.The De-embedded, sample rate converted and processed audio data of all 8 SDI channels is provided to the audio crosspoint for distribution. Both modules consume up to 50 watts each, depending on operating conditions.

Key Features

Key processing features for each channel are:

- Video ProcAmp: gain, hue, black/white clip
- SMPTE 352M video payload detection and insertion
- EDH (SD) and CRC (HD) detection and insertion
- Simple test signal generator
- Audio De-embedder: 4 groups, 4 mono channels per group
- Audio Sample Rate Conversion (SRC) after de-embedding
- Audio delay
- Audio test tone generator
- Audio ProcAmp: gain, mute, invert, sum, and swap

Frame Sync Features

In addition, modules with the Frame Sync license have these features:

- Video frame synchronizer and delay
- Audio embedder with append or overwrite mode
- Audio synchronizer

Modules with the Frame Sync license installed operate in the following modes:

- **Framesync mode**—SDI channels are genlocked to a common reference source, which can be either NTSC, PAL or TriLevel. Your video reference has to be the same frame rate as your input. The input channels can be asynchronous to each other.
- **Delay mode**—SDI channels will be processed in their recovered input clock domain. In Delay mode, some restrictions apply to the processing of Audio data.
- **Mixed operation**—Some channels run in Framesync mode while others run in Delay mode.

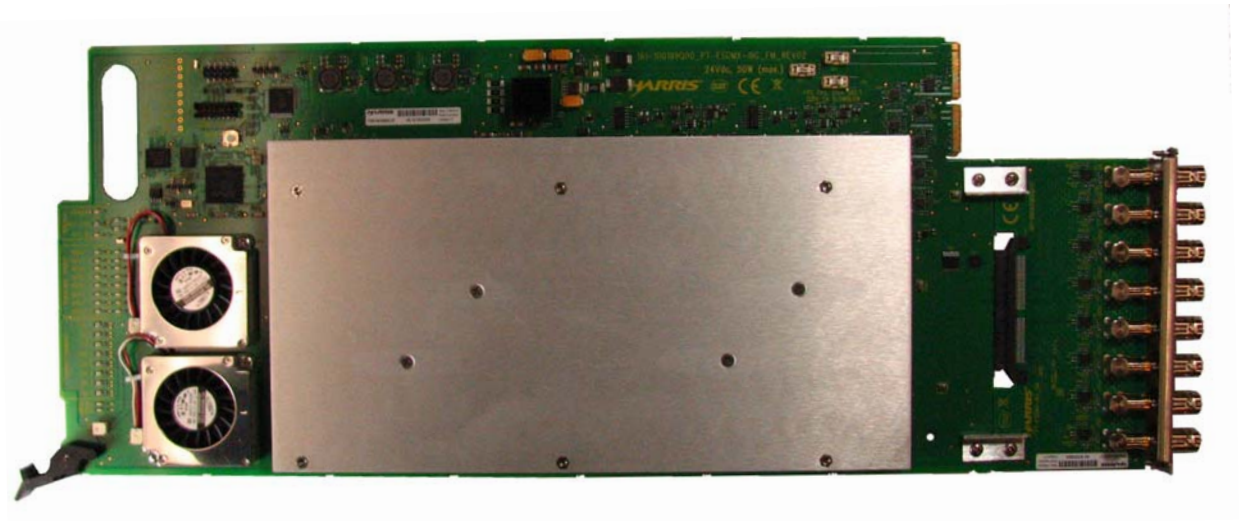


Figure 10-1 PT-FSDMX-IBG Module

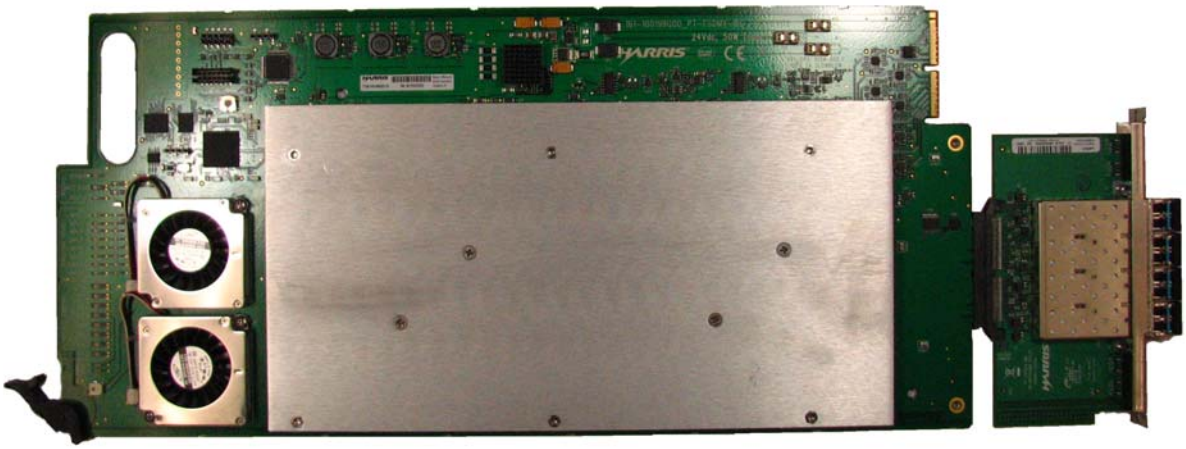


Figure 10-2 PT-FSDMXO-IBG Module

Power-Up sequence

Due to the complexity of the board and its parameter list, it takes about 2.5 minutes after power-cycling a board before it is fully operational.

About 30 seconds after power-cycling, a board is ready to detect input signals, but it outputs a 75% color bar test pattern of the same video standard as the detected input signal until the PT-Resource card has completed uploading the previously used configuration (parameters).

The readiness of the board is reflected by the read-only **Control Status** parameter. See **Table 10-6 General -> Control Status** for details.

Firmware Upgrade and Backup Image

The PT-FSDMX-IBG/PT-FSDMXO-IBG modules maintain a backup image of the last working firmware at all times. In the event of an upgrade failure, the module will revert back to its backup image to maintain operation on the board. You can verify the version that is current running on the module by looking at the version parameters: Software Version, Control FPGA Version and Processing FPGA Version.

Upgrading the firmware on PT-FSDMX-IBG and PT-FSDMXO-IBG modules takes approximately 50 minutes. Multiple (identical) boards can be upgraded at once in batches of up to 16 boards (= one 'zone'). A 'batch' upgrade takes about as long as upgrading a single board.

Always wait for the 'Firmware upgrade successful' message before power-cycling the system, exchanging boards, or carrying out any other maintenance work that could interfere with the upgrade process. Do not interrupt the power supply or tamper with a board while an upgrade is in progress. This could corrupt the firmware, necessitating a restart of the upgrade process.

Note: *If the Software Version shows 0.00, this indicates that the PT-FSDMX-IBG is in failsafe mode. In this mode, the board will only support upgrade operations and basic control with the Platinum Resource module. You can perform software upgrades as usual while the module is in failsafe mode, but after the upgrade is completed, the module will need to be hot-swapped in order to have the new firmware take effect.*

Activating PT-FSDMX Functions

The following topics are described in this section:

Audio Order of Operations

1. Insert Tone (if enabled)
2. Polarity Reversal and Level Adjust
3. Sum
4. Swap/Copy
5. Mute (if enabled)

Operating with the Frame Sync

The frame sync is a licensable option. If you do not have the Frame Sync license, this feature will not be available. To acquire a Frame Sync license, contact your Customer Service representative. A license can be added for the module using the License Key parameter in **Table 10-6**.

When operating the Frame Sync in Delay mode, the audio embedders are automatically turned off. Any ancillary data will be passed unprocessed (aside from any video delay).

If the input video frame rate does not match the genlock frame rate for a channel, that channel is automatically placed into Delay Mode. This information is reflected in the Frame Sync Status parameter.

Fast Video Switch

When input video is switched between two sources while both sources are within vertical blanking, use the **Fast Switch** parameter to enable fast video switching between the sources. In this mode, output video is not frozen when both sources are within the vertical blanking area when the switch takes place.

Audio Test Tones

Table 10-3 describes the frequency and levels of each audio output test tone, available as a selection from each of the **Output Ch** (**1–16**) **Source Select** parameters:

Table 10-3 Audio Test Tones

Test Tone	Frequency
Test Tone 1	400 Hz
Test Tone 2	1 kHz
Test Tone 3	2 kHz
Test Tone 4	4 kHz

Group (1-4) Deembedding Control

Table 10-4 describes options for the **Group** (1–4) **Deembedding Control** parameter.

Table 10-4 Deembedding Control Options

Item	Description
Repeat	Upon detection of a de-embedding error, the de-embedder repeats the last good AES sample.
Mute	Upon detection of a de-embedding error, the de-embedder mutes the current outgoing AES sample.

Audio Embedding Modes

See **Appendix A, *Audio Embedding***.

Video Frame Synchronization

The frame synchronizer offers two modes of operation: Delay mode and Synchronizer (Sync) mode. These modes can be chosen using the **Frame Sync Mode** parameter.

- In Delay mode, the output video is synchronized to the input video.
- In Sync mode, the output video is synchronized to the reference video. The reference standard you can use depends on the output video standard you have set, as outlined in **Table 10-5**.

Table 10-5 Supported Reference and Output Video Standard Combinations in Sync Mode

Reference Standard	Output Video Standard
525i 59.94	■ 1080i 59.94 ■ 1080p 59.94 ■ 1080p 29.97 ■ 720p 59.94 ■ 525i 59.94 ■ 1080p 59.94 DL
625i 50	■ 1080i 50 ■ 1080p 50 ■ 1080p 25 ■ 720p 50 ■ 625i 50 ■ 1080p 50 DL
720p 60	■ 720p 60 ■ 1080p 60 ■ 1080p 60 DL
720p 59.94	■ 720p 59.94 ■ 1080p 59.94 ■ 1080p 59.94 DL
720p 50	■ 720p 50 ■ 1080p 50 ■ 1080p 50 DL
1080i 60 1080p 30	■ 1080i 60 ■ 1080p 60 ■ 1080p 30 ■ 720p 60 ■ 1080p 60 DL
1080i 59.94 1080p 29.97	■ 1080i 59.94 ■ 1080p 29.97 ■ 1080p 59.94 ■ 720p 59.94 ■ 525i 59.94 ■ 1080p 59.94 DL
1080i 50 1080p 25	■ 1080i 50 ■ 1080p 50 ■ 1080p 25 ■ 720p 50 ■ 625i 50 ■ 1080p 50 DL
1080p 24 1080sF 24	■ 1080p 24 ■ 1080sF 24
1080p 23.98 1080sF 23.98	■ 1080p 23.98 ■ 1080sF 23.98

In both Sync mode and Delay mode, PT-FSDMX provides several controls to manipulate the output video signal:

- Horizontal timing
- Vertical timing
- Adjustable frame delay
- Manually freeze output video on first or second field (interlaced standards), or on the whole frame (all standards)

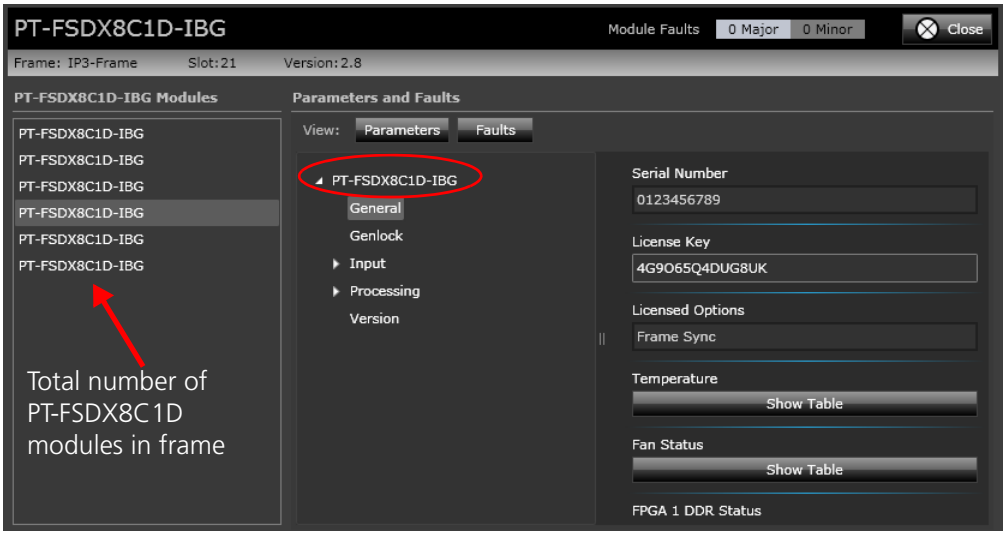
Audio Synchronization

By default, PT-FSDMX-IBG and PT-FSDMXO-IBG synchronize de-embedded audio with timing information from the video frame synchronizer prior to re-embedding the audio.

When **Pair Delay Track i**s set to sync tracking, the audio will be automatically delayed to match the video delay. Additionally, up to three seconds of delay can be added through the **Audio Channel Delay** parameter.

PT-FSDMX-IBG Controllable Parameters

The **PT-FSDMX-IBG** Module can be controlled via the Controller. When you access a PT-FSDMX-IBG module (by clicking on it in the list of modules), its parameters are displayed. The total number of PT-FSDMX-IBG modules in the frame is also displayed on the left.



The following are user-controllable parameters for **PT-FSDMX-IBG/PT-FSDMXO-IBG**.

- **General Parameters**
- **Genlock Parameters**
- **Input Parameters**
- **Processing Parameters**

General Parameters

Table 10-6 PT-FSDMX-IBG - General Parameters

Name	Description	Type	Options
Serial Number	Displays the module's unique identifier	RO	<String>
License Key	Activates the Frame Sync option	RW	<String>
Licensed Options	Displays activated options	RO	■ None ■ Frame Sync
Temperature (x 2) *(TABLE PARAMETER)*	Indicates the temperature of the FPGA	RO	<String> in Degrees Celsius
Fan Status *(TABLE PARAMETER)*	Indicates proper functioning of the module's fan unit	RO	■ Bad ■ **Good**
FPGA (x 2) DDR Memory Status (x 2) *(TABLE PARAMETER)*	Indicates proper functioning of the DDR memory	RO	■ Bad ■ **Good**
Parameter Update Rate	Defines the rate at which parameters are updated	RW	■ Slow ■ Medium ■ **Fast**
Control Status [RO]		RO	■ Please Wait ■ Ready to Set

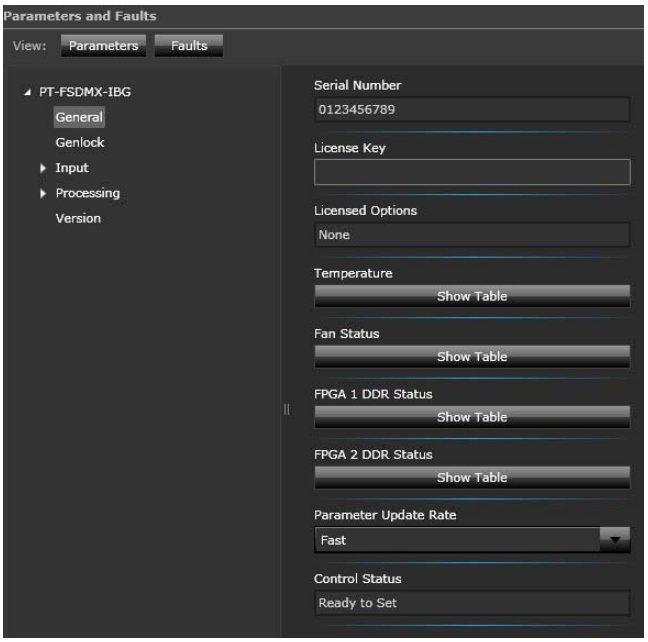


Figure 10-3 PT-FSDMX-IBG - General Parameters

Genlock Parameters

Table 10-7 PT-FSDMX-IBG - Genlock Parameters

Name	Description	Type	Options
Sync Select	Selects which physical sync port the module uses as a reference	RW	■ 1 ■ 2 ■ 3 ■ 4
Genlock Video Present	Reports the presence of the reference video signal	RO	■ **No** ■ Yes
Genlock Video Locked	Reports the locked status of the reference video signal	RO	■ **No** ■ Yes
Genlock Standard	Indicates the video standard detected on the genlock input	RO	■ Unknown ■ 525i 59.94 ■ 625i 50 ■ 720p 25 ■ 720p 29.97 ■ 720p 30 ■ 720p 50 ■ 720p 59.94 ■ 720p 60 ■ 1080p 23.98 ■ 1080p 24 ■ 1080p 29.97 ■ 1080p 30 ■ 1080p 25 ■ 1080i 50 ■ 1080i 59.94 ■ 1080i 60 ■ 1080sF 23.98 ■ 1080sF 24

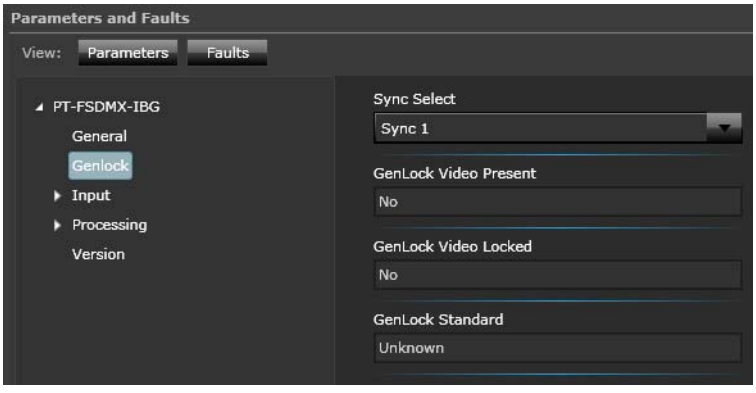


Figure 10-4 Genlock Parameters

Input Parameters

Table 10-8 PT-FSDMX-IBG - Input Parameters

Name	Description	Type	Options
VIDEO			
SDI Video Standard (x 8)	Displays the SDI video signal standard	RO	■ Unknown ■ 525i 59.94 ■ 625i 50 ■ 720p 25 ■ 720p 29.97 ■ 720p 30 ■ 720p 50 ■ 720p 59.94 ■ 720p 60 ■ 1080p 23.98 ■ 1080p 24 ■ 1080p 29.97 ■ 1080p 30 ■ 1080p 25 ■ 1080i 50 ■ 1080i 59.94 ■ 1080i 60 ■ 1080p 50 ■ 1080p 59.94 ■ 1080p 60 ■ 1080p 50 DL ■ 1080p 59.94 DL ■ 1080p 60 DL ■ 1080sF 23.98 ■ 1080sF 24
Signal Presence (x 8)	Reports the presence of the SDI input video signal	RO	■ **No** ■ Yes
EDH Present (x 8)	Reports the presence of EDH in the input SDI signal	RO	■ **No** ■ Yes
CRC/EDH Error Counter (x 8)	Reports the number of chrominance CRC/EDH errors that have occurred	RO	0 to 65535
CRC/EDH Error Clear (x 8)	Clears all CRC/EDH error counters	RW	■ **No** ■ Yes
Input Optical Power *(Optical modules only)*	Reports input optical signal power level	RO	■ **Too Low** ■ -32 - 1 dBm ■ Too High
SFP Type *(Optical modules only)*	Shows the type of optical receiver installed	RO	■ Unknown ■ N/A ■ (G)Dual-Rx PIN
EMBEDDED AUDIO STATUS			
Group Presence (8 x 4) *(TABLE PARAMETER)*	Reports the presence of the specified audio group in the SDI signal	RO	■ **No** ■ Yes

Table 10-8 PT-FSDMX-IBG - Input Parameters

Name	Description	Type	Options
Group Active Channels (8 x 4) *(TABLE PARAMETER)*	Indicates which channels are active	RO	■ None ■ CH1 ■ CH2 ■ CH12 ■ CH3 ■ CH13 ■ CH23 ■ **CH123** ■ CH4 ■ CH14 ■ CH24 ■ CH124 ■ CH34 ■ CH134 ■ CH234 ■ CH1234
Group Sampling Rate (8 x 4) *(TABLE PARAMETER)*	Reports the sampling rate from the control packet of the specified audio group	RO	■ 48.0 kHz ■ 44.1 kHz ■ 32.0 kHz ■ N/A ■ FreeRun
Audio Format (8 x 16) *(TABLE PARAMETER)*	Reports the AES format (PCM/non-PCM) of specified output embedded audio channel	RO	■ PCM ■ Non-PCM

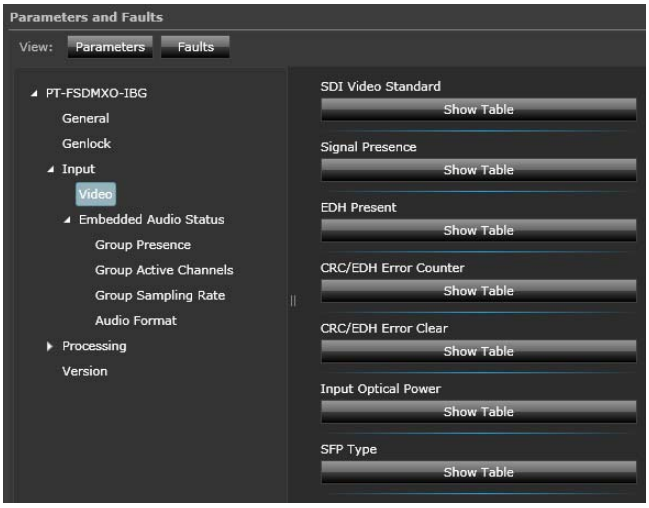


Figure 10-5 PT-FSDMX-IBG - Input Parameters

Processing Parameters

Table 10-9 PT-FSDMX-IBG - Processing Parameters

Name	Description	Type	Options
VIDEO			
TSG Enable (x 8) *(TABLE PARAMETER)*	Enables and disables the test signal generator	RW	■ **No** ■ Yes
TSG Pattern (x 8) *(TABLE PARAMETER)*	Selects the test pattern for the test signal generator	RW	■ **Bar 75** ■ Bar 100 ■ Eq. Test ■ PLL Test
TSG Standard (x 8) *(TABLE PARAMETER)*	Selects the video standard for the TSG (default is to follow the detected standard)	RW	■ Follow RX ■ 525i 59.94 ■ 625i 50 ■ 720p 25 ■ 720p 29.97 ■ 720p 30 ■ 720p 50 ■ 720p 59.94 ■ 720p 60 ■ 1080p 23.98 ■ 1080p 24 ■ 1080p 29.97 ■ 1080p 30 ■ 1080p 25 ■ 1080i 50 ■ 1080i 59.94 ■ 1080i 60 ■ 1080p 50 ■ 1080p 59.94 ■ 1080p 60 ■ 1080p 50 DL ■ 1080p 59.94 DL ■ 1080p 60 DL ■ 1080sF 23.98 ■ 1080sF 24
EMBEDDING			
Dolby E Start Line			
ADS Clean			
Group Embedding Mode (8 x 4)	Selects the embedding mode for the specified audio group	RW	■ **Off** ■ Append ■ Overwrite ■ **Auto**
Dolby E Auto Align			Yes No
AUDIO			
Fade Rate (x 8)	Specifies the fade rate	RW	0 - 10 (**10**) s, in 1-second steps

Table 10-9 PT-FSDMX-IBG - Processing Parameters

Name	Description	Type	Options
Word Length (x8)	Specifies the audio word length for all audio channels within the SDI stream	RW	■ 16 bits ■ **20 bits** ■ 24 bits
V-Bit Mute Enable	Enables automatic muting of audio outputs when the V-bit is set Muting on a detected V-Bit applies to PCM audio channels only. Non-PCM audio channels will not be muted.	RW	■ **No** ■ Yes
Sample Rate Conversion (8 x 8) (TABLE PARAMETER)	Engages or disengages the sample rate converter	RW	■ **Auto** ■ Enable ■ Bypass
Tones (8 x 16) *(TABLE PARAMETER)*	Selects the tone level for the specified audio channel	RW	■ **Off** ■ 400 Hz ■ 1 KHz ■ 2 KHz ■ 4 KHz
Level Adjust (8 x 16) *(TABLE PARAMETER)*	Adjusts the audio level (gain) for each audio channel	RW	**-18 dB - 18 dB (0) in 0.1 dB steps**
Polarity Reversal (8 x 16) *(TABLE PARAMETER)*	Specifies whether the audio channel should be inverted	RW	■ **No** ■ Yes
Audio Mute (8 x 16) *(TABLE PARAMETER)*	Enables muting for the specified output channel	RW	■ **Off** ■ On
Summing (8 x 8) *(TABLE PARAMETER)*	Specifies whether to sum the audio within a pair **Left to Right** - the summed audio is placed in the right channel **Right to Left** - the summed audio is placed in the left channel **Both** - the summed audio is placed in both left and right channels	RW	■ **None** ■ Right to left ■ Left to right ■ Both
Swap/Copy (8 x 8) *(TABLE PARAMETER)*	Specifies whether to swap or copy the audio within a pair; able to swap left and right channels, copy left channel to the right channel, and copy the right channel to the left	RW	■ **No Swap** ■ Swap ■ Right to left ■ Left to right

Table 10-9 PT-FSDMX-IBG - Processing Parameters

Name	Description	Type	Options
DEEMBEDDING > AUDIO SYNC			
Audio Channel Pair Delay Track (8 x 8) †	Selects the audio tracking type	RW	■ **No Tracking** ■ Synch Tracking
Audio Channel Delay (8 x 16)	Selects the amount of delay applied to the audio channel	RW	**0** - 3000 ms in 1 ms steps
DEEMBEDDING > PROC AMP			
Y Gain (x 8)	Adjusts gain for the Y channel	RW	-3.0 to +3.0 dB (**0 dB**) in 0.1 dB steps
Cb Gain (x 8)	Adjusts gain to the Cb color difference component	RW	-3.0 to +3.0 dB (**0 dB**) in 0.1 dB steps
Cr Gain (x 8)	Adjusts gain to the Cr color difference component	RW	-3.0 to +3.0 dB (**0 dB**) in 0.1 dB steps
Y Offset (x 8)	Adjusts offset for the Y channel	RW	±100.6 mV (**0 mV**) in 0.8 mV increments
Cb Offset (x 8)	Adjusts offset for the Cb channel	RW	±100.6 mV (**0 mV**) in 0.8 mV increments
Cr Offset (x 8)	Adjusts offset for the Cr channel	RW	±100.6 mV (**0 mV**) in 0.8 mV increments
White Clip Enable (x 8)	Controls level clipping according to the White Clip Level control	RW	■ **Disable** ■ Enable
White Clip Level (x 8)	Sets the white clip level	RW	636.9 to 763.1 mV (**700 mV**) in 0.8 mV increments
Black Clip Enable (x 8)	Controls level clipping according to the Black Clip Level control	RW	■ **Disable** ■ Enable
Black Clip Level (x 8)	Sets the black clip level	RW	-47.9 to +47.9 mV (**0.0 mV**) in 0.8 mV increments
Hue (x 8)	Adjusts the hue of the incoming digital video signal	RW	-180 to +180° **(0°**)
DEEMBEDDING > FRAME SYNC			
Frame Sync Mode (x 8) †	Sets the operational mode of the frame sync, delay or sync. Available with the optional Frame Sync license.	RW	■ Delay mode ■ **Sync mode**

Table 10-9 PT-FSDMX-IBG - Processing Parameters

Name	Description	Type	Options
Frame Sync Status (x 8) †	Indicates whether the frame sync is locked, and what it is locked to	RW	■ Sync Ext Lock ■ Sync Local Lock ■ Delay Mode ■ Delay Mismatch
Fast Switch (x 8) †	Enable fast switching	RW	■ No ■ **Yes**
Force Freeze (x 8) †	Enables video freeze	RW	■ **No** ■ Yes
Force Freeze Mode (x 8) †	Specifies the type of freeze, field 1, field 2 or frame	RW	■ **Field 1** (1080i/525i 59.94/625i 50/ 1080sF) ■ Field 2 ■ **Frame** (1080p/720p)
Loss of Video Mode †	Selects the output video mode when the input video is disrupted	RW	■ Pass ■ **Black** ■ Freeze
Horizontal Phase (x 8) †	Adjusts the horizontal timing Note: The usable range depends on the video standard.	RW	■ **0.000** us to 29.616 us (1080p 30, 1035i 60) ■ **0.000** us to 14.808 us (1080p 60, 1080p 60 DL) ■ **0.000** us to 29.646 us (1080p 29, 1080i 59) ■ **0.000** us to 14.823 us (1080p 59, 1080p 59.94 DL) ■ **0.000** us to 35.542 us (1080p 25, 1080i 50) ■ **0.000** us to 17.771 us (1080p 50, 1080p 50 DL) ■ **0.000** us to 37.024 us (1080p 24, 1080sF 24) ■ **0.000** us to 37.061 us (1080p 23.98, 1080sF 23.98) ■ **0.000** us to 31.987 us (1080i 50_295) ■ **0.000** us to 22.209 us (720p 60) ■ **0.000** us to 22.231 us (720p 59.94) ■ **0.000** us to 26.653 us (720p 50) ■ **0.000** us to 44.431 us (720p 30) ■ **0.000** us to 44.475 us (720p 29) ■ **0.000** us to 53.320 us (720p 25) ■ **0.000** us to 63.518 us (525i 59.94) ■ **0.000** us to 63.963 us (625i 50)

Table 10-9 PT-FSDMX-IBG - Processing Parameters

Name	Description	Type	Options
Vertical Phase (x 8) †	Adjusts the vertical timing Note: The usable range depends on the video standard.	RW	■ **0**–1124 lines (1080p/l/sF) ■ **0**–1249 lines (1080i 50 SMPTE 295M) ■ **0**–749 lines (720p) ■ **0**–524 lines (525i 59.94) ■ **0**–624 lines (625i 50)
Frame Offset (x 8) †	Determines the number of frames the video is offset	RW	**0** - 17 frames (Delay mode) **0** - 16 frames (Sync mode)
VERSION			
Software Version	Indicates software version	RO	<String>
Control FPGA Version	Indicates firmware version	RO	<String>
Processing FPGA Version	Indicates firmware version	RO	<String>

Functional Block Diagram

This diagram shows the video and audio data paths for a single channel through the module. This path is duplicated for each of the module's eight channels.

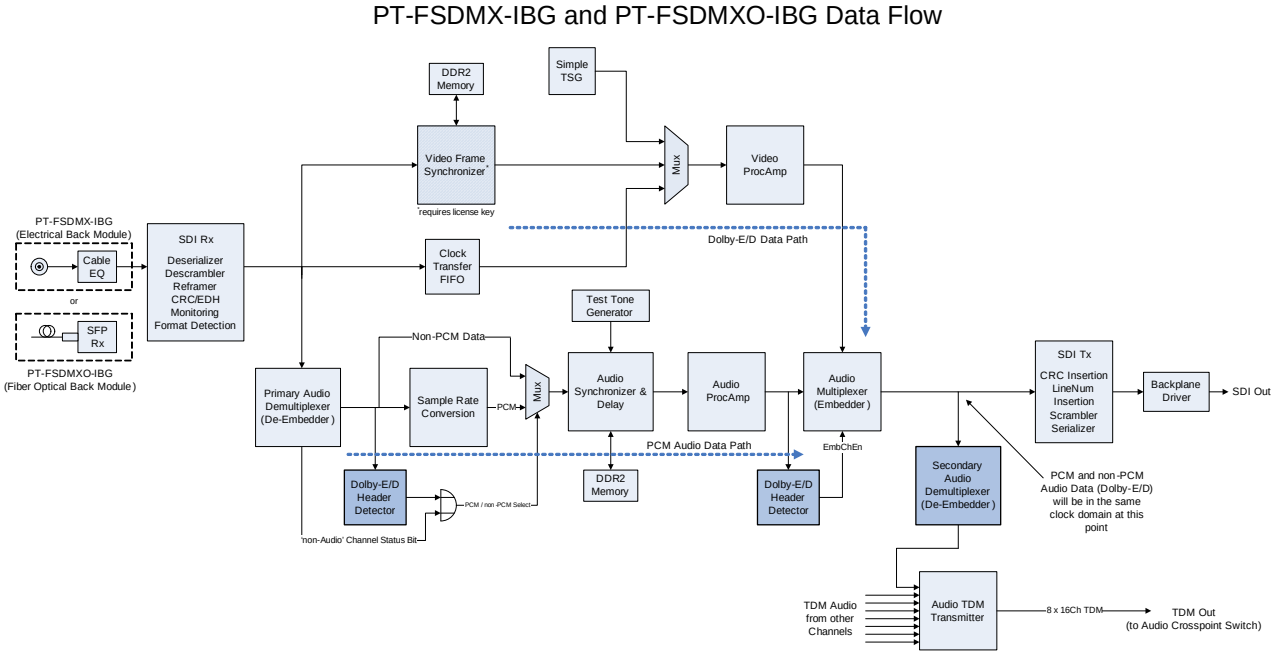


Figure 10-6 PT-FSDMX-IBG/PT-FSDMXO-IBG Functional Block Diagram

LED Indicators

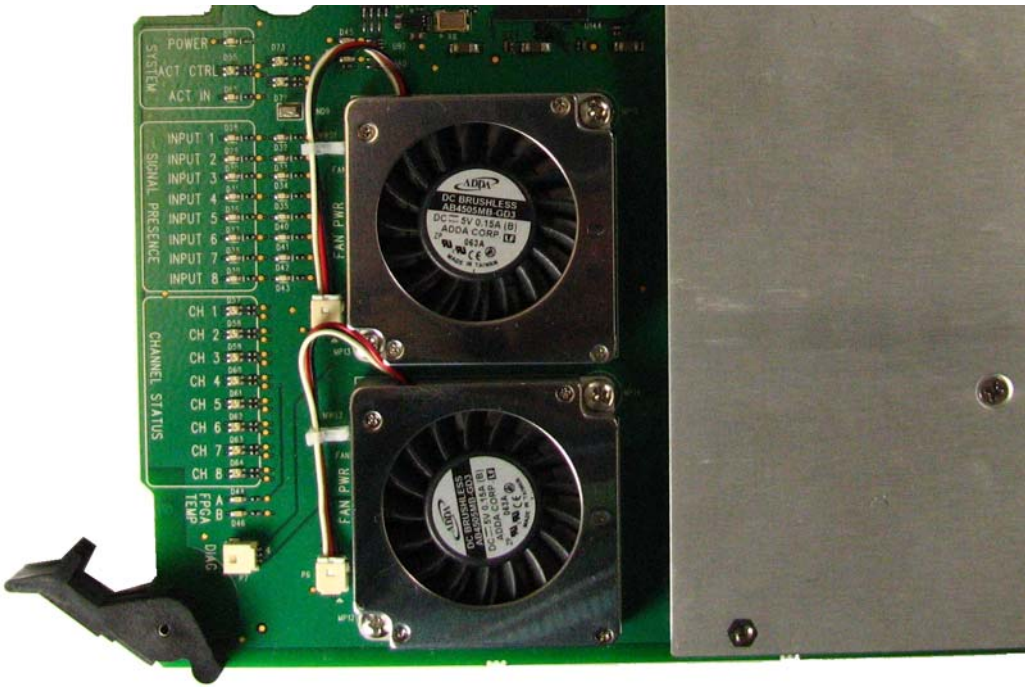


Figure 10-7 PT-FSDMX Card-Edge LED Indicators

Table 10-10 PT-FSDMX-IBG/PT-FSDMXO-IBG Specific LEDs

LED	Function
Channel Status	
Ch (1 - 8)	Red: Power on test failed
FPGA Temp	
FPGA Temp (A - B)	Red: Above temperature limit

PT-FSDMX-IBG Specifications

Specifications and designs are subject to change without notice.

Table 10-11 PT-FSDMX-IBG Specifications

Item	Specification
Number of inputs	8
Connector	BNC (IEC169-8)
Impedance	75 Ω
SD SDI (270Mb/s)	SMPTE 259M
Format	525i59.94, 625i50
Return loss	> 18 dB from 5 MHz to 270 MHz
Equalization	Adaptive cable equalization for up to 984 ft (300m), typical, of Belden 8281 coaxial cable
HD-SDI (1.5Gb/s)	SMPTE 292M
Format and image sample structure	SMPTE274M (1080i, 1080sF, 1080p) SMPTE296M (720p)

Table 10-11 PT-FSDMX-IBG Specifications

Item	Specification
Return loss	> 18 dB (typical) from 5 MHz to 1485 MHz
Equalization	Adaptive cable equalization for up to 590 ft (180 m), typical, of Belden 1694A co-axial cable
HD-SDI (3Gb/s)	SMPTE 424M
Format and image sample structure	SMPTE 425M Level A SMPTE 372M
Return loss	> 15 dB (typical) from 5 MHz to 1485 MHz > 10 dB (typical) from 1485 MHz to 2970 MHz
Equalization	Adaptive cable equalization for up to 328 ft (100 m), typical, of Belden 1694A co-axial cable

Table 10-12 PT-FSDMXO-IBG Specifications

Item	Specification
Number of inputs	8
Package	4x Dual Channel Receiver SFP Modules
Connector	LC with PC/UPC polish
Wavelengths	1260nm – 1620nm
Receiver sensitivity	-23dBm (PIN Receiver)
Supported video rates	270Mb/s, 1.5Gb/s, 3Gb/s
Supported formats and sampling structures	See Electrical Input Specification

Power Consumption

Table 10-13 PT-FSDMX-IBG Power Consumption

24V Power Rail	50W
5V Power Rail	0.15W
Total Power	50.15W

Table 10-14 PT-FSDMXO-IBG Power Consumption

24V Power Rail	52W
5V Power Rail	0.15W
Total Power	52.15W

PT-FSDX8C1D-IBG Frame Sync Input Module with Matrix Expansion

PT-FSDX8C1D-IBG Operation

The **PT-FSDX8C1D-IBG** is an 8 Channel Frame Synchronizer and Demux Input Module that provides Video and Audio processing to input boards in the IP3 Frame. This Input module enables video matrix expansion. A high density interconnect cable routes the eight incoming signals to a second frame.

All functions and features of the PT-FSDX8C1D-IBG module are identical to the PT-FSDMX-IBG module, on which it is based. See **PT-FSDMX-IBG/PT-FSDMXO-IBG Frame Synchronizer and Demultiplexing Input Modules**.

WARNING

Ensure that you mate the front and back modules before plugging in the DensiShield cable. This protects your back module from any unintended alignment issues.

PT-FSDX8C1D-IBG Input Module

The PT-FSDX8C1D-IBG Input module provides 8 input SDI options via HD-BNC connectors. In addition, these 8 input SDI signals are re-clocked and output via a DensiShield connector.

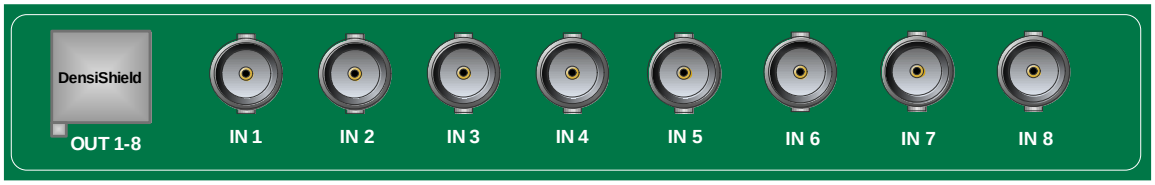


Figure 10-8 PT-FSDX8C1D-IBG Back Module

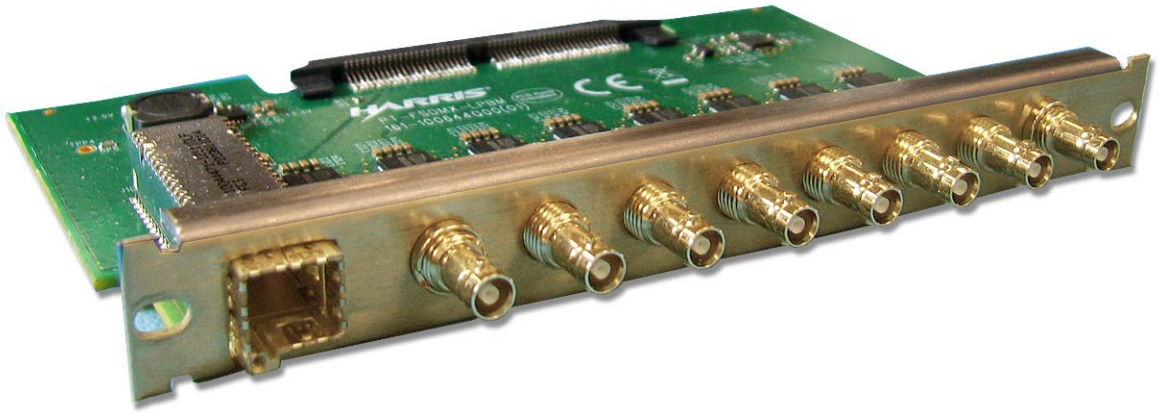


Figure 10-9 PT-FSDX8C1D-IBG Back Module

PT-FSDX8C1D-IBG - Distributing Outputs to 2 Frames

The following graphic depicts how the PT-FSDX8C1D-IBG and the PT-HSR1D-IBG can be used together to distribute the 8 possible SDI inputs to 2 frames, expanding the available outputs.

Using a DensiShield cable to connect the DensiShield output of Frame 1 to the DensiShield input of Frame 2, the eight inputs from Frame 1 can be directly routed (through the DensiShield out of Frame 1) to the inputs in Frame 2.

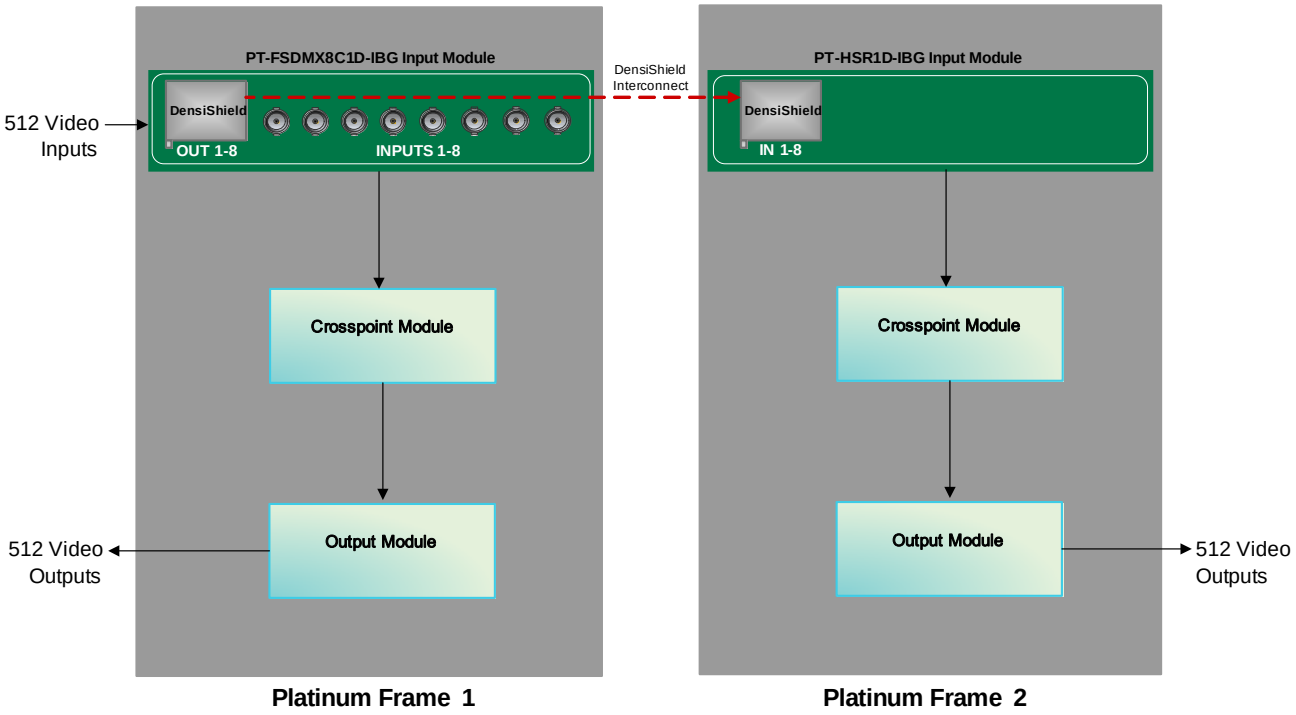
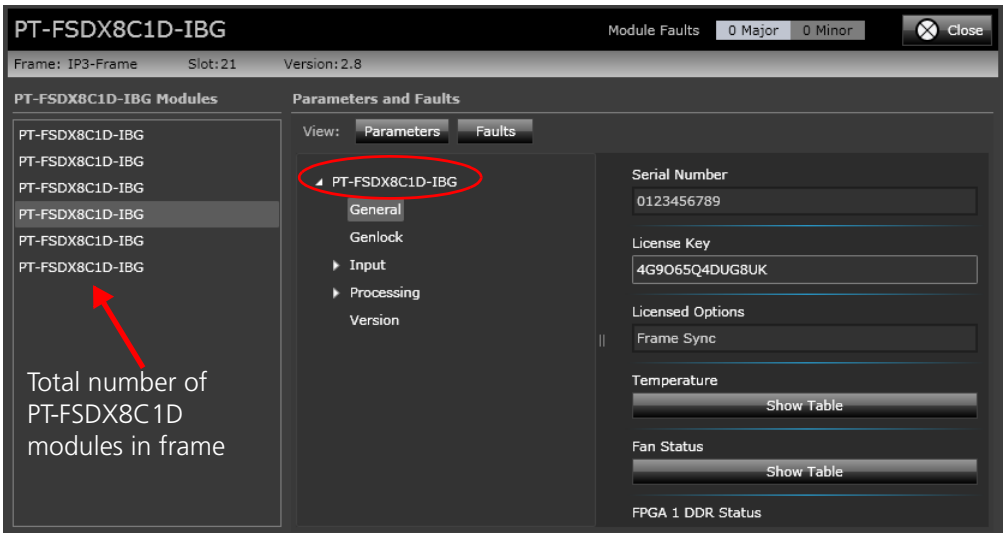


Figure 10-10 Using the PT-FSDX8C1D-IBG and PT-HSR1D-IBG to distribute the outputs of one frame to the inputs of a second frame

PT-FSDX8C1D-IBG Parameters

The **PT-FSDX8C1D-IBG** Module can be controlled via the Controller. When you access a PT-FSDX8C1D-IBG module (by clicking on it in the list of modules), its parameters are displayed. The total number of PT-FSDX8C1D-IBG modules in the frame is also displayed on the left.



PT-FSDX8C1D-IBG Parameters are similar to PT-FSDMX-IBG/PT-FSDMXO-IBG, on which it is based. See **PT-FSDMX-IBG Controllable Parameters**.

PT-FSDX8C1D-IBG Specifications

Specifications are identical to **PT-FSDMX-IBG Specifications**.

Specifications and designs are subject to change without notice.

Table 10-15 PT-FSDX8C1D-IBG Specifications

Item	Specification
Number of inputs	8
Connector	BNC (IEC169-8)
Impedance	75 Ω
Number of outputs	1
Connector	DensiShield
Impedance	100 Ωdifferential
SD SDI (270Mb/s)	SMPTE 259M
Format	525i59.94, 625i50
Return loss	> 18 dB from 5 MHz to 270 MHz
Equalization See **Equalization Information**	Adaptive cable equalization for up to 984 ft (300m), typical, of Belden 8281 coaxial cable
HD-SDI (1.5Gb/s)	SMPTE 292M
Format and image sample structure	SMPTE274M (1080i, 1080sF, 1080p) SMPTE296M (720p)

Table 10-15 PT-FSDX8C1D-IBG Specifications

Item	Specification
Return loss	> 18 dB (typical) from 5 MHz to 1485 MHz
Equalization	Adaptive cable equalization for up to 590 ft (150 m), typical, of Belden 1694A co-axial cable
HD-SDI (3Gb/s)	SMPTE 424M
Format and image sample structure	SMPTE 425M Level A SMPTE 372M
Return loss	> 15 dB (typical) from 5 MHz to 1485 MHz > 10 dB (typical) from 1485 MHz to 2970 MHz
Equalization	Adaptive cable equalization for up to 328 ft (100 m), typical, of Belden 1694A co-axial cable

Equalization Information

The cable length is 300 meters, Belden 8281, but the following applies in addition:

Note: *The PT-FSDX8C1D-IBG uses an extended 3G-reach equalization. When combined with Belden 8281 coaxial cable, a pathological pattern, and a non-SPMTE424 (6.1.7)-compliant signal with excessive output amplitude excursions, the source equalization may be reduced to between 200 and 300 m for SD-SDI signal.*

This condition typically only occurs with older SD-SDI equipment having a 1uF capacitor on the output. All recent and multi-rate SD/HD/3G equipment is compliant with the standard (has at least a 4.7uF capacitor on the output), and can achieve 300 m with 8281 cable and pathological pattern.

Power Consumption

Table 10-16 PT-FSDX8C1D-IBG Power Consumption

24V Power Rail	52W
5V Power Rail	0.15W
Total Power	52.15W

PT-HSRMX8C/PT-HSRMX8O-OBG Frame Synchronizer and Mux Output Module

The **PT-HSRMX8C/8O-OBG** is an 8 Channel Frame Synchronizer and Mux Output Board that provides Video and Audio processing in the IP3 Frame.

Video and Audio Frame Synchronizers are available for each of the 8 SDI channels in addition to Audio Mux functionality. Each SDI path is processed independently with support for SD, 1.5 Gb/s HD, 3 Gb/s HD, and 3 Gb/s Dual Link formats. ASI signals are reported and processing stages are automatically bypassed. Framesync and Delay modes are available. For more details, see **Audio Processing**, **Video Processing**, and **Operation Modes**.

The **PT-HSRMX8C/8O-OBG** consists of a front module and different back module options. The Front Module accommodates all active components, such as CPU, Processing FPGAs, DDR2 Memory, Clocking and Genlock circuits and POL (Point-of-Load) power supplies.

The **PT-HSRMX8C/8O-OBG** boards consume up to 65 watts per board, depending on operating conditions. Ensure that the IP3 frame system has a sufficient number of power supplies to meet the demand resulting from the actual number of boards installed.

Two Back Module variants (electrical and optical) provide external connectivity through electrical (BNC) or fiber optic outputs.

Note: *The PT-HSRMX8C-OBG and PT-HSRMX8O-OBG may be used in the Platinum IP3 frame. Note that while up to 1.5G HD video standards are fully supported, 3G performance cannot be guaranteed.*

PT-HSRMX8C-OBG Electrical Output Module

The **PT-HSRMX8C-OBG** is a SD/HD/3G Mux Output module with 8 BNC connectors. This back module stays affixed to the front module when pulling it out of the frame.
See **Electrical Output (Back Module with 8 BNCs)** for specifications.

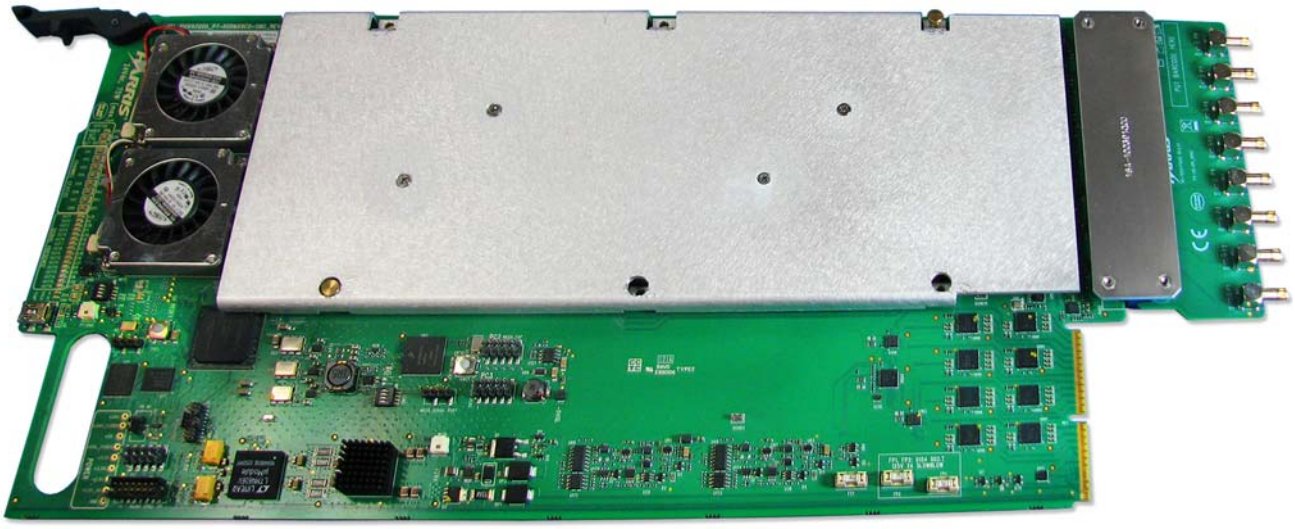


Figure 10-11 PT-HSRMX8C-OBG (Electrical)

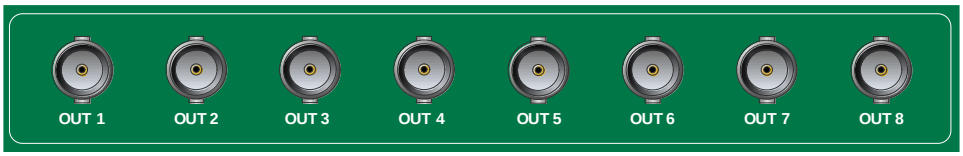


Figure 10-12 PT-HSRMX8C-OBG Electrical Back Module

PT-HSRMX8O-OBG Optical Output Module

The **PT-HSRMX8O-OBG** is a SD/HD/3G Mux Output module with 8 LC-type Fiber connectors (4 Dual Tx SFP modules). The fiber back module gets mounted into the rear of the frame and is secured with screws. The front module detaches from the back module when the front module is pulled from the frame.
See **Optical Output (Fiber Back Modules with 4 SFPs)** for specifications.

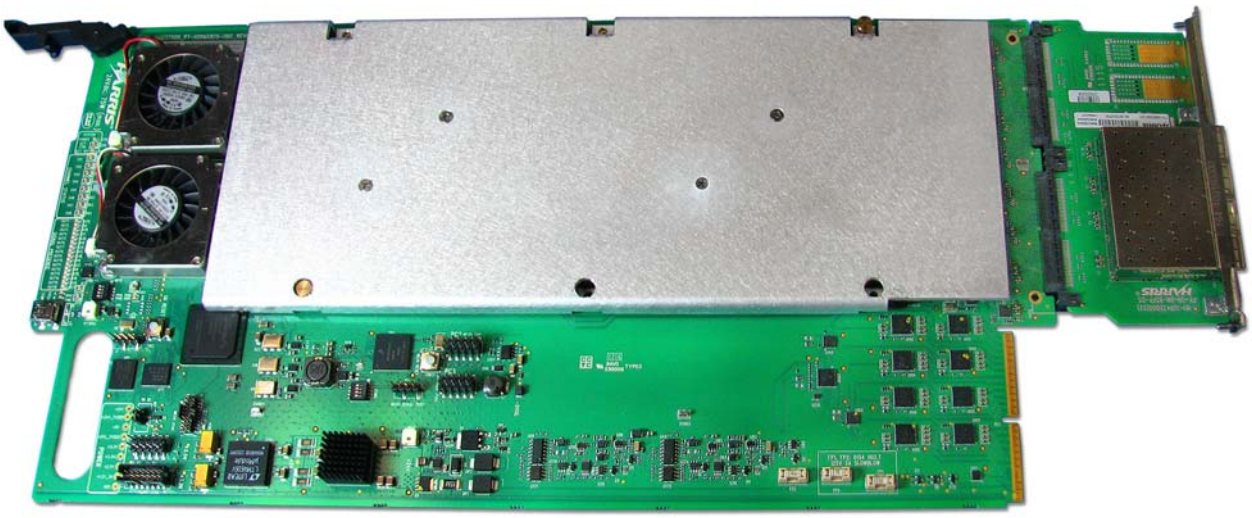


Figure 10-13 PT-HSRMX8O-OBG (Optical)

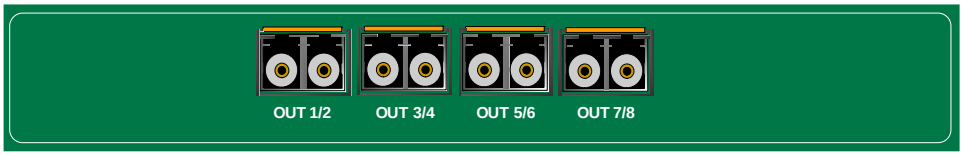


Figure 10-14 PT-HSRMX8O-OBG Fiber Back Module

Power-Up sequence

Due to the complexity of the board and its parameter list, it takes about 2 minutes after power-cycling a board before it is fully operational.About 10 seconds after power-cycling, a board is ready to detect input signals, but the outputs will not become active until the Resource card has completed uploading the previously used configuration (parameters).

The readiness of the board is reflected by the read-only **Control Status** parameter. See the **Control Status [RO]** parameter for details.

Firmware Upgrade and Backup Image

The PT-HSRMX8C-OBG and PT-HSRMX8O-OBG modules maintain a backup image of the last working firmware at all times. In the event of an upgrade failure, the module will revert back to its backup image to maintain operation on the board. You can verify the version that is currently running on the module by looking at the version parameter **Version (MK20_App_S6_V6)**

Upgrading the firmware on PT-HSRMX8C-OBG and PT-HSRMX8O-OBG modules takes approximately 30 minutes. Multiple (identical) boards can be upgraded at once in batches of up to 16 boards (= one 'zone'). A 'batch' upgrade takes about as long as upgrading a single board.

Always wait for the 'Firmware upgrade successful' message before power-cycling the system, exchanging boards, or carrying out any other maintenance work that could interfere with the upgrade process. Do not interrupt the power supply or tamper with a board while an upgrade is in progress. This could corrupt the firmware, necessitating a restart of the upgrade process.

After a successful firmware upgrade, the upgraded board(s) will automatically reboot and will start unpacking the newly installed firmware components. This process can take up to 2 minutes and should not be interrupted. In case the board is removed from the frame or a power outage happens whilst the board is preparing the newly installed firmware, it will retry as soon as the board is plugged back into the frame or power is resumed.

Operation Modes

There are different operation modes available, depending on whether or not you have a Framesync license:

Table 10-17 PT-FSDX8C1D-IBG - Operation Modes

Operation Mode	Option
MUX only mode (Without Framesync License)	**MUX: Auto Detect**
	MUX: Always On
	Bypass Mode
Framesync Mode and Delay Mode (with Framesync License)	**Frame Sync: Sync Mode**
	Frame Sync: Delay Mode
	Bypass Mode

MUX only mode (Without Framesync License)

For proper audio muxing operation, each SDI channel destined for Audio MUX must be locked to the Reference signal provided to the board. While SDI channels can be of different data rates (e.g. SD SDI, HD, HD 3G), their field/frame-rates need to match the those of the applied Reference.

In the Frame Sync / Mux Mode menu, the following modes of operation can be selected on a per SDI channel basis:

- **MUX: Auto Detect**
- **MUX: Always On**
- **Bypass Mode**

MUX: Auto Detect

Note: *MUX: Auto Detect is the recommended operation mode for boards without a framesync license.*

This mode auto checks if SDI channels are locked to the Reference signal provided to the board.

- For **Locked** SDI channels**:**
  - All supported Audio muxing operations are applicable
  - F**rame Sync / Mux Status** menu reports locked channels as **Mux: Locked**
  - **CHANNEL STATUS** LED associated with the SDI channel at the front card edge will be lit green
- For **Unlocked** SDI channels:
  - No Audio muxing will be performed and the channel will bypass all processing stages on the board, including TSG operation
  - **Frame Sync / Mux Status** menu reports unlocked channels as **Bypass**
  - **CHANNEL STATUS** LED at the front card edge associated with the SDI channel will be off

MUX: Always On

Note: *For channels that are asynchronous to the Reference, re-embedded Audio will suffer disturbances.*

In this mode, SDI channels are processed (audio muxing operations are supported), regardless of whether the channel is locked to the Reference signal.

- For **Locked** SDI channels:
  - **Frame Sync / Mux Status** menu reports locked channels as **Mux: Locked**
  - **CHANNEL STATUS** LED associated with the SDI channel at the front card edge will be lit green
- For **Unlocked** SDI channels:
  - **Frame Sync / Mux Status** menu reports unlocked channels as **Mux: Unlocked**
  - **CHANNEL STATUS** LED associated with the SDI channel at the front card edge will be lit Red

Bypass Mode

In Bypass mode:

- SDI channels bypass all processing stages including TSG operation
- No Audio muxing takes place when operating a channel in Bypass mode
- **Frame Sync / Mux Status** menu reports channels operating in Bypass mode as **Bypass**

Framesync Mode and Delay Mode (with Framesync License)

Framesync is a licensable option. If you do not have the Framesync license, this feature will not be available. To acquire a Framesync license, contact your Customer Service representative. A license can be added for the module using the **License Key** parameter.

Framesync is required if the incoming SDI data is asynchronous to the reference signal applied to the board. With Framesync (**PT-FSOB-OPT**) installed, incoming SDI data does not need to have a common data rate to be processed (muxing audio back into SDI streams). A mix of SD, HD, 3G, 3G DL is supported for channels with the same frame rate. If the input signal and reference signal have different frame rates, inputs are processed in Delay mode (no audio muxing) See **Frame Sync: Delay Mode**.

In the Frame Sync / Mux Mode menu, the following operation modes can be selected (on a per SDI channel basis):

- **Frame Sync: Sync Mode**
- **Frame Sync: Delay Mode**
- **Bypass Mode**

Frame Sync: Sync Mode

An SDI channel qualifies for **Frame Sync: Sync Mode** if its field or frame rate matches that of the Reference signal provided to the board.

- If no Reference is present but the operation mode is set to **Frame Sync: Sync Mode**
  - The outgoing signal will be locked to a local and fixed 27MHz high precision Reference.
  - The **Frame Sync / Mux Status** menu will report channels set to Frame Sync: Sync Mode as F**rame Sync: Local Lock**.

- If an external Reference signal is applied to the frame (e.g. 525 or 625 Black, HD tri-level Sync), if the proper Reference Input has been selected for the board, if the Reference is being detected as 'Present' and 'Locked' and if the SDI channel's field-or frame-rate matches the rate of the Reference signal
  - Video- and embedded Audio-data will be processed and synchronized to the applied Reference.
  - The **Frame Sync / Mux Status** menu will report channels set to Frame Sync: Sync Mode as **Frame Sync: Ext Lock**.

- If a Reference is present and locked, but the SDI channel's field or frame rate doesn't match the rate of the Reference signal
  - The channel will be automatically forced into **Delay** mode.
  - The **Frame Sync / Mux Status** menu will report channels set to Frame Sync: Sync Mode as **Frame Sync: Delay Rate Mismatch**.

Frame Sync: Delay Mode

Note: *In 'Delay' mode, only a restricted set of processing features can be applied to an SDI channel.*

When operating the Frame Sync in Delay mode, the audio embedders are automatically turned off. Any ancillary data will be passed unprocessed (aside from any video delay).

If the input video frame rate does not match the genlock frame rate for a channel, that channel is automatically placed into Delay Mode. This information is reflected in the Frame Sync Status parameter (see **Frame Sync / Mux Status (1-8)**).

- An SDI channel can be forced into **Delay** mode operation by setting it to **Frame Sync: Delay Mode.**
- Channels set to Frame Sync: Delay Mode will be reported as Frame Sync: Delay Forced by the **Frame Sync / Mux Status** menu.

Bypass Mode

In Bypass mode, the SDI channel will bypass all processing stages, including TSG operation.

- No Framesync operation and no Audio muxing takes place when operating a channel in Bypass mode.
- The F**rame Sync / Mux Status** menu reports channel forced to operate in Bypass mode as **Bypass**.

Features

Key processing features for each channel are:

- Video Frame Synchronizer and Delay
- User selectable Loss-of-Video modes: Black, Freeze, Pass
- Video ProcAmp: Gain, Offset, Hue, Black/White Clip
- SMPTE 352M Video Payload: Detection, Insertion
- EDH (SD) and CRC (HD): Detection, Insertion
- Simple Test Signal Generator
- Automatic ASI detection and bypass
- Audio De-Embedder: 4 groups, 4 mono channels per group
- Audio Sample Rate Conversion (SRC) after de-embedding (PCM data only)
- Audio Synchronizer and Delay (arbitrary Audio delay for PCM data only)
- Audio Test Tone Generator
- Audio ProcAmp: Gain, Mute, Invert, Sum, Swap
- Audio Embedder with Append/Overwrite mode
- Supports mix of embedded PCM and non-PCM (Dolby-E/D) data

Note: *The availability of some features depends on the Framesync license. Refer* **Table 10-18** *for details.*

Features based on Licensing

Framesync/Delay Mode requires a Framesync License - See ***Framesync Mode and Delay Mode (with Framesync License)*** on page 128.

Mux Mode (See ***MUX only mode (Without Framesync License)*** on page 126) is available on boards without the Framesync license installed.

Table 10-18 PT-HSRMX8X-OBG - Features Supported in Framesync, Delay, and Mux Only Mode

Processing Feature	Video	Embedded Audio	TDM Audio
Video Framesync	FS Mode		
H/V Phase Control	FS Mode, DLY Mode		
Frame Offset	FS Mode, DLY Mode		
Freeze	FS Mode, DLY Mode		
Video ProcAmp	FS Mode, DLY Mode, Mux Mode *		
TSG	FS Mode, DLY Mode, Mux Mode *		
ASI Bypass	FS Mode, DLY Mode, Mux Mode *		
Audio Sync (Sample rate conversion)		FS Mode	
Audio Delay		FS Mode, Mux Mode*	FS Mode, Mux Mode*
Audio ProcAmp		FS Mode, Mux Mode*	FS Mode, Mux Mode*
Dolby E Header Alignment			FS Mode, Mux Mode*

Note: *In Mux Mode, SDI channels must be locked to the external reference for proper operation.*

Audio Processing

The **PT-HSRMX8C/8O-OBG** output card is equipped with an Audio TDM Receiver that supports a TDM data rate of 344 Mb/s and 128 channels of TDMed audio.

The following audio functionality is supported per SDI channel

- De-embedding 4 groups (16 mono channels) of Audio prior to the Frame/Audio Synchronizer
- Sample Rate Conversion (with bypass capability on a per stereo-pair basis) - *Embedded Audio only*
- Audio Synchronizer - *Embedded Audio only*
- Audio Delay (> 3000ms / mono channel)
- Audio Proc (Gain, Mute, Invert)
- Audio Sum (on a per mono-channel basis, but based on a predefined list of Sums)
- Audio Swap (on a per mono-channel basis, but based on a predefined list of Swaps)
- Audio Test Tone Generator (Off, 400Hz, 2kHz, 4kHz)
- Dolby-E Header alignment (for Dolby-E data received via TDM only)
- Embedding 4 groups (16 mono channels) of Audio after the Frame/Audio Synchronizer.

- Automatic Audio selection from video source (embedded audio) or associated 16 channels of Audio received via TDM.
- TDM Audio channels if present (i.e. routed from the Audio crosspoint) take precedence over channels de-embedded from the video source.
- Fixed mapping of Audio channels received via TDM and the eight SDI streams (e.g. TDM1-16 -> SDI1, TDM17-32 -> SD).

Notes

- For De-embedding, audio must be embedded synchronously at a sample rate of 48kHz.
- Embedded Dolby-E frames must be properly aligned with the Video frame in order to be transferred from the Frame Synchronizer's input clock domain into the output clock domain. Proper alignment (position of guard-band) is important since Dolby-E frames can be dropped or repeated alongside the active video content.
- All Audio channels received from the Audio crosspoint via TDM are assumed to have a 48kHz sample rate and locked to the same Video reference applied to the board.
- Automatic Dolby-E header alignment supported for Dolby-E data received via TDM, where Audio data (PCM or non-PCM) is expected to be already synchronous to the reference applied to the board. When receiving Dolby-E data via TDM, alignment with the actual Video data is unknown and it is therefore important to have the Dolby- E data automatically re-aligned prior to muxing it back into the SDI stream.
- Sample Rate Conversion can only be applied to de-embedded Audio data, but not to TDM Audio data. The downstream clock for the SRCs will be locked to the applied Video reference. Non-PCM Audio data (such as Dolby-E/D) cannot be sample rate converted, and is transferred from the input clock domain to the output clock domain by dropping or repeating a full frame of non-PCM data, every time the Video Frame Synchronizer reaches its roll-over point.

Video Processing

- SD-SDI (270Mb/s) standards - 525, 625
- HD-SDI (1.5Gb/s) standards - 720p50, 720p59, 720p60, 1080i50, 1080i59.94, 1080i60, 1080psF24, 1080psF23
- HD-SDI (3Gb/s) standards – SMPTE425 Level A, SMPTE 372M Dual Link
- Framesync mode or Delay mode
- Freeze modes: Frame, Field1, Field2
- High noise immunity (TRS error resilience) and glitchless processing (fast switching without freeze) of input feeds, that were asynchronously switched on the recommended switching point (as defined in SMPTE RP168)
- User selectable Loss-of-Video modes: Black, Freeze, Pass
- Video Frame Synchronizer with H,V Phase control and fixed frame delay on top of variable delay
- Video Frame Delay: up to 16 Frames (all standards)
- Video ProcAmp: Gain, Offset, Hue, Black/White Clip
- SMPTE 352M Video Payload: Detection, Insertion (HD and 3G only)
- EDH (SD) and CRC (HD): Detection, Insertion
- Simple Test Signal Generator: 75% Color Bars, 100% Color Bars, SDI Pathologicals
- Automatic ASI detection and bypass

Notes

- VANC/HANC data other than embedded Audio is not processed. Closed Captioning data, Teletext data or SMPTE 12M Timecode (LTC, VITC), for instance, will be dropped or repeated together with the active video content, every time the Frame Synchronizer drops or repeats a frame.
- For channels operating in Delay mode, all VANC/HANC data (including embedded Audio) is passed through the delay memory unprocessed. Ancillary data remains untouched. The absolute delay from In to Out can be changed arbitrarily within the predefined limits (e.g. from 3us up to 16 frames + 3us).
- Support for SMPTE 372M Dual-Link formats, with 16 (mono) channels of Audio processed. Processed Video/Audio data exits the board as a single 3Gb/s stream.
- Non-PCM Audio data (Dolby-E or Dolby-D) is not processed by the Audio Synchronizer / Audio Delay / Audio ProcAmp processing blocks. It is passed alongside the active video content through the Video Frame Synchronizer memory and a frame's worth of non-PCM data is dropped or repeated - together with the active video content every time the Video Frame Synchronizer drops or repeats a frame.

Support for Quiet Audio Switching

Switching between two sources of the same data- and frame-rate in the serial domain, e.g. on a router's crosspoint board, can cause momentary discontinuities in the SDI stream. It doesn't matter whether the two sources are asynchronous or not, a temporary glitch in the resulting SDI stream can cause downstream equipment to generate an erroneous output.

The PT-HSRMXxx-OBG can absorb such glitches and will provide not only a continuous and uninterrupted stream of video, it will also handle the transitioning of embedded Audio from one source to another in a 'quiet' manner.

In order to accomplish that, the following conditions must be met:

1. The two video sources, that get switched upstream, must be of the same data- and frame-rate. They can be asynchronous with respect to each other and with respect to the reference signal, that is applied to the board.
2. The channel that is supposed to produce a clean and quiet output must be operated in Frame Sync mode (Frame Sync license is required).
3. ADS Clean must be turned on.

Note: *ADS Clean* ***ON*** *will wipe out any embedded non-PCM audio data, such as Dolby-E. If a quiet audio transition between two sources, which contain a mix of PCM and non-PCM audio data, is desired, it is recommended to bring in the non-PCM data via TDM.*

LED Indicators

LED Indicators on the board signal the following:

- Power Good
- Power On Self Test Passed
- Temperature Alarm
- Communication Activity
- SDI Signal Presence (8 LEDs, 1 per output)
- Status LEDs for Status and Diagnostics

Jumpers and DIP Switches

This board has no user configurable jumpers.

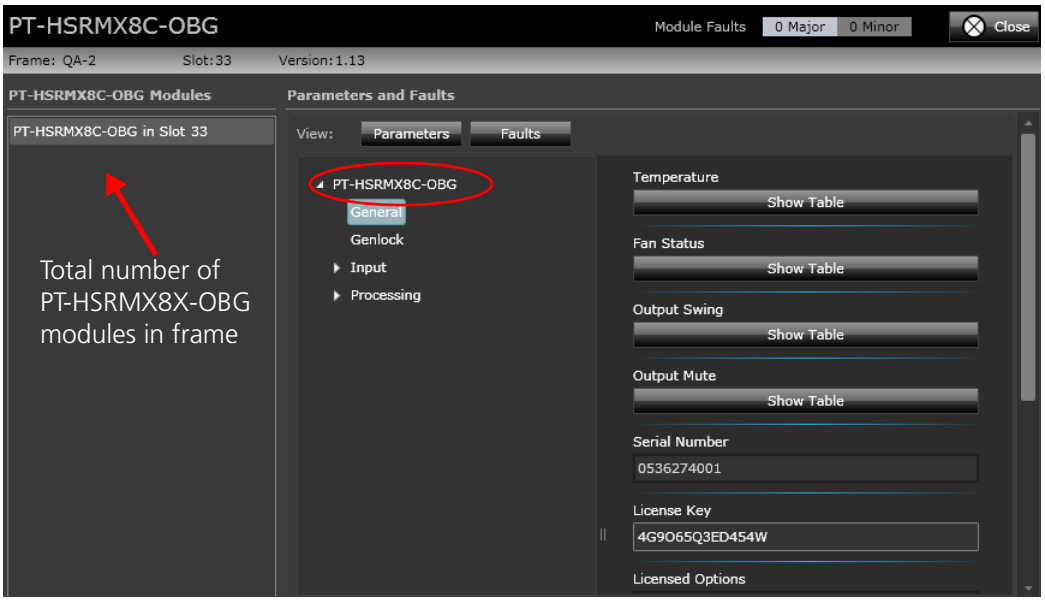
The two DIP Switches, labeled **SW1** and **SWC2**, must remain in their factory set default positions - **OFF.**

Failsafe Module Upgrade

The Flash Memory can be partially or entirely upgraded through the PIPE interface. In case of upgrade issues due to power failures or system instability during upgrade, the last known good working version is automatically reverted to.

Controllable Parameters

The **PT-HSRMX8X-OBG** Module can be controlled via the Controller. When you access a PT-HSRMX8X-OBG module (by clicking on it in the list of modules), its parameters are displayed. The total number of PT-HSRMX8X-OBG modules in the frame is also displayed on the left.



The following are user-controllable parameters for **PT-HSRMX8X-OBG**.

- General Parameters
- Genlock Parameters
- Input Parameters
- Processing Parameters

General Parameters

Table 10-19 PT-HSRMX8X-OBG - General Parameters

Name	Description	Type	Options
Temperature *(TABLE PARAMETER)*	Indicates the temperature of the FPGA	RO	<String> in Degrees Celsius
Fan Status *(TABLE PARAMETER)*	Indicates proper functioning of the module's fan unit	RO	<String>
Laser Enable (1-8) (optical version only) *(TABLE PARAMETER)*	Enables/Disables Laser Transmitter.	RW	Yes No
Laser Status (1-8) (optical version only) *(TABLE PARAMETER)*	Indicates status of Laser Transmitter device (SFP Tx Module)	RO	Normal Failed Disabled No SFP
Serial Number	Displays the module's unique identifier	RO	<String>
License Key	Activates the Frame Sync option	RW	<String>
Licensed Options	Displays activated options	RO	None Frame Sync
Parameter Update Rate	Defines the rate at which parameters are updated	RW	Slow Medium Fast
Control Status		RO	Please Wait Ready to Set
Version (MK20_App_S6_V6)	Lists version numbers of individual firmware components.	RO	<String>

Genlock Parameters

Table 10-20 PT-HSRMX8X-OBG - General Parameters

Name	Description	Type	Options
Sync Select	Selects which physical sync port the module uses as a reference	RO	Sync 1 Sync 2 Sync 3 Sync 4

Table 10-20 PT-HSRMX8X-OBG - General Parameters

Name	Description	Type	Options
Genlock Video Present	Reports the presence of the reference video signal	RO	No Yes
Genlock Video Locked	Reports the locked status of the reference video signal	RO	No Yes
Genlock Standard	Indicates the video standard detected on the genlock input	RO	Unknown 525i 59.94 625i 50 720p 25 720p 29.97 720p 30 720p 50 720p 59.94 720p 60 1080p 23.98 1080p 24 1080p 29.97 1080p 30 1080p 25 1080i 50 1080i 59.94 1080i 60 1080sF 23.98 1080sF 24

Input Parameters

Table 10-21 PT-HSRMX8X-OBG - Input Parameters

	Name	Description	Type	Options
Video Status	SDI Video Standard *(TABLE PARAMETER)*	Displays the SDI video signal standard	RO	Unknown 525i 59.94 625i 50 720p 25 720p 29.97 720p 30 720p 50 720p 59.94 720p 60 1080p 23.98 1080p 24 1080p 29.97 1080p 30 1080p 25 1080i 50 1080i 59.94 1080i 60 1080p 50 1080p 59.94 1080p 60 1080p 50 DL 1080p 59.94 DL 1080p 60 DL 1080sF 23.98 1080sF 24 ASI
	Signal Presence (1-8) *(TABLE PARAMETER)*	Indicates presence of SDI or ASI signal. ASI signals will automatically bypass all processing stages.	RO	No Yes
	EDH Present *(TABLE PARAMETER)*	Reports the presence of EDH in the input SDI signal	RO	No Yes
	CRC/EDH Error Counter *(TABLE PARAMETER)*	Reports the number of chrominance CRC/EDH errors that have occurred	RO	0 to 65535
	CRC/EDH Error Clear *(TABLE PARAMETER)*	Clears all CRC/EDH error counters	RO	No Yes

Table 10-21 PT-HSRMX8X-OBG - Input Parameters

	Name	Description	Type	Options
Embedded Audio Status	Group Presence (1-8) *(TABLE PARAMETER)*	Indicates which audio groups are present	RO	None Group 1 Group 2 Group 12 Group 3 Group 13 Group 23 Group 123 Group 4 Group 14 Group 24 Group 124 Group 34 Group 134 Group 234 Group 1234
	Group Active Channels (1-8) *(TABLE PARAMETER)*	Indicates which channels are active. Note: When operating with SD-SDI modes, this parameter will return "None" due to the lack of Audio Control packets.	RO	None CH1 CH2 CH12 CH3 CH13 CH23 CH123 CH4 CH14 CH24 CH124 CH34 CH134 CH234 CH1234
	Audio Format (1-8) *(TABLE PARAMETER)*	Indicates format of TDM channels (e.g. PCM Audio).	RO	PCM Non-PCM
TDM Audio Status	TDM Presence (1-128) *(TABLE PARAMETER)*	Indicates presence of TDM Audio Channels.		No Yes
	TDM Format (1-128) *(TABLE PARAMETER)*	Indicates format of TDM channels (e.g. PCM Audio).		PCM Non-PCM

Processing Parameters

Table 10-22 PT-HSRMX8X-OBG - Processing Parameters

	Name	Description	Options
Embedding	TDM Audio (1-8) *(TABLE PARAMETER)*	Enables embedding of Audio Channels received from the ATDM board. Each instance of this control applies to all 16 Mono Channels of Audio (or 8 Stereo pairs) of an SDI stream. If set to 'Yes', only those TDM channels, which are connected in the Audio cross-point's matrix, will be embedded into the outgoing SDI stream. Disconnected Stereo-pairs will be automatically replaced by whatever has been de-embedded from the incoming SDI stream.	Yes No
	ADS Clean (1-8) *(TABLE PARAMETER)*	Enables and disables the cleaning of the Ancillary Data Space before embedding audio	Yes No
	Dolby E Start Line *(TABLE PARAMETER)*	Determines the Dolby-E start line.	Range is mode specific and complies with Dolby-E specification
	Group Embedding Mode (1-8) *(TABLE PARAMETER)*	Selects the embedding mode for the specified audio group	Off Append OverWrite Auto
	Dolby E Auto Align *(TABLE PARAMETER)*	Enables Dolby-E Header alignment of Dolby-E data received via TDM (from ATDM cross-point).	Yes No

Table 10-22 PT-HSRMX8X-OBG - Processing Parameters

	Name	Description	Options
Audio	Fade Rate	Fade rate applies to all 16 audio channels in a video stream	0 - 10 s, in 1 s steps (1 s)
	Word Length	Specifies the audio word length for all 16 channels in a video stream. See **Word Length Parameter**.	16 bits 20 bits 24 bits
Audio > Sample Rate Conversion			
	SRC Control (1-8) *(TABLE PARAMETER)*	Sets the SRC to on/ bypass/auto	On Bypass Auto
	V-Bit Mute Enable	Enables automatic muting of audio outputs when the V-bit is set Muting on a detected V-Bit applies to PCM audio channels only. Non-PCM audio channels will not be muted.	No Yes
	Tone (1-8) *(TABLE PARAMETER)*	Enables Tones	Off 400 Hz 2 kHz 4 kHz
	Level Adjust (1-8) *(TABLE PARAMETER)*	Adjusts the audio level (gain) for each audio channel	-18 dB - 18 dB (0) in 0.1 dB steps
	Polarity Reversal (1-8) *(TABLE PARAMETER)*	Specifies whether the audio channel should be inverted	No Yes
	Audio Mute (1-8) *(TABLE PARAMETER)*	Enables muting for the specified output channel	Off On

Table 10-22 PT-HSRMX8X-OBG - Processing Parameters

	Name	Description	Options
	Summing (1-8) *(TABLE PARAMETER)*	Specifies whether to sum the audio within a pair Left to Right - the summed audio is placed in the right channel Right to Left - the summed audio is placed in the left channel Both - the summed audio is placed in both left and right channels	None Right to left Left to right Both
	Swap/Copy (1-8) *(TABLE PARAMETER)*	Specifies whether to swap or copy the audio within a pair; able to swap left and right channels, copy left channel to the right channel, and copy the right channel to the left	No Swap Swap Right to left Left to right
Deembedding > Group DeEmbed Control	Group DeEmbed Control (1-8)	Specifies the operation of the audio de-embedder when an error occurs; it will either repeat the last audio sample or mute when an error occurs. See **Group (1-4) Deembedding Control**	Mute Repeat
Video > TSG	TSG Pattern	Selects the test pattern for the test signal generator	75% Bars 100% Bars EQ Test PLL Test

Table 10-22 PT-HSRMX8X-OBG - Processing Parameters

	Name	Description	Options
	TSG Standard	Selects the video standard for the TSG (default is to follow the detected standard)	Follow RX 525i 59.94 625i 50 720p 25 720p 29.97 720p 30 720p 50 720p 59.94 720p 60 1080i 50 1080i 59.94 1080i 60 1080p 23.98 1080p 24 1080p 25 1080p 29.97 1080p 30 1080p 50 1080p 59.94 1080p 60 1080p 50 1080p 59.94 1080p 60 DL 1080sF 23.98 1080sF 24
	TSG Enable	Enables and disables the test signal generator	No Yes
Audio Sync	Audio Ch Pair Delay Track (1-8)	No Tracking / Sync Tracking - per stereo pair See **Audio Synchronization**.	No Tracking Sync Tracking
	Audio Channel Delay (1-8)	Specifies audio delay - per mono channel See **Audio Synchronization**.	0 - 3000 ms in 1 ms steps
Proc Amp	Y Gain *(TABLE PARAMETER)*	Adjusts gain for the Y channel	-3.0 to +3.0 dB (0 dB) in 0.1 dB steps
	Cb Gain *(TABLE PARAMETER)*	Adjusts gain to the Cb color difference component	-3.0 to +3.0 dB (0 dB) in 0.1 dB steps
	Cr Gain *(TABLE PARAMETER)*	Adjusts gain to the Cr color difference component	-3.0 to +3.0 dB (0 dB) in 0.1 dB steps
	Y Offset *(TABLE PARAMETER)*	Adjusts offset for the Y channel	±100.6 mV (0 mV) in 0.8 mV increments
	Cb Offset *(TABLE PARAMETER)*	Adjusts offset for the Cb channel	±100.6 mV (0 mV) in 0.8 mV increments

Table 10-22 PT-HSRMX8X-OBG - Processing Parameters

	Name	Description	Options
	Cr Offset *(TABLE PARAMETER)*	Adjusts offset for the Cr channel	±100.6 mV (0 mV) in 0.8 mV increments
	White Clip Enable *(TABLE PARAMETER)*	Controls level clipping according to the White Clip Level control	Disable Enable
	White Clip Level *(TABLE PARAMETER)*	Sets the white clip level	636.9 to 763.1 mV (700 mV) in 0.8 mV increments
	Black Clip Enable *(TABLE PARAMETER)*	Controls level clipping according to the Black Clip Level control	Disable Enable
	Black Clip Level *(TABLE PARAMETER)*	Sets the black clip level	-47.9 to +47.9 mV (0.0 mV) in 0.8 mV increments
	Hue *(TABLE PARAMETER)*	Adjusts the hue of the incoming digital video signal	-180 to +180° (0°)

Table 10-22 PT-HSRMX8X-OBG - Processing Parameters

	Name	Description	Options
Frame Sync	Horizontal Phase *(TABLE PARAMETER)*	Adjusts the horizontal timing	0.000 us to 29.616 us (1080p 30, 1035i 60) 0.000 us to 14.808 us (1080p 60, 1080p 60 DL) 0.000 us to 29.646 us (1080p 29, 1080i 59) 0.000 us to 14.823 us (1080p 59, 1080p 59.94 DL) 0.000 us to 35.542 us (1080p 25, 1080i 50) 0.000 us to 17.771 us (1080p 50, 1080p 50 DL) 0.000 us to 37.024 us (1080p 24, 1080sF 24) 0.000 us to 37.061 us (1080p 23.98, 1080sF 23.98) 0.000 us to 31.987 us (1080i 50_295) 0.000 us to 22.209 us (720p 60) 0.000 us to 22.231 us (720p 59.94) 0.000 us to 26.653 us (720p 50) 0.000 us to 44.431 us (720p 30) 0.000 us to 44.475 us (720p 29) 0.000 us to 53.320 us (720p 25) 0.000 us to 63.518 us (525i 59.94) 0.000 us to 63.963 us (625i 50)
	Vertical Phase *(TABLE PARAMETER)*	Adjusts the vertical timing	0–1124 lines (1080p/l/sF) 0–1249 lines (1080i 50 SMPTE 295M) 0–749 lines (720p) 0–524 lines (525i 59.94) 0–624 lines (625i 50)

Table 10-22 PT-HSRMX8X-OBG - Processing Parameters

	Name	Description	Options
	Frame Offset *(TABLE PARAMETER)*	Determines the number of frames the video is offset	0 - 17 frames (Delay mode) 0 - 16 frames (Sync mode)
	Force Freeze *(TABLE PARAMETER)*	Enables video freeze	No Yes
	Force Freeze Mode *(TABLE PARAMETER)*	Specifies the type of freeze, field 1, field 2 or frame	Field 1 Field 2 Frame
	Loss of Video Mode *(TABLE PARAMETER)*	Specifies operation on loss of video, pass, black or freeze.	Pass Black Freeze
	Fast Switch *(TABLE PARAMETER)*	Enable fast switching. See **Fast Video Switch**.	No Yes
Frame Sync > Mux Mode	Frame Sync / Mux Mode (1-8)	Sets the operational mode of the frame sync, delay or sync. See **Video Frame Synchronization**	FS: Sync Mode FS: Delay Mode Mux: Auto Detect Mux: Always On Bypass
Frame Sync > Mux Status	Frame Sync / Mux Status (1-8)	Reflects operational mode status based on license, mode of operation, presence, and rate of Reference signal.	FS: Ext Lock FS: Local Lock FS: Delay Forced FS: Delay Rate Mismatch Mux: Locked Mux: Unlocked ASI TSG Bypass Output Off (LOV) Output Off (User) Invalid

Notes:

Word Length Parameter

The **Word Length** parameter can be set through the **Audio** section of the GUI to 16, 20, or 25 bits on a per SDI channel basis. 20 bits is the default and is applicable when the video standard is SD SDI (525/625).

If the SD SDI Video has extended Audio packets (which can apply to any of up to four groups of embedded Audio), Audio data embedded in such group(s) should have a word length of 24 bits. When the processed audio data word length is 20 bits (determined by parameter 'Word Length' parameter), the Audio Embedder cannot overwrite existing extended Audio packets. There are 2 options in this case:

- Turn on **ADS Clean** (See **ADS Clean (1-8) (TABLE PARAMETER)**) prior to re-embedding new Audio data, to wipe out any existing Audio packets (regular and extended).
- Set the **Word Length** parameter for the SDI channel in question to match the word length of the Audio data embedded in the incoming SDI stream.

The Word Length bits for processed Audio data are not auto-detected (based on the detected word length of the embedded Audio data) and set. This is to allow the flexibility for users to steer the word length of the re-embedded Audio data such that it matches the word length of Audio data that originates from a different source (for example, Audio received via TDM).

Fast Video Switch

When input video is switched between two sources while both sources are within vertical blanking, use the **Fast Switch (TABLE PARAMETER)** parameter to enable fast video switching between the sources. In this mode, output video is not frozen when both sources are within the vertical blanking area when the switch takes place.

TSG Operation

If the boards boots up with no active (and valid) SDI signal(s) presented to its input(s) (i.e. nothing is routed from the wide-band crosspoint), enabling the TSG will not produce an output when the **TSG Standard (x 8) (TABLE PARAMETER)** parameter it set to **Follow Rx**, which is the default setting. This is the expected behavior. Under such operating conditions, the user has to manually select the desired Video Output Standard for the TSG (e.g. 1080i59).

Once an active and valid SDI signal has been applied, the TSG will automatically follow the detected input standard. The SDI signal can now be removed, the TSG however will continue working in the same standard that was detected before, provided that the TSG Standard parameter remains set to Follow Rx.

Group DeEmbed Control (1-8)

The following are options for the **Group** (1–8) **Deembedding Control** parameter.

Table 10-23 Deembedding Control Options

Item	Description
Repeat	Upon detection of a de-embedding error, the de-embedder repeats the last good AES sample.
Mute	Upon detection of a de-embedding error, the de-embedder mutes the current outgoing AES sample.

Audio Embedding Modes

See **Appendix A, *Audio Embedding***.

Audio Synchronization

By default, PT-HSRMX8C-OBG and PT-HSRMX8O-OBG synchronize de-embedded audio with timing information from the video frame synchronizer prior to re-embedding audio. When **Audio Ch Pair Delay Track (1-8)** is set to sync tracking, the audio will be automatically delayed to match the video delay. Additionally, up to three seconds of delay can be added through the **Audio Channel Delay (1-8)** parameter.

Video Frame Synchronization

The Frame synchronizer offers two modes: **Delay** mode and **Synchronizer** (Sync) mode. These modes can be chosen using the **Frame Sync / Mux Mode (1-8)** parameter.

- In Delay mode, the output video is synchronized to the input video.

- In Sync mode, the output video is synchronized to the reference video. The reference standard you can use depends on the output video standard set.

Table 10-24 Supported Reference and Output Video Standard Combinations in Sync Mode

Reference Standard	Output Video Standard
525i 59.94	■ 1080i 59.94 ■ 1080p 59.94 ■ 1080p 29.97 ■ 720p 59.94 ■ 525i 59.94 ■ 1080p 59.94 DL
625i 50	■ 1080i 50 ■ 1080p 50 ■ 1080p 25 ■ 720p 50 ■ 625i 50 ■ 1080p 50 DL
720p 60	■ 720p 60 ■ 1080p 60 ■ 1080p 60 DL
720p 59.94	■ 720p 59.94 ■ 1080p 59.94 ■ 1080p 59.94 DL
720p 50	■ 720p 50 ■ 1080p 50 ■ 1080p 50 DL
1080i 60 1080p 30	■ 1080i 60 ■ 1080p 60 ■ 1080p 30 ■ 720p 60 ■ 1080p 60 DL
1080i 59.94 1080p 29.97	■ 1080i 59.94 ■ 1080p 29.97 ■ 1080p 59.94 ■ 720p 59.94 ■ 525i 59.94 ■ 1080p 59.94 DL
1080i 50 1080p 25	■ 1080i 50 ■ 1080p 50 ■ 1080p 25 ■ 720p 50 ■ 625i 50 ■ 1080p 50 DL
1080p 24 1080sF 24	■ 1080p 24 ■ 1080sF 24
1080p 23.98 1080sF 23.98	■ 1080p 23.98 ■ 1080sF 23.98

In both **Sync** mode and **Delay** mode, several controls are available to manipulate the output video signal:

- **Horizontal Phase (TABLE PARAMETER)** - To adjust the horizontal timing.
- **Vertical Phase (TABLE PARAMETER)** - To adjust the vertical timing.
- **Frame Offset (TABLE PARAMETER)** - Adjustable frame delay.
- **Force Freeze (TABLE PARAMETER)** - To manually freeze output video on first or second field (interlaced standards), or on the whole frame (all standards).

Block Diagram

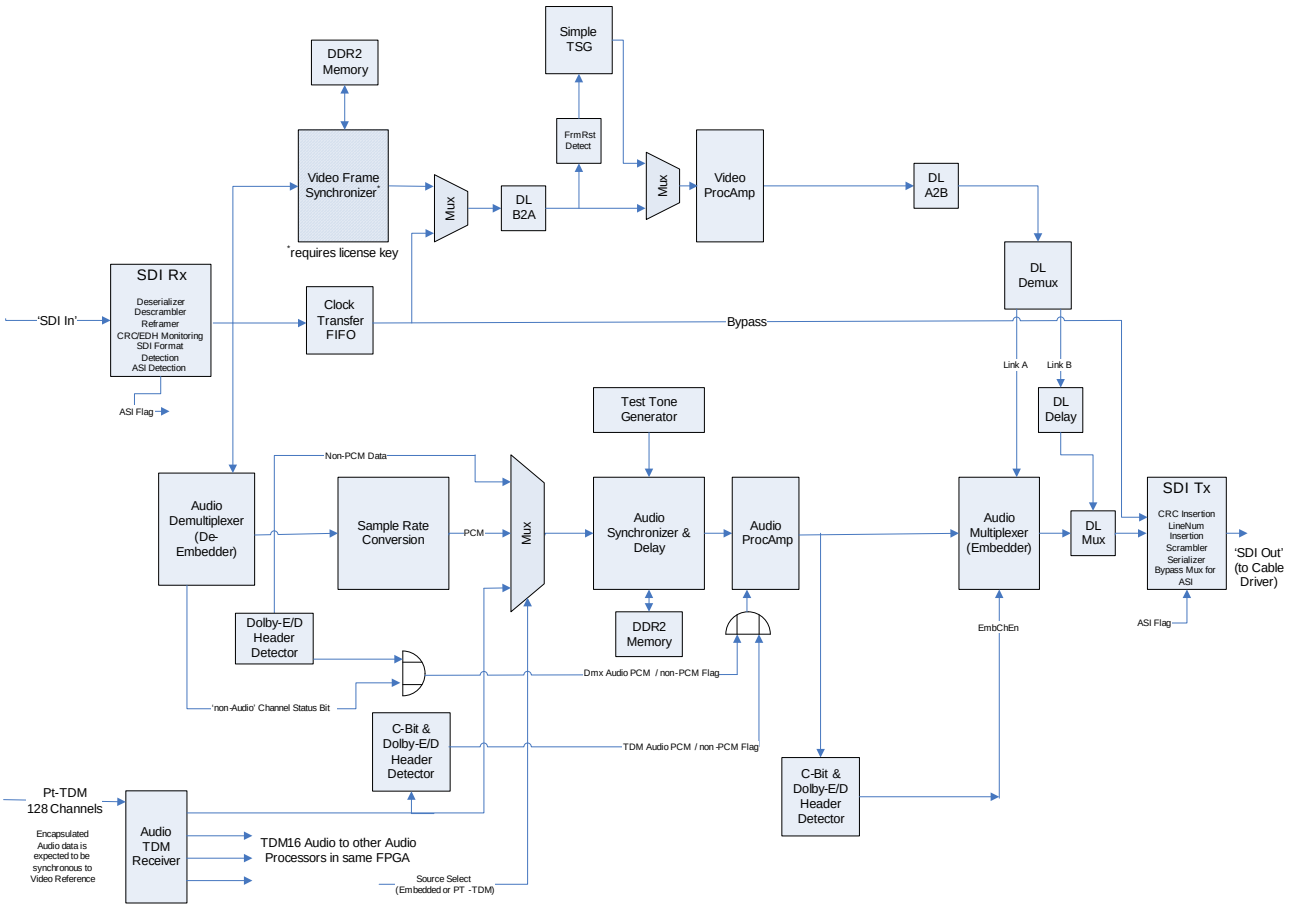


Figure 10-15 PT-HSRMX8C/8O-OBG Block Diagram

Specifications

Electrical Output (Back Module with 8 BNCs)

Table 10-25 PT-HSRMX8C-OBG Electrical Output

Item	Specification
Number of Outputs	8 (standard BNC)
Connector	BNC (IEC169-8)
Impedance	75 ohms
ASI (270 Mb/s)	
SD SDI (270 Mb/s)	SMPTE 259M
Format	525i59.94, 625i50
Return Loss	> 15 dB from 5 MHz to 270 MHz
HD SDI (1.5 Gb/s)	SMPTE 292M
Format and Image Sample Structure	SMPTE274M (1080i, 1080psF, 1080p) SMPTE296M (720p)
Return Loss	> 15 dB (typical) from 5 MHz to 1485 MHz
HD SDI (3 Gb/s)	
Format and Image Sample Structure	SMPTE 425M Level A SMPTE 372M
Return Loss	> 15 dB (typical) from 5 MHz to 1485 MHz > 10 dB (typical) from 1485 MHz to 2970 MHz

Optical Output (Fiber Back Modules with 4 SFPs)

Table 10-26 PT-HSRMX8O-OBG - Optical Output

Item	Specification
Number of Outputs	8
Package	Dual Channel Transmitter SFP Modules
Connector	LC with PC/UPC polish (single mode fiber)
Wavelengths	1310nm, 1550nm (single mode fiber)
Output Power	-5 dBm min, 0 dBm max (Gennum GF2922)
Supported Video rates	270Mb/s, 1.5Gb/s, 3Gb/s
Supported Formats and Sampling Structures	ASI, SD SDI, HD SDI, 3G SDI
Bit Error Rate	Complies with SMPTE 297-2006

Power Consumption

The maximum power consumption is 65 watts (3 Gb/s) - this is when all 8 fiber outputs are running at 3 Gb/s.

11 Multichannel Audio Digital Interface (MADI) Modules

Multichannel Audio Digital Interface (MADI) Overview

MADI (Serial **M**ultichannel **A**udio **D**igital **I**nterface) is an industry-standard electronic communications protocol that defines the data format and electrical characteristics of an interface carrying multiple channels of digital audio. MADI supports multi-channel audio transmission through copper (coaxial) cable or multi mode fiber cable.

MADI is widely used in the audio industry, especially in the professional sector. Its advantages over other audio digital interface protocols and standards are support of a greater number of channels per line.

MADI support enables seamless integration of Audio Consoles and other third party Audio equipment with MADI I/O into the Harris Audio/Video routing framework. MADI support is offered through the following standard full length boards:

- A four channel MADI input board with **electrical** or **optical** back module.
  See ***PT-MADI4X-IBG MADI Input Module*** on page 152.
- A four channel MADI output board with **electrical** or **optical** back module
  See ***PT-MADI4X-OBG Output Module*** on page 284.

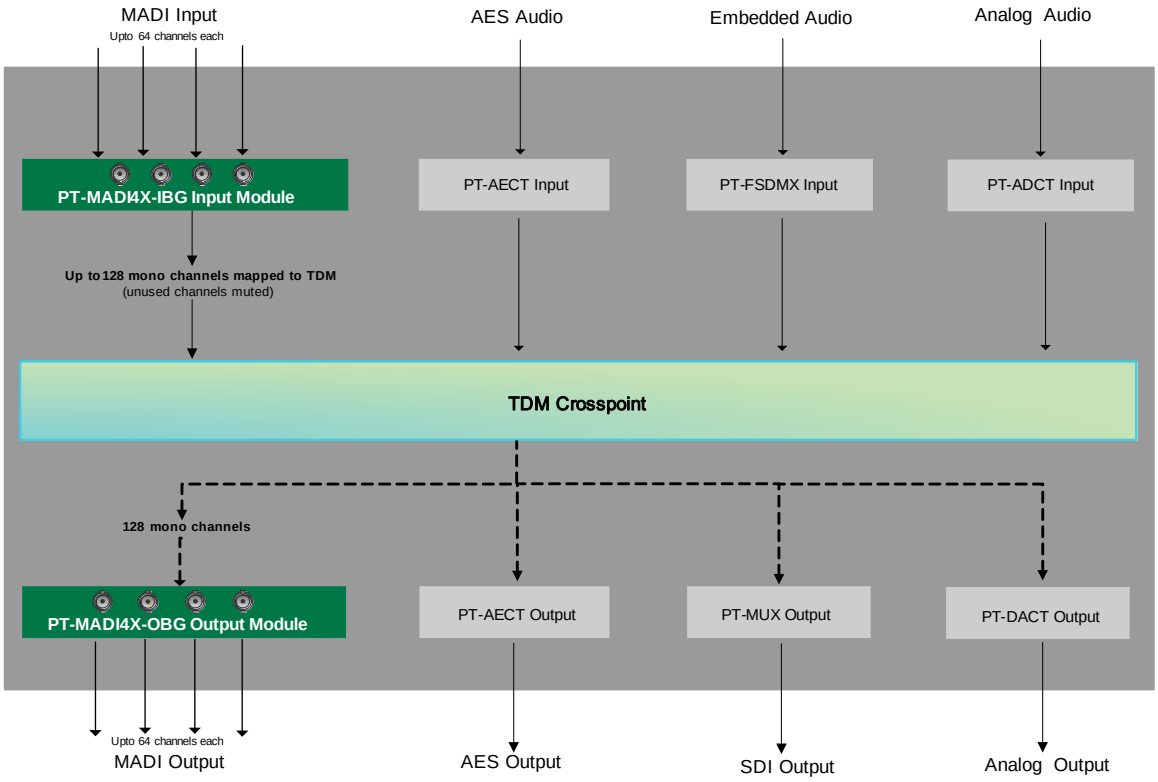


Figure 11-1 MADI Input and Output Modules (and other audio routing options) in a Frame

Note: *This diagram represents Platinum MADI as well as other audio routing options in the Platinum frame. For details, refer to the relevant modules in the Input Modules and Output Modules chapters of this manual.*

PT-MADI4X-IBG MADI Input Module

The **PT-MADI4C-IBG** / **PT-MADI4O-IBG** input module is an AES10-2008 compliant audio input board that supports three MADI formats: 32 channel (96kHz sample rate) and 56 or 64 channels (48 kHz sample rate).

The PT-MADI4X-IBG is user configurable between one and four inputs, each up to 64 Audio mono channels (32 AES stereo pairs) of PCM Audio. The four MADI input streams can comprise up to 256 mono channels, but **a maximum of 128 mono channels can be mapped to the TDM stream**. All inputs are converted to a common 48kHz sample rate prior to merging 128 mono channels into a single TDM stream.

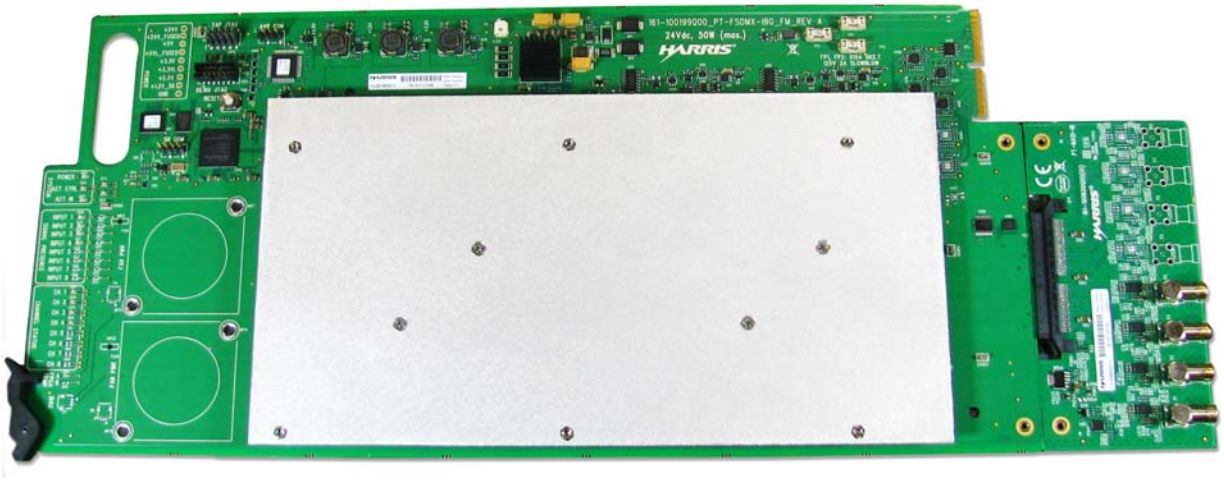


Figure 11-2 PT-MADI4C-IBG Input Module (with electrical back module attached)

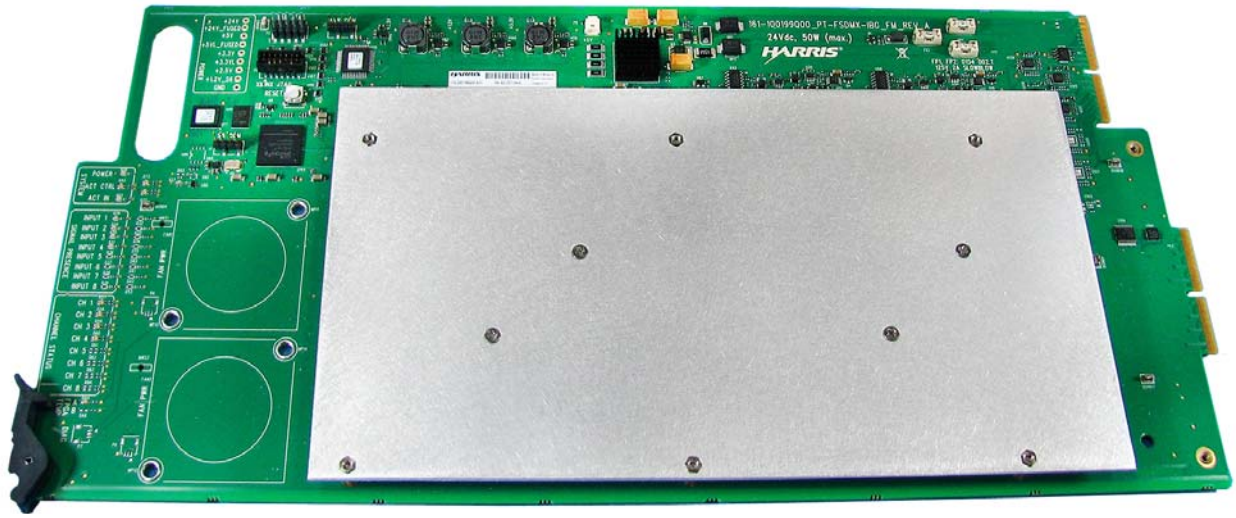


Figure 11-3 PT-MADI4O-IBG Input Module

Electrical Back Module

The electrical back module is an active back module attached to the front module with two brackets and with Cable Equalizers. The back module has four BNC connectors and stays attached to the front module when pulling the module from the frame. The back module is fully MADI compliant in terms of its electrical characteristics.

Figure 11-4 PT-MADI4C-IBG electrical back module

Optical Back Module

The optical back module hosts the cages for up to four Dual-Rx Small Form-factor Pluggable (SFP) Fiber Optic Receivers. In connection with the PT-MADI-IBG front module, only two of the four 'cages' will be used. The back module has to be mounted onto the frame and the Front Module detaches from the Back Module when the Front Module is pulled out from the frame. One Dual-Rx SFP module is pre-installed. The SFP module complies with the AES10-2008 requirements for optical interfaces. See **PT-MADI4O-IBG Specifications** for details.

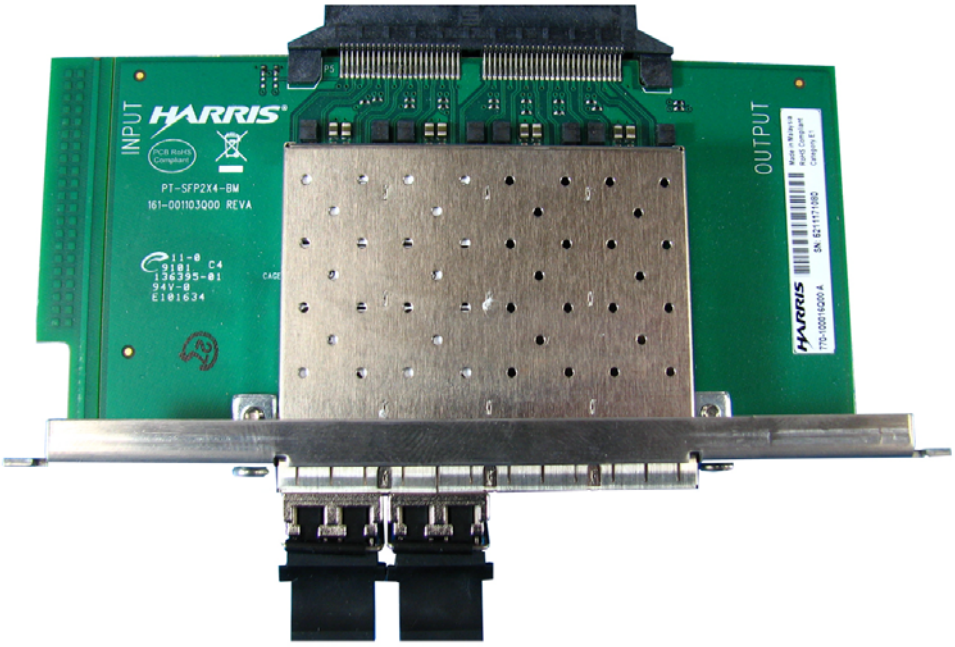
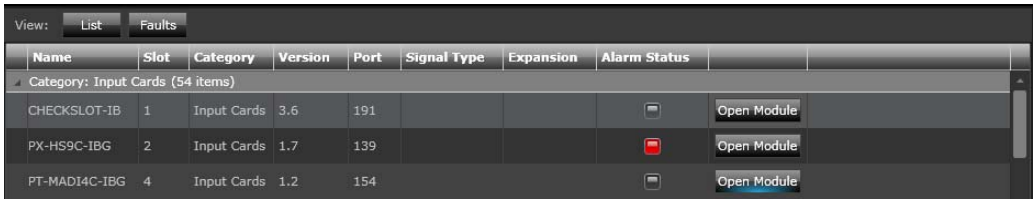


Figure 11-5 PT-MADI4O-IBG optical back module

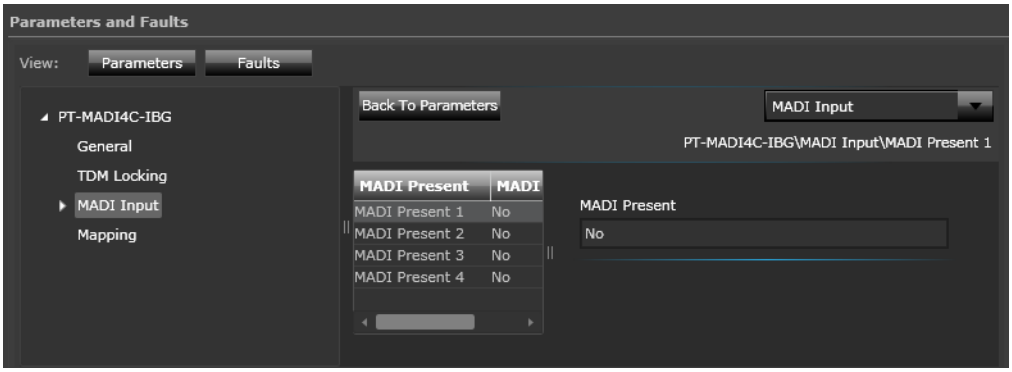
Controlling the MADI Input Module through the Controller

You can access and control **PT-MADI4X-IBG** parameters through the Controller by selecting it in the list of modules and then clicking **Open Module**.



MADI Presence

MADI Presence on each of the four input streams is automatically detected and reported in the **MADI Present** section of the **MADI Input** category.



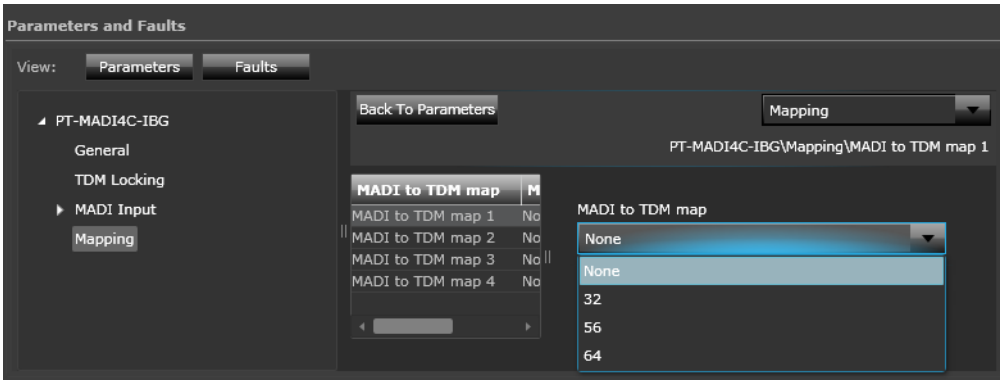
If MADI is present, the following information is reported:

- The number of channels per input stream (32, 56, or 64) along with the sample rate for each stream.
- Each MADI input is divided into chunks of 16 channels (1-16, 17-32, 33-48, and 49-64) and these are reported as active or not.

TDM Mapping

Through the PT-MADI4X-IBG parameter interface, channels in MADI inputs can be manually mapped to the TDM stream and you can select if one or all of the MADI inputs contribute to the stream. A maximum of 128 mono channels can be mapped to the TDM stream.

The **Mapping** parameter category provides a **MADI to TDM map** section in which you can select the channels in each stream to map to the TDM.



For each of the 4 inputs, you can choose whether or not its channels contribute to the TDM stream. Unused channels in the TDM stream are muted. Mapping from MADI inputs to the TDM stream has a granularity of 32 channels, aligned at 32-channel boundaries. 56 channel formats are treated as 64 channel formats, with the unused uppermost channels always muted.

The following table shows how signals are processed, based on the actual input present and the MADI to TDM map settings.

If the selected MADI input is not present, associated channels on the TDM bus are muted and marked as inactive.

Table 11-1 Combinations of MADI to TDM map selections and signal status

Input Status	MADI to TDM map	Result
No input present	32 channels	■ 32 channels allocated on the TDM bus for the MADI signal ■ All TDM channels are muted and inactive
No input present	56 or 64 channels	■ 64 channels allocated on the TDM bus for the MADI signal ■ All TDM channels are muted and inactive
32 channel input	32 channels	■ 32 channels allocated on the TDM bus for the MADI signal ■ All channels within input signal are passed
32 channel input	56 or 64 channels	■ 64 channels allocated on the TDM bus for the MADI signal ■ Channels within input signal are passed ■ The uppermost 32 TDM channels are muted and inactive
56 channel input	32 channels	■ 32 channels allocated on the TDM bus for the MADI signal ■ Channels 1 through 32 of input signal are passed
56 channel input	56 or 64 channels	■ 64 channels allocated on the TDM bus for the MADI signal ■ All channels of input signal are passed ■ Uppermost 8 TDM channels are muted and inactive
64 channel input	32 channels	■ 32 channels allocated on the TDM bus for the MADI signal ■ Channels 1 through 32 of input signal are passed
64 channel input	56 channels	■ 64 channels allocated on the TDM bus for the MADI signal ■ Channels 1 through 56 of input signal are passed ■ Uppermost 8 TDM channels are muted and inactive
64 channel input	64 channels	■ 64 channels allocated on the TDM bus for the MADI signal ■ All channels with input signal are passed

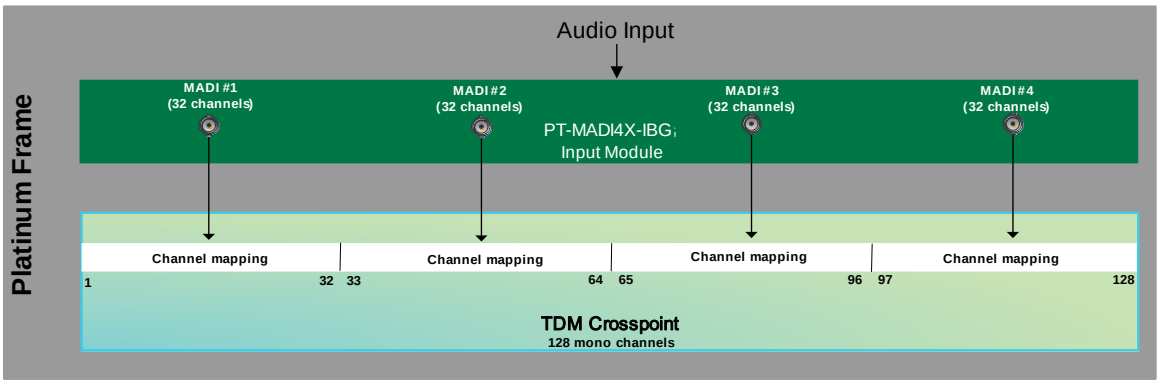
Sample MADI to TDM Mapping Scenarios

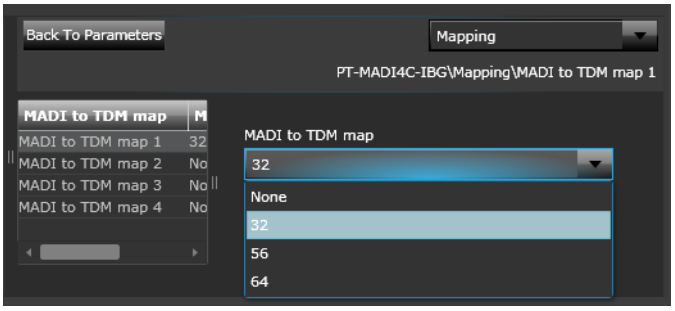
The following are mapping use cases with different MADI configurations such 32 channel, 56 channel or 64 channel.

- **Four 32 channel MADI Inputs, all channels mapped**
- **Four 64 channel MADI Inputs, #1 and #3 mapped**
- **Combination (32/56 channel) MADI Inputs, #3 and #4 mapped**

Four 32 channel MADI Inputs, all channels mapped

This example depicts 4 MADI inputs with 32 channel inputs each. Since a total of 128 channels mappings are allowed, all four inputs can be mapped to the TDM.



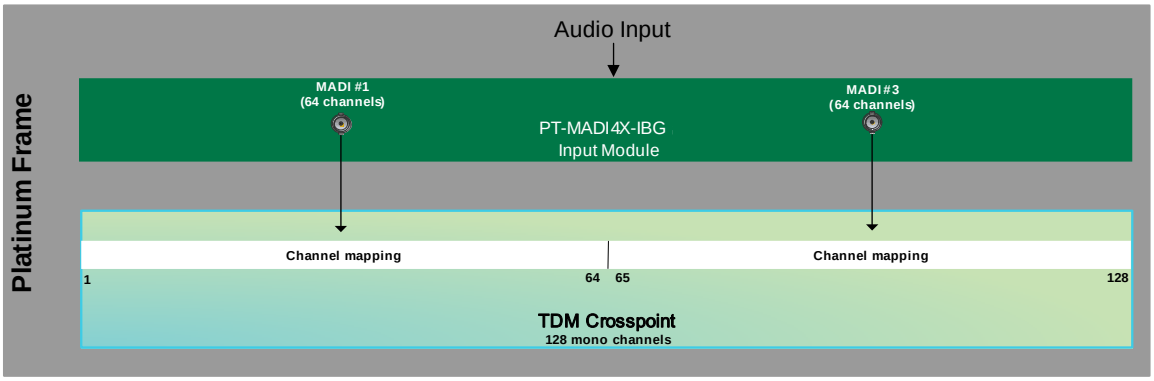


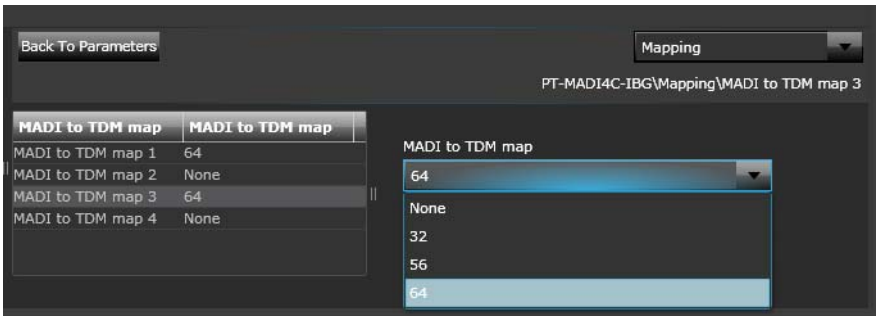
In the Controller UI:

- Open up the MADI Input Module
- Go to Mapping in the navigation tree
- Set all four MADI to TDM maps to 32

Four 64 channel MADI Inputs, #1 and #3 mapped

In this example, all MADI inputs are 64 channel. Since a total of 128 channels mappings are allowed, a maximum of two inputs can be mapped to the TDM. Inputs from MADI #1 and #3 have been selected for mapping.





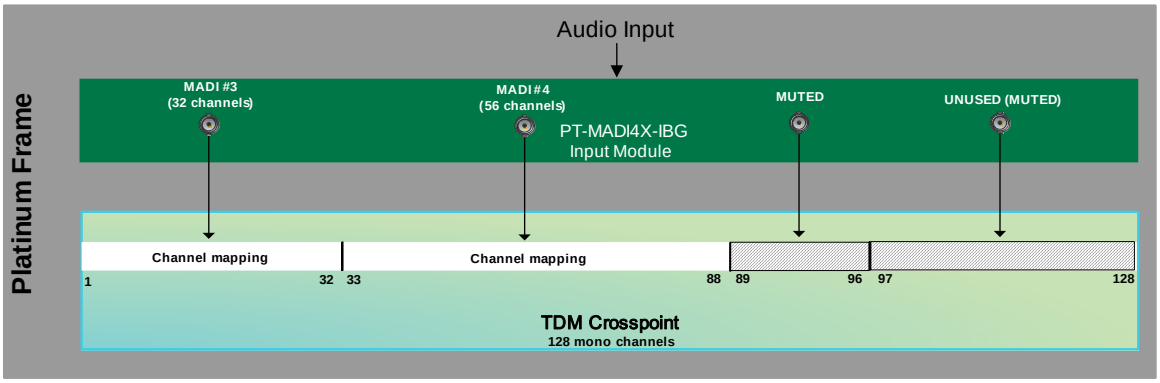
In the Controller UI:

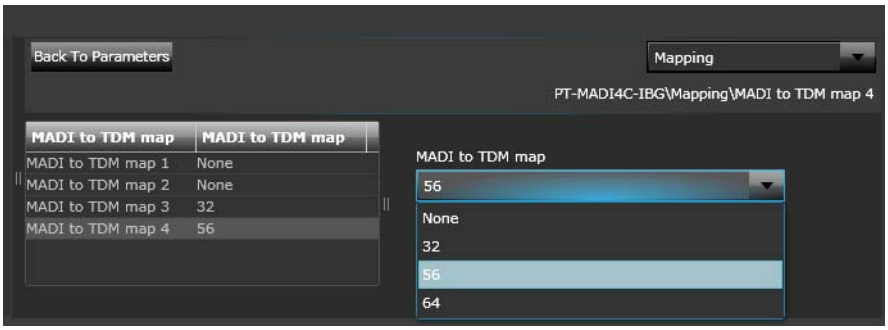
- Open up the MADI Input Module
- Go to **Mapping** in the navigation tree
- Set all **MADI Inputs 1** and **3** to **64** in the **MADI to TDM Map**

Combination (32/56 channel) MADI Inputs, #3 and #4 mapped

This example depicts different channel configurations in the incoming MADI. MADI inputs #1-3 are 32 channel. MADI input #4 is 56 channel. MADI Inputs #3 and #4 have been mapped to the TDM. All other channels are muted.

Other possible mapping scenarios in this situation include:
(1) mapping channels #1-3 (96 channels)
(2) mapping channel #4 (56 channels considered as 64 channels) plus two of three 32 channel inputs (64 channels).





In the Controller UI:

- Open up the MADI Input Module
- Go to **Mapping** in the navigation tree
- Set all **MADI Input 3** to **32** and **MADI Input 4** to **56** in the **MADI to TDM Map**

MADI Audio Formats

MADI sources and/or destinations are typically assigned as either Mono or Stereo format.

For **Mono** configuration, the default MADI mapping using the **Multiplex Mono Audio** Device Type can be used, since it maps 128 mono ports by default when inserting/adding logical sources and/or destinations. See below example:

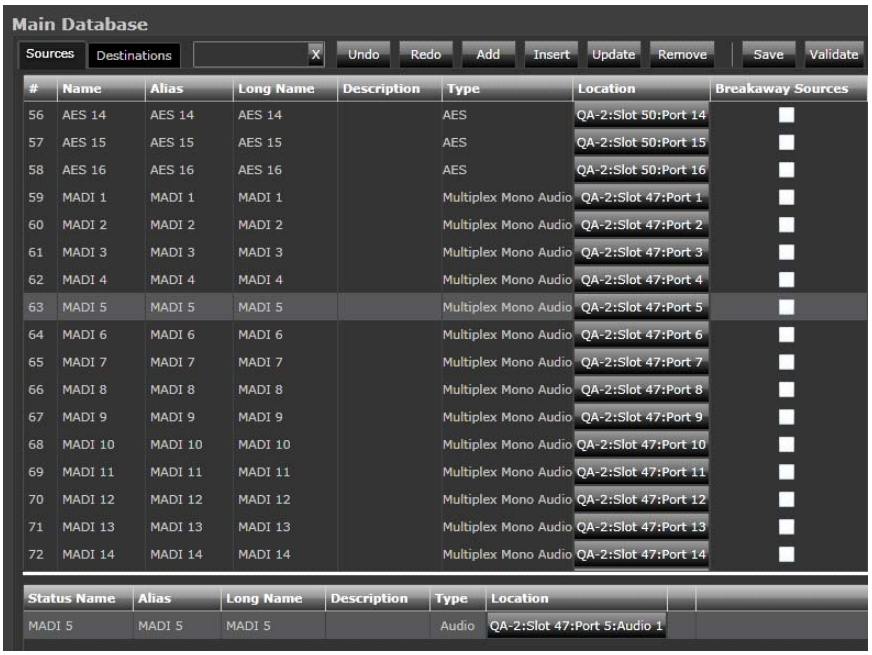


Figure 11-6 MADI - Mono Audio Configuration

For **Stereo** configuration, and using the **Multiplex Stereo Audio** Device Type, the Audio channel must be kept at **Audio 1** while incrementing the Port number between **Left** and **Right** audio channels.

For example, for stereo audio channel 1, ensure the assignments are:
Port 1: Audio 1 (left) and **Port 2: Audio 1 (right)**.

For stereo audio channel 2, ensure the assignments are
Port 3: Audio 1 (left) and **Port 4: Audio 1 (right).**

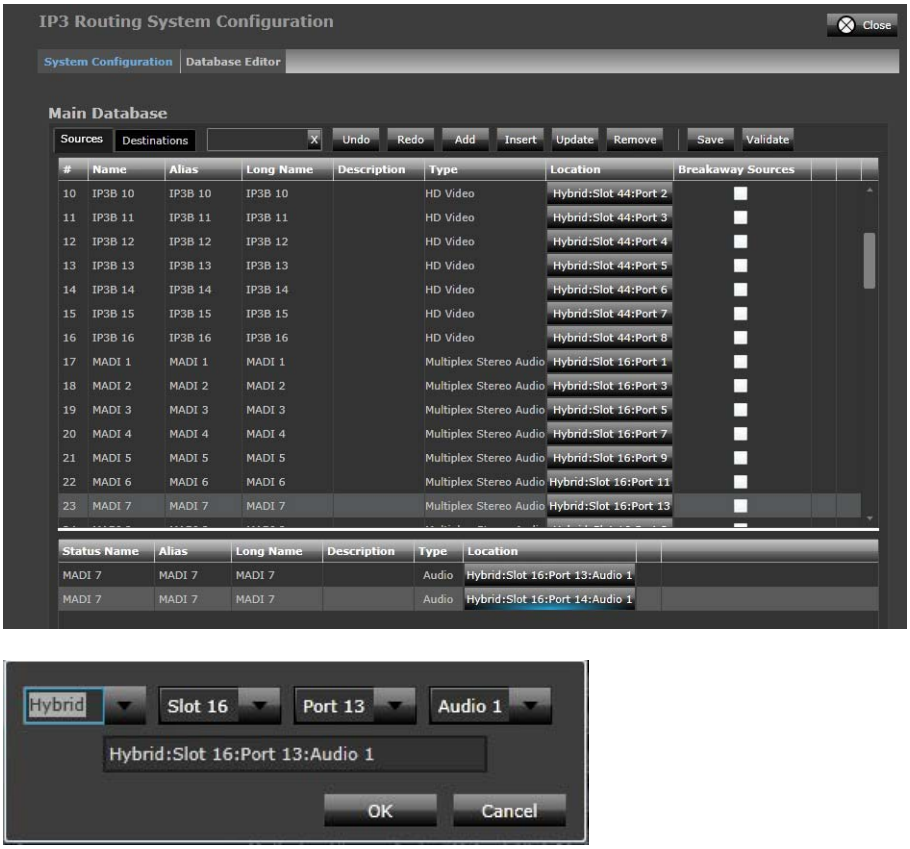


Figure 11-7 MADI - Stereo Audio Configuration

PT-MADI4C-IBG Specifications

Table 11-2 Electrical Input Specifications

Item	Specification
Number of Inputs	4
Connector	BNC (IEC169-8)
Impedance	75
Input Level	150mV to 600mV
Link rate	125Mbit/s (4B5B encoded, NRZI)
Return Loss	NA
Equalization	Adaptive cable equalization for up to 984 ft (300m), typical, of Belden 8281 coaxial cable

Power Consumption

Table 11-3 PT-MADI4C-IBG Power Consumption

Power Consumption	15W (includes front module and back module)

PT-MADI4O-IBG Specifications

Table 11-4 Optical Input Specifications

Item	Specification
Number of Inputs	4
Fiber Type	Multi-mode
Package	2x Dual Channel Receiver SFP modules
Connector	LC with PC/UPC polish
Wavelength	Wideband, 1250nm-1380nm
Receiver Sensitivity	-30dBm (PIN Receiver)
Link rate	125Mbit/s (4B5B encoded, NRZI)
Qualified devices	Optoway SPM-3102W-2RG

Power Consumption

Table 11-5 PT-MADI4O-IBG Power Consumption

Power Consumption	18W (includes front module and 2 Dual Rx SFPs)

PT-MADI4X-IBG Parameters

Note: *SFP Parameters are applicable to the Optical module only.*

The following parameters apply to the PT-MADI4C-IBG:

Table 11-6 Control Parameters for PT-MADI4C-IBG

Functional Block	Parameter Name	R/W	Description	Options
General	Serial Number	R	Displays the module's unique identifier	<String>
	Temperature	R	FPGA (V6) temperature	<String> in degrees celsius
	Parameter Hysteresis	R/W	Parameter updated time	<Integer> 2000000 us
	Software Version	R	Embedded software version	<String>
	Control FPGA Version	R	Control FPGA design version	<String>
	Processing FPGA Version	R	Processing FPGA design version	<String>
	Input Type	R	Input signal media type	**BNC** Optical
TDM Locking	Sync Select	R/W	Sync Source	Sync1 Sync2 Sync3
	GenLock Present	R	Indicates the GenLock signal present	**No** Yes
	GenLock Locked	R	Genlock is locked	**No** Yes
	GenLock Standard	R	GenLock Standard	**Unknown** 525i 59.94 625i 50 720p 25 720p 29.97 720p 30 720p 50 720p 59.94 720p 60 1080p 23.98 1080p 24 1080p 29.97 1080p 30 1080p 25 1080i 50 1080i 59.94 1080i 60
MADI Input				
MADI Present *(Table Parameter)*	MADI Present (1-4)	R	Reports the presence of the reference signal	**No** Yes

Table 11-6 Control Parameters for PT-MADI4C-IBG

Functional Block	Parameter Name	R/W	Description	Options
Number of Channels *(Table Parameter)*	Number of Channels (1-4)		Reports the number of channels in the MADI Input	**0** 32 56 64
Sample Rate *(Table Parameter)*	Sample Rate (1-4)	R	Sample Rate in kHz	
MADI (1-4) Active Channel	MADI<1-4> 01-16	R	Bit map for each active channel	<String>
	MADI<1-4> 17-32	R	Bit map for each active channel	<String>
	MADI<1-4> 33-48	R	Bit map for each active channel	<String>
	MADI<1-4> 49-64	R	Bit map for each active channel	<String>
Mapping				
MADI to TDM map *(Table Parameter)*	MADI to TDM map (1-4)		Indicates how to map MADI signal to TDM	None 32 56 64
SFP				
Input Optical Power *(Table Parameter)*	Input Optical Power <1-4>	R	Reports Input Optical Power	■ Too Low ■ Too High ■ Unknown ■ -31 dBm to 1 dBm
SFP Type *(Table Parameter)*	SFP Type <1-2>	R	Reports type of SFP plugged in	■ OP+SFP+MADI+2 RX ■ Unknown ■ No SFP

PT-MADI4X-OBG Output Module

The **PT-MADI4C-OBG / PT-MADI4O-OBG** output module is an AES10-2008 (MADI) compliant audio output board that supports two MADI formats: 56 and 64 channels. Audio data is encapsulated into the MADI transport stream at a sample rate of 48kHz and typically locked to the same Reference as the TDM Receiver.

The **PT-MADI4X-OBG** output module can encode up to128 TDM audio channels into up to 4 MADI outputs, with each output capable of up to 64 channels each (or 32 AES stereo pairs) of PCM Audio or non-PCM data, such as Dolby-E or Dolby-D.

Electrical Back Module

The PT-MADI4C-OBG output module has a built-in electrical back module that provides 4 BNC connectors (there are a total of 8 connectors but the last 4 are unused and covered).

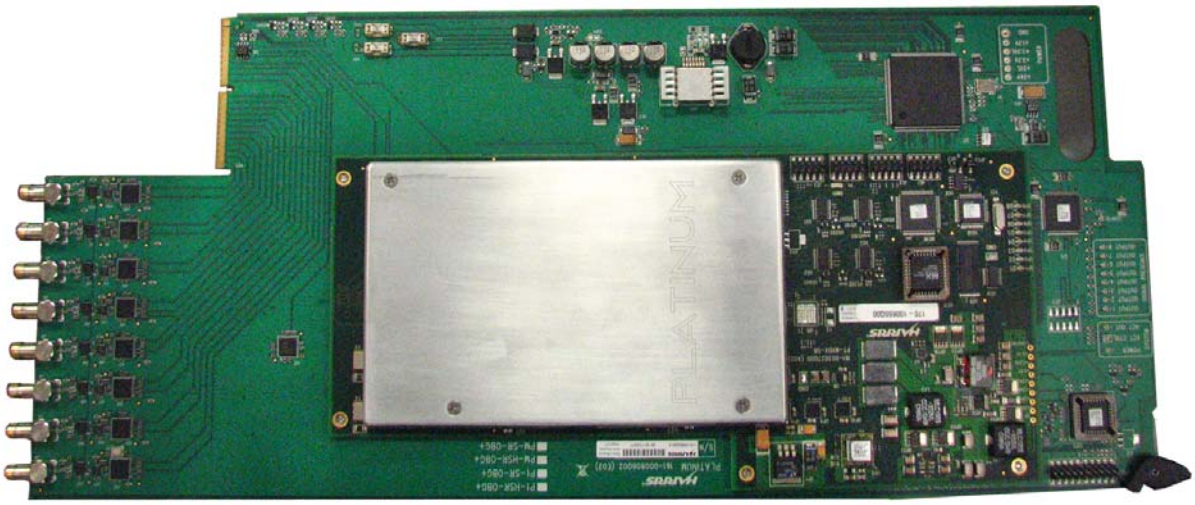


Figure 11-8 PT-MADI4C-OBG Output Module

Optical Back Module

The **PT-MADI4O-OBG** Optical (Multi-mode Fiber) SFP Back Module is same one used for the MADI Optical Input Module; break away tabs determine if the back module is to be used as input or output. The Back Module hosts the cages for up to four Dual-Rx Small Form-factor Pluggable (SFP) Fiber Optic Modules (Rx or Tx). Only two of the four 'cages' will be used. The back module has to be mounted onto the Platinum frame and the Front Module detaches from the Back Module when the Front Module is pulled out from the frame.

The **PT-MADI4O-OBG** comes pre-fitted with one MADI compliant, Dual-Tx SFP module. See **Specifications** for details.

Figure 11-9 PT-MADI4O-OBG Output Module

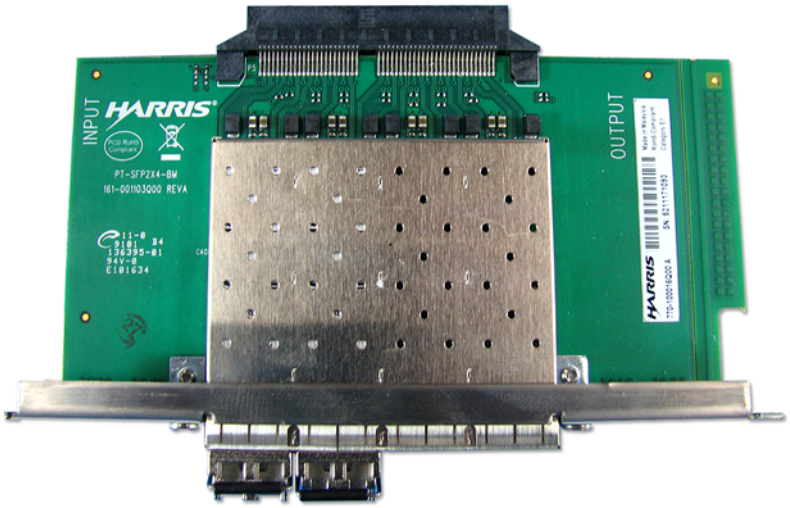
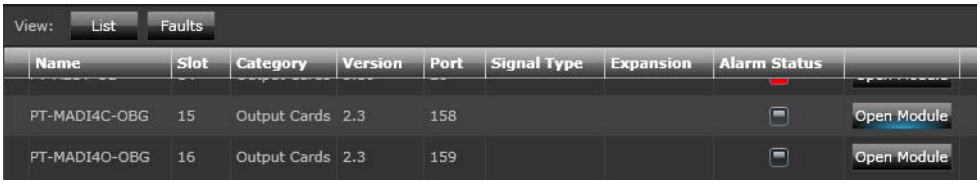


Figure 11-10 PT-MADI40-OBG Back Module

Controlling the MADI Output Module through the Controller

You can access and control **PT-MADI4x-OBG** parameters through the Controller by selecting it in the list of Output Modules and then clicking **Open Module.**



Reference Locking

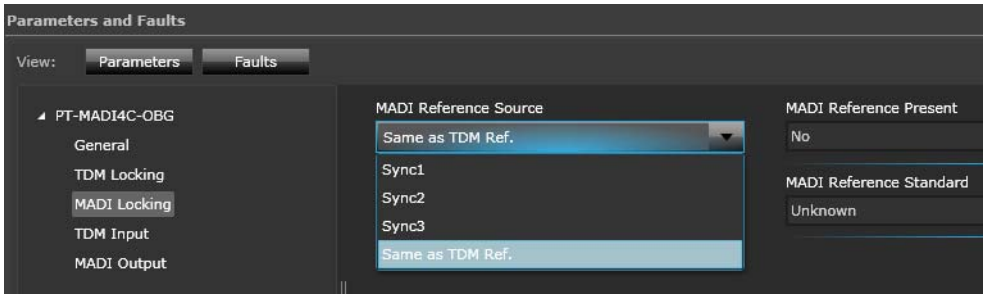
Reference locking is controlled by the following parameters:

- **TDM Reference Source** in the **TDM Locking** category (options are Sync1, Sync2, or Sync3)
- **MADI Reference source** in the **MADI Locking** category (options are Sync1, Sync2, Sync3, or Same as TDM Ref.)

By default, audio encapsulated into the MADI transport stream is locked to the same reference as the TDM receiver.

Using the TDM reference for MADI (default option)

If you select the same reference for MADI as for TDM ("Same as TDM Ref" option), non-PCM data such as Dolby-E or Dolby-D can also be encapsulated into the MADI transport stream.

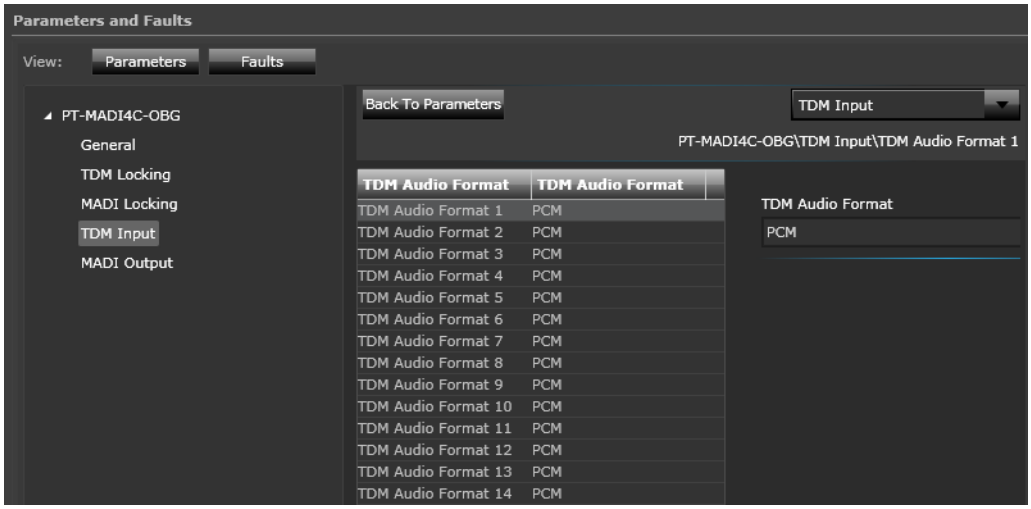


Using a separate (non-TDM) reference for MADI

If the reference signal for MADI is different than the one used for TDM locking, channels conveying non-PCM data (such as Dolby-E/D) are destroyed. Non-PCM data becomes unusable because of a sample-rate conversion process that transfers received TDM data into a new clock domain (MADI). As a workaround - for example, when you need to lock the TDM data to a video reference - lock the MADI audio data to an unrelated 48kHz DARS reference.

TDM Input

The **TDM Input** section reports on audio presence and format for each of the 128 mono audio channels that can be received by the TDM receiver. Possible Audio formats are PCM, non-PCM, Dolby-E, and Dolby-D.



TDM Output Mapping

You can map portions of the TDM stream to one or more of the four MADI outputs. The **MADI Output Format** section provides mapping options for each of the 4 MADI Outputs. You can map predefined channel ranges in chunks of 56 or 64 channels. The following options are available:

- TDM 1-56 (56 channels)
- TDM 33-88 (56 channels)
- TDM 65-120 (56 channels)
- TDM 1-64 (64 channels)
- TDM 33-96 (64 channels)
- TDM 65-128 (64 channels)

Table 11-7 Supported TDM Reference/MADI Reference combinations

TDM	MADI
Any of the supported DARS Ref. Rates	Same as TDM Ref. (= DARS Ref.)
Any of the supported DARS Ref. Rates	Any of the supported DARS Ref. Rates (can be unrelated and asynchronous to TDM DARS Ref.)
Any of the supported DARS Ref. Rates	Any of the supported Video Ref. Standards
Any of the supported Video Ref. Standards	Same as TDM Ref. (= Video Ref.)
Any of the supported Video Ref. Standards	any of the supported DARS Ref. Rates

Note: *The use of two different Video Ref. Standards (for example, TDM:525 and MADI:625) is not supported.*

Supported DARS Ref. Rates are 192kHz, 96kHz, 48kHz, 32kHz.
Supported Video Ref. Standards are 525, 625, HD tri-level sync (various formats).

Specifications

Table 11-8 Electrical Output Specifications

Item	Specification
Number of Outputs	4
Connector	BNC (IEC169-8)
Impedance	75 Ohm
Output Level	600mV
Link rate	125Mbit/s (4B5B encoded, NRZI)
Return Loss	NA

Table 11-9 Optical Output Specifications

Item	Specification
Number of Outputs	4
Fiber Type	Multi-mode (works with 50/125um or 62.5/125um cables)
Package	2x Dual Channel Transmitter SFP Modules
Connector	LC with PC/UPC polish
Center Wavelength	1300nm
Output Power	-19dBm to -12dBm
Distance	up to 2000m
Extinction Rate	8.2dB (min)
Link rate	125Mbit/s (4B5B encoded, NRZI)
Qualified Devices	Optoway SPM-3102W-2TG
Laser Safety	Class 1 Laser Product

Power Consumption

Table 11-10 PT-MADI4C-OBG Power Consumption

Power Consumption	22W (includes front module and back module)

Table 11-11 PT-MADI4O-OBG Power Consumption

Power Consumption	25W (includes front module and back module - 2x Dual Tx SFPs)

PT-MADI4X-OBG Parameters

Note: *SFP Parameters are applicable to the Optical module only.*

Table 11-12 PT-MADI4X-OBG Output parameters

Path	Parameter Name	Description	Options
General	Serial Number (RO)	Displays the module's unique identifier.	<String>
	Submodule Temperature (RO)	Indicates the temperature of the FPGA	<String> in Degrees Celsius
	TDM Error Enable	For in-field diagnostics only	**No** Yes
	TDM Error Count (RO)	For in-field diagnostics only	TDM Error count
	Submodule Firmware Version (RO)	Indicates MC software version	<String>
	Submodule FPGA Version (RO)	Indicates FPGA firmware version	<String>
SFP	Wavelength <1-4> *(Table Parameter)*	Reports wavelength of fiber optical output	■ N/A ■ 1300
	Laser Status <1-4> *(Table Parameter)*	Reports laser status	■ Enabled ■ Disabled ■ N/A ■ Normal ■ Failed
	Laser Enable <1-4> *(Table Parameter)*	Enables or disables fiber optical output	■ Yes ■ No
	SFP Type <1-2> *(Table Parameter)*	Reports type of SFP plugged in	■ OP+SFP+MADI+2 TX ■ Unknown ■ NO SFP
TDM Locking	TDM Reference Source	Selects which physical sync port the module uses for the TDM reference	**Sync1** Sync2 Sync3
	TDM Reference Present (RO)	Reports the presence of the reference signal	**No** Yes
	TDM Reference Locked (RO)	Reports the locked status of the reference signal	**No** Yes

Table 11-12 PT-MADI4X-OBG Output parameters

Path	Parameter Name	Description	Options
	TDM Reference Standard (RO)	Indicates the reference standard detected on the genlock input. Reference standards marked with an asterisk can be detected, but they cannot be used in connection with the PT-MADIxx-OBG, since the output sample rate is always 48kHz.	Unknown 525i 59.94 625i 50 720p 25 720p 29.97 720p 30 720p 50 720p 59.94 720p 60 1080p 23.98 1080p 24 1080p 29.97 1080p 30 1080p 25 1080i 50 1080i 59.94 1080i 60 1080sF 23.98 1080sF 24 DARS 192kHz DARS 96kHz DARS 88.2kHz* DARS 48kHz DARS 44.1kHz* DARS 32kHz*
MADI Locking	MADI Reference Source	Selects which physical sync port the module uses for the TDM reference	Sync1 Sync2 Sync3 **Same as TDM Ref.**
	MADI Reference Present (RO)	Reports the presence of the reference signal	**No** Yes
	MADI Reference Locked (RO)	Reports the locked status of the reference signal	**No** Yes

Table 11-12 PT-MADI4X-OBG Output parameters

Path	Parameter Name	Description	Options
	MADI Reference Standard (RO)	Indicates the reference standard detected on the genlock input. Reference standards marked with an asterisk can be detected, but they cannot be used in connection with the PT-MADIxx-OBG, since the output sample rate is always 48kHz.	Unknown 525i 59.94 625i 50 720p 25 720p 29.97 720p 30 720p 50 720p 59.94 720p 60 1080p 23.98 1080p 24 1080p 29.97 1080p 30 1080p 25 1080i 50 1080i 59.94 1080i 60 1080sF 23.98 1080sF 24 DARS 192kHz DARS 96kHz DARS 88.2kHz* DARS 48kHz DARS 44.1kHz* DARS 32kHz*
TDM Input	TDM Audio Format (x128) (RO) *(Table Parameter)*	Indicates the format of each of the 128 Audio mono channels received by the TDM Receiver	**PCM** Non-PCM Dolby-E Dolby-D
	TDM Audio Present (x128) (RO) *(Table Parameter)*	Indicates the presence of each of the 128 Audio mono channels received by the TDM Receiver	**No** Yes
MADI Output	MADI Output Format (x4)	Selects which portion of the TDM stream gets encapsulated into the MADI transport stream.	TDM 1 - 56 (56 Channels) TDM 33- 88 (56 Channels) TDM 65- 120 (56 Channels) **TDM 1 - 64 (64 Channels)** TDM 33- 96 (64 Channels) TDM 65 - 128 (64 Channels)

12 Analog/Digital Audio Converter Modules with TDM

Audio A/D Input Modules with TDM Capability (PT-ADCT-IB)

Operation

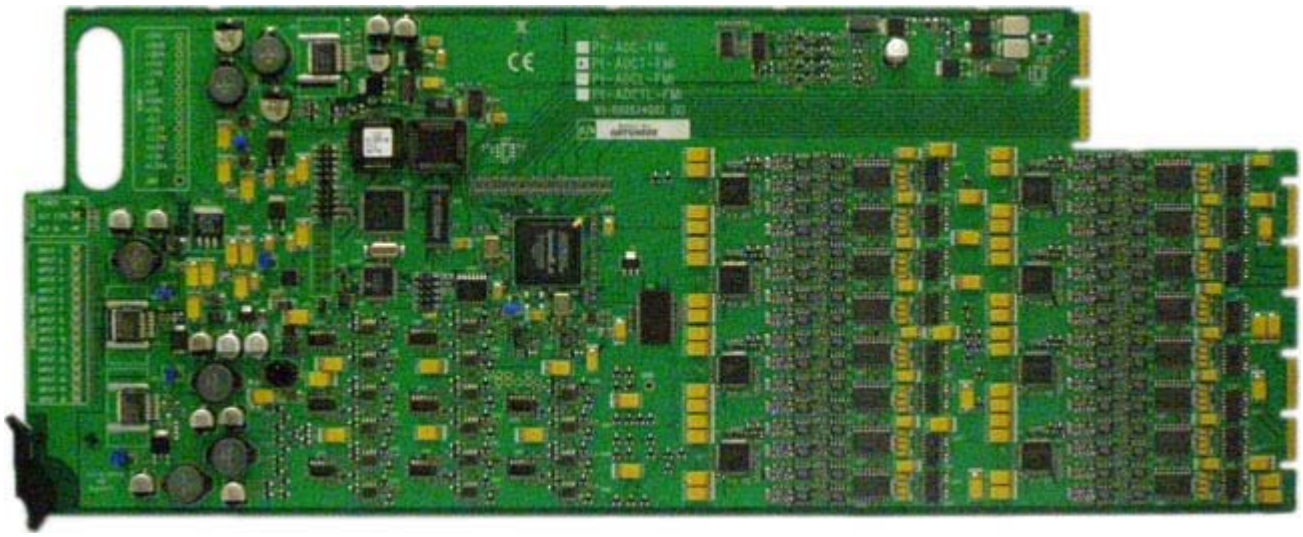


Figure 12-1 PM-ADCT-IB/PT-ADCT-IB Module

The PM-ADCT-IB/PT-ADCT-IB audio A/D input module provides analog audio to AES digital audio conversion within the Platinum routing system. Two optional builds (one option with High Z inputs, the other with 600Ω terminated inputs) provide 16 stereo channels of conversion with standard Platinum I/O module features. This option will provide the user higher conversion capacity (16 stereo channels), made available via Harris's TDM (Time Division Multiplexing) architecture.

To reduce idle channel noise in systems using A/D and D/A converters, audio level sensing circuitry is included that will mute the output (i.e., set all sample data = 0) when the analog input is lost. The level at which input signal presence is determined is user adjustable, and includes a minimal level which effectively disables the function. The duration for which this minimum amplitude is maintained before muting occurs is also user-defined.

The PM-ADCT-IB/PT-ADCT-IB can automatically detect an external AES reference signal (DARS), to derive the required sampling clocks and generate AES streams that are locked in both frequency and phase to this external reference signal. When this reference signal is absent, the PM-ADCT-IB/PT-ADCT-IB generates the necessary sampling clocks at one of several of the most common AES frame rates. Users will have the ability to adjust these internally generated sampling clock frequencies within a specified tolerance.

Analog Inputs

The PM-ADCT-IB/PT-ADCT-IB provides 16 dual channel balanced analog audio inputs via the PT-A2-BP back module. The standard option provides high impedance inputs; optional 600Ω terminated inputs are also available. Input signals are received by high-quality, audio line receivers containing internal laser-trimmed, matched resistors for maximum common mode rejection. The signals are converted from balanced to single-ended by the receivers, and are then attenuated and AC-coupled to the second stage attenuators.

Digitally controlled audio attenuators provide users with the ability to set digital full scale to a variety of analog audio levels. These low-noise, low distortion attenuators can be software controlled to provide a wide range of full scale settings.

The output signals from the second stage are then buffered and converted to differential signals in preparation for presentation to the converters, along with a gain adjustment to compensate for the first stage attenuation required prior to the digital attenuators.

The final analog stage provides low-pass filtering and the addition of a DC offset before presenting the audio signal to the A/D converter.

A/D Conversion

Analog-to-digital conversion is provided by quad channel 24-bit oversampling delta-sigma converters supporting sampling frequencies up to 192 kHz. These converters provide DC bias voltage outputs, digital decimation and high pass filtering, and audio input clipping detection.

AES Outputs

The FPGA receives the audio samples from the converters where they are formatted into AES data streams. The FPGA inserts channel status, parity, and CRC bits, and then encodes the data into biphase AES signals. Two copies of the first eight AES signals are provided as AC coupled LVDS for distribution to the wideband Platinum crosspoints. The FPGA also provides a TDM version of all sixteen AES signals for distribution to the audio-specific crosspoint module(s).

Reporting

Each channel will provide standard reporting of signal presence using card-edge mounted LEDs.

- The green signal presence LEDs, labeled “Input 1” to “Input 16,” are located in a row on the front of the input module. Each of these LEDs illuminates when a signal is detected on its corresponding input.

- The red signal clipping LEDs, labeled “Input 1” to “Input 16,” are located in a row on the front of the input module. Each of these LEDs illuminates when a signal on the input exceeds the maximum input amplitude or level adjust available through TDM scales the digital signal beyond AES limits.

In addition, the usual three system LEDs are included.

Operating Modes

The PM-ADCT-IB/PT-ADCT-IB operates in one of three modes: External, internal, and auto mode:.

- In external mode, all necessary sampling clocks are derived from an external AES reference (DARS). The resulting AES streams generated from the sampled analog audio inputs will be locked in both frequency and phase to this external reference.
- In internal mode, all necessary sampling clocks are derived from internal oscillators. These oscillators have been chosen to provide for many of the most common AES frame rates (32 kHz, 44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz, and 192 kHz). Voltage-controlled crystal oscillators, or VCXOs, allow adjustment of these internally generated sampling clocks within a specified tolerance.
- In auto mode, the PM-ADCT-IB/PT-ADCT-IB detects whether a usable external reference is present or not. If it is able to lock to the reference, it will operate as described in External mode; however, if the reference is lost or becomes unusable, the PM-ADCT-IB/PT-ADCT-IB will automatically switch over to operate as described in Internal Mode. If the reference is restored, the board will again automatically switch over to operate as described in External Mode.

Analog Level Detection

Analog input level detection is provided in two forms:

- The first implementation is through the use of rectifier and comparator circuits that are used to detect a user-defined minimum signal amplitude. This minimum amplitude is conveyed via a nonvolatile, digitally controlled potentiometer that provides the reference voltage to the comparators. (The reference voltage can be individually set for channels A and B on all inputs.) If the amplitude of the input signal exceeds the comparator reference voltage, the green LED for that channel is illuminated.

  If the signal level falls below the minimum threshold for a user-defined time duration, the sampled data output from the A/D converter will be overwritten by all zeroes within the FPGA. This greatly reduces idle channel noise in systems using A/D and D/A converters. Conversely, the detection of a signal above the minimum threshold value also has an associated time duration before muting is released, providing hysteresis to this function.
- The second implementation of analog level detection is performed in the A/D converter. When the analog level exceeds the digital full-scale capability of the converter, the red Clipping LED for that channel is illuminated, and the condition is reported to the control system. The user has the option of defining whether this condition constitutes an alarm.

Back Panel I/O Module for PM-ADCT-IB/PT-ADCT-IB

The PT-A2-BP back panel I/O module corresponds to the PM-ADCT-IB and PT-ADCT-IB modules. DB-44 connectors are used on the PT-A2-BP. The optional PT-A2-DTB terminal block adapter is available to accommodate wiring of individual signals to the frame.

Figure 12-2 PT-A2-DTB Terminal Block Adapter

Installation

Input Module Installation

All input modules are installed at our manufacturing facility. If you need to purchase additional components, please contact your dealer or our Sales Department.

Back Panel I/O Module Installation

All back panel modules are installed at our manufacturing facility. If you need to purchase additional components, please contact your dealer or our Sales Department.

Control

This Module's parameters can be enabled and/or changed via CCS Navigator or the IP3 Controller.

Controllable Parameters

Table 12-1 PT-ADCT-IB User-Controllable Parameters

	Parameter	Description	Options
Module	External Reference Frequency [RO]	Reports external reference frequency (NOTE: Must be a sample rate supported by TDM)	■ Unlocked ■ Out of Range ■ 192 kHz ■ 96 kHz ■ 88.2 kHz ■ 48 kHz ■ 44.1 kHz ■ 32 kHz
	Ext. Reference CRC Error	Reports CRC error on external reference	■ No ■ Yes
	Ext. Reference Lock Error	Reports lock error on external reference	■ No ■ Yes
	Ext. Reference Validity Error	Reports validity error on external reference	■ No ■ Yes

Table 12-1 PT-ADCT-IB User-Controllable Parameters

	Parameter	Description	Options
	Ext. Reference Confidence Error	Reports confidence error on external reference	■ No ■ Yes
	Ext. Reference Biphase Error	Reports biphase error on external reference	■ No ■ Yes
	Ext. Reference Parity Error	Reports parity error on external reference	■ No ■ Yes
	Bypass (1-16) *(Table Parameter)*	For signals routed to wideband crosspoint only - tells control to make switch regardless of signal presence	■ No bypass ■ Ignore signal presence
	Operating Mode	Sets PM-ADCT-IB/PT-ADCT-IB operating mode	■ Auto mode ■ Internal mode ■ External mode
	0dBFS setting	Sets 0 dBFS setting for analog to digital conversion	13 dB to 28 dB in 1 dB increments
	Presence Hysteresis (1-16)	Sets the time duration between acquisition of signal presence and release of audio muting	7.5 ms to 32.76 s in 500 ns steps
	Silence Delay (1-16)	Sets time duration between loss of signal presence and audio muting	7.5 ms to 32.76 s in 500 ns steps
	Silence Disable (1-8)	Disables feature of generating AES silence when signal is not present (wideband mode only)	■ No ■ Yes
	Threshold (1-8)	Sets signal presence threshold (all inputs)	0x00 to 0x7F
	Sample Frequency Adjust	Adjusts internal mode sampling frequency	0x00 to 0xFF
	Sampling Frequency Select	Sets the sampling frequency when in internal mode	■ 32 kHz ■ 44.1 kHz ■ 48 kHz ■ 88.2 kHz ■ 96k Hz ■ 192 kHz
	Audio Reference	Selects AES reference input for source	■ Sync 4 ■ Sync 3 ■ Sync 2 ■ Sync 1
	Parameter Hysteresis	Sets hysteresis for parameters needing it	0 to 5 seconds in 500 ns steps
	Sync Select		■ Sync 4 ■ Sync 3 ■ Sync 2 ■ Sync 1

Table 12-1 PT-ADCT-IB User-Controllable Parameters

	Parameter	Description	Options
In	Crosspoint Type	Determines crosspoint matrix requirement	■ TDM XPT ■ Wideband ■ Both TDM and wideband ■ Undefined
	Level Adjust (1-32)	Indicates gain/attenuation applied to mono channel	10dB to -30dB in 0.5dB increments
	Signal Presence (1-16) [RO]	Reports presence or absence of valid signal (determined by signal presence threshold, signal absence before mute, signal presence before mute release, and tone generation)	■ Signal absent ■ Signal present
	Ch. A Presence (1-16)	Reports absence or presence of a signal on Channel A	■ Absent ■ Present
	Ch. B Presence (1-16)	Reports absence or presence of a signal on Channel B	■ Absent ■ Present
	Phase Alarm (1-16) [RO]	Alarm set if left and right channels are out of phase	■ No phase error ■ Phase error
	Clip Detect (1-32) [RO]	Reports if signal on the input exceeds the maximum input amplitude	■ Signal OK ■ Signal clipping
	Polarity Reversal (1-32)	Reverses + and - to correct audio polarity in the analog domain	■ Normal polarity ■ Invert polarity
	Tone	Indicates type of tone to send out AES output	■ Pass input ■ Silence ■ 500Hz ■ 1K
	Swap/Copy (1-16)	Swap/Copy left and right audio channels (NOTE: This parameter is always applied after summing)	■ No swap ■ Swap left and right ■ Copy left to right ■ Copy right to left
	Summing (1-16)	Add left and right audio samples, and then divide by 2 (NOTE: This parameter is always applied before swap/copy)	■ No summing ■ Right to left ■ Left to right ■ Both

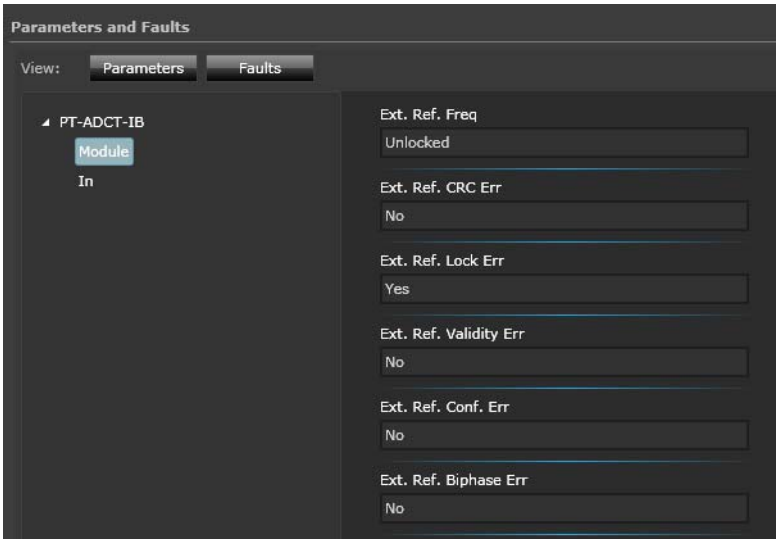


Figure 12-3 PT-ADCT Parameters

Functional Block Diagram

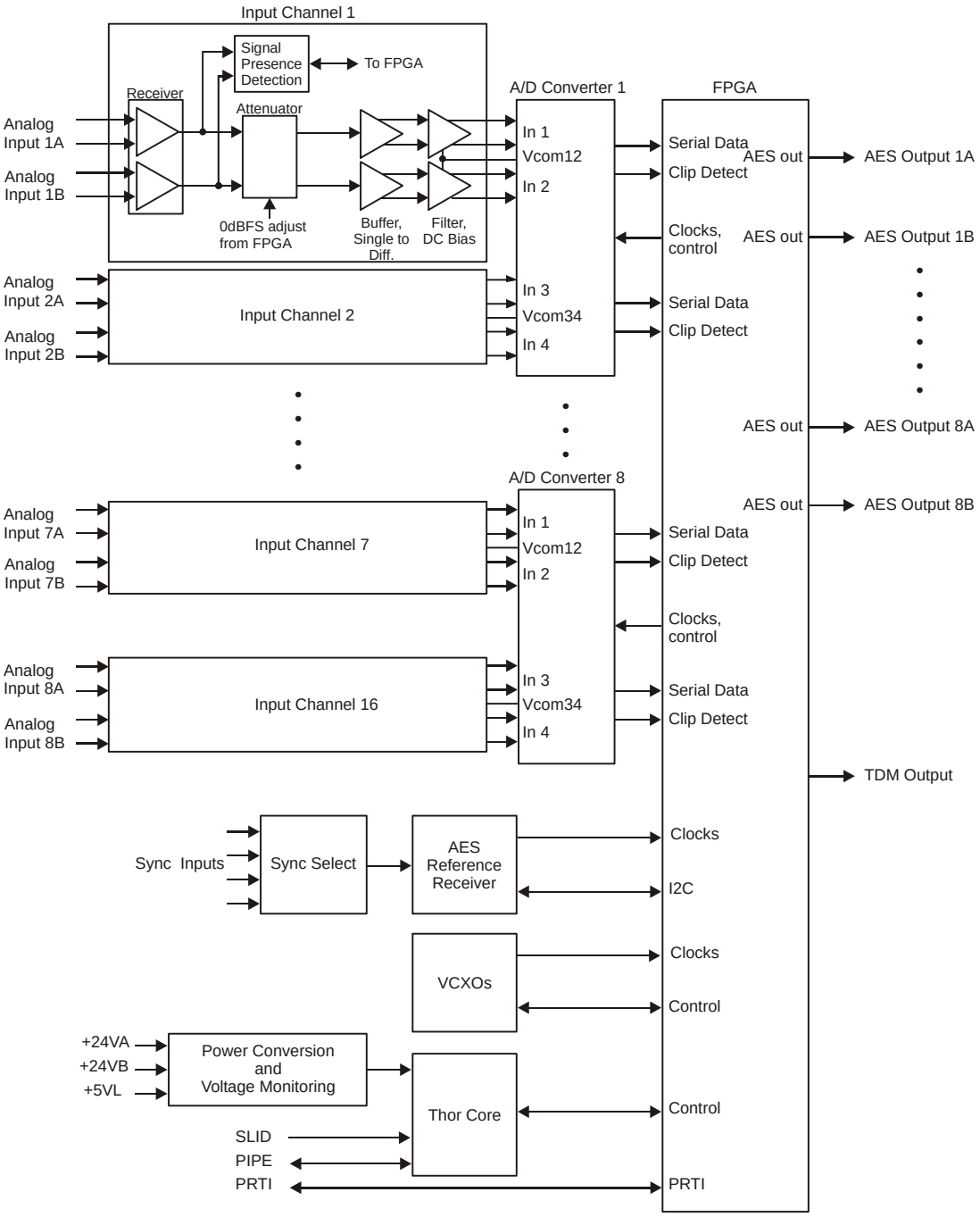
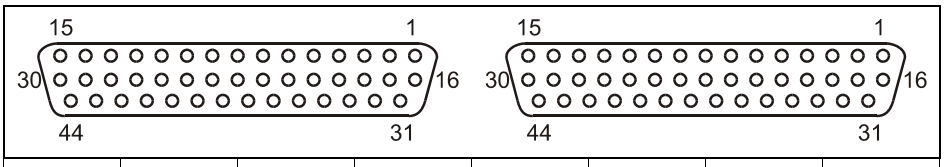


Figure 12-4 PM-ADCT-IB/PT-ADCT-IB Functional Block Diagram

Pinout Diagram

Table 12-2 PT-ADCT-IB Pinout Information



Inputs 1 – 4	DB-44 Pin No.	Inputs 5 – 8	DB-44 Pin No.	Inputs 9 – 12	DB-44 Pin No.	Inputs 13 – 16	DB-44 Pin No.
1A+	15	5A+	8	9A+	15	13A+	8
1A-	30	5A-	7	9A-	30	13A-	7
1A Gnd	44	5A, 6A Gnd	22	9A Gnd	44	13A, 14A Gnd	22
1B+	43	5B+	36	9B+	43	13B+	36
1B-	28	5B-	21	9B-	28	13B-	21
1B Gnd	42	5B Gnd	35	9B Gnd	42	13B Gnd	35
2A+	14	6A+	6	10A+	14	14A+	6
2A-	13	6A-	5	10A-	13	14A-	5
2A Gnd	29	6B+	34	10A Gnd	29	14B+	34
2B+	41	6B-	19	10B+	41	14B-	19
2B-	26	6B, 7A Gnd	20	10B-	26	14B, 15A Gnd	20
2B Gnd	40	7A+	4	10B Gnd	40	15A+	4
3A+	12	7A-	3	11A+	12	15A-	3
3A-	11	7B+	32	11A-	11	15B+	32
3A Gnd	27	7B-	17	11A Gnd	27	15B-	17
3B+	24	7B Gnd	33	11B+	24	15B Gnd	33
3B-	39	8A+	1	11B-	39	16A+	1
3B, 4A Gnd	25	8A-	2	11B, 12A Gnd	25	16A-	2
4A+	10	8A, 8B Gnd	18	12A+	10	16A, 16B Gnd	18
4A-	9	8B+	31	12A-	9	16B+	31
4B+	23	8B-	16	12B+	23	16B-	16
4B-	38			12B-	38		
4B Gnd	37			12B Gnd	37		

Specifications

Specifications and designs are subject to change without notice.

Table 12-3 PT-ADCT-IB Analog to Digital Audio Input – Standard Version
Unless otherwise noted, all specifications are measured using a 48 kHz sampling rate

Item	Specification
Number of inputs	16
Input type	Balanced
Input connector	DB-44
Impedance	> 20kΩ
Signal type	Stereo analog audio
Maximum input amplitude	+28 dBu

Table 12-3 PT-ADCT-IB Analog to Digital Audio Input – Standard Version
Unless otherwise noted, all specifications are measured using a 48 kHz sampling rate

Item	Specification
Full scale adjustment range	0 dBFS = +13 dBu to +28 dBu in 1 dB steps, ± 0.5 dB
CMRR	> 75dB rejection @ 60Hz
Conversion type	128x oversampling, 1-bit, delta-sigma
Resolution	24 bits
Sampling rates	32 kHz – 192 kHz using external AES reference 32 kHz, 44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz, or 192 kHz using internal oscillators
Gain stability	± 0.01 dB
Frequency response	± 0.15 dB, 20 Hz to 20 kHz
Linearity deviation	< ± 0.5 dB typical < ± 1.0 dB worst case
THD+N	< 0.01% @ 997 Hz, –1 dBFS = +23 dBu
Idle channel noise	< –100 dBFS CCIR-RMS, typical < –90 dBFS CCIR-RMS, worst case
Dynamic range	> 100 dB CCIR-RMS, typical > 90 dB CCIR-RMS, worst case
Crosstalk	> 90 dB isolation, 20 Hz to 20 kHz, all hostile (hostile channels driven at –1 dBFS = +23 dBu)

Table 12-4 PT-ADCT-IB Analog to Digital Audio Input – 600Ω Version
Unless otherwise noted, all specifications are measured using a 48 kHz sampling rate

Item	Specification
Number of inputs	16
Input type	Balanced
Input connector	DB-44
Impedance	600Ω
Signal type	Stereo analog audio
Maximum input amplitude	+22 dBm
Full scale adjustment range	0 dBFS = +7 dBm to +22 dBm in 1 dB steps, ± 0.5 dB
CMRR	> 60 dB rejection @ 60Hz
Conversion type	128x oversampling, 1-bit, delta-sigma
Resolution	24 bits

Table 12-4 PT-ADCT-IB Analog to Digital Audio Input – 600Ω Version
Unless otherwise noted, all specifications are measured using a 48 kHz sampling rate

Item	Specification
Sampling rates	32 kHz – 192 kHz using external AES reference 32 kHz, 44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz, or 192 kHz using internal oscillators
Gain stability	± 0.01 dB
Frequency response	± 0.15 dB, 20 Hz to 20 kHz
Linearity deviation	< ± 0.5 dB typical < ± 1.0 dB worst case
THD+N	< 0.01% @ 997 Hz, –1 dBFS = +17 dBm
Idle channel noise	< –100 dBFS CCIR-RMS, typical < –90 dBFS CCIR-RMS, worst case
Dynamic range	> 100 dB CCIR-RMS typical > 90 dB CCIR-RMS worst case
Crosstalk	> 90 dB isolation, 20 Hz to 20 kHz, all hostile (hostile channels driven at –1 dBFS = +17 dBm)

Power Consumption

Table 12-5 PT-ADCT-IB Power Consumption

Power Consumption	24.7W

AES to Analog Audio Converter Output Modules with TDM Capability (PT-DACT-OB)

Operation

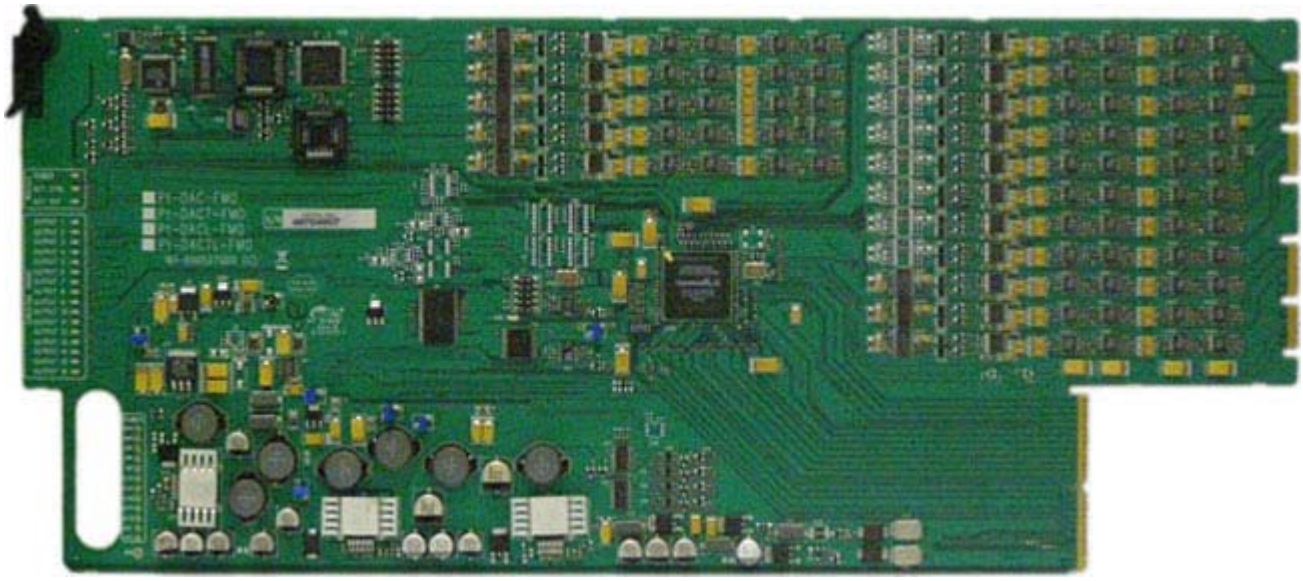


Figure 12-5 PT-DACT-OB Module

The PT-DACT-OB audio D/A output module provides the platform for AES digital to analog audio conversion within the Platinum routing system. The TDM option provides 16 channels of conversion with enhanced Platinum I/O module features. The PT-DACT-OB provides greater conversion capacity, made available via Time Division Multiplexing (TDM).

Back Panel I/O Module for PT-DACT-OB

The PT-A2-BP back panel I/O module corresponds to the PT-DACT-OB module. DB-44 connectors are used on the PT-A2-BP. The optional PT-A2-DTB terminal block adapter is available to accommodate wiring of individual signals to the frame.

Figure 12-6 PT-A2-DTB Terminal Block Adapter

Installation

Output Module Installation

All output modules are installed at our manufacturing facility. See ***Installing Input and Output Modules*** on page 363 for the procedure for field expansion or replacement of output modules. If you need to purchase additional components, please contact your dealer or our Sales Department.

Back Panel I/O Module Installation

All back panel modules are installed at our manufacturing facility. If you need to purchase additional components, please contact your dealer or our Sales Department.

Control

This Module's parameters can be enabled and/or changed via CCS Navigator or the IP3 Controller.

Controllable Parameters

PT-DACT-OB User-Controllable Parameters List [RO] = Read-only parameter

	Parameter	Description	Options
Out	Tone (1-16) *(Table Parameter)*	Indicates type of tone to send out AES output	■ Pass input ■ Silence ■ 500Hz ■ 1K
	Polarity Reversal (1-32) *(Table Parameter)*	Reverses + and - to correct audio polarity in the analog domain	■ Normal polarity ■ Invert polarity
	Crosspoint Type	Determines crosspoint matrix requirement	■ TDM XPT ■ Wideband
	Lock Detect (1-16) [RO] *(Table Parameter)*	Reports if data is re-locked by reclocking stage	■ Not locked ■ Locked
	Phase Alarm (1-16) *(Table Parameter)*	Alarm set if right and left channels are out of phase	■ No phase error ■ Phase error
	Clip Detect (1-16) [RO] *(Table Parameter)*	Reports if signal on the input exceeds the maximum input amplitude	■ Signal OK ■ Signal clipping
	Audio Mute (1-16) *(Table Parameter)*	Sets mute for any data passing reclocking stage	■ Muted ■ Unmuted
	Swap/Copy (1-16) *(Table Parameter)*	Swap/Copy left and right audio channels (NOTE: This parameter is always applied after summing)	■ No swap ■ Swap left and right ■ Copy left to right ■ Copy right to left
	Level Adjust (1-32) *(Table Parameter)*	Indicates gain/attenuation applied to mono channel	1 0dB to -30 dB in 0.5 dB increments
	Summing (1-16) *(Table Parameter)*	Add left and right audio samples, divide by 2 (NOTE: This parameter is always applied before swap/copy)	■ No summing ■ Right to left ■ Left to right ■ Both
	Transition (1-16) *(Table Parameter)*	Determines type of transition on a given destination	■ Quiet switch ■ V-fade ■ Fade/cut ■ Cut/fade ■ Synchronous switch
	Duration (1-16) *(Table Parameter)*	Determines transition length	■ No duration ■ Shortest ■ Short ■ Medium short ■ Medium ■ Medium long ■ Long ■ Longest

PT-DACT-OB User-Controllable Parameters List [RO] = Read-only parameter

	Parameter	Description	Options
Module	Audio Reference	Selects AES reference input for source	■ Sync 4 ■ Sync 3 ■ Sync 2 ■ Sync 1
	Parameter Hysteresis	Sets hysteresis for parameters needing it	0 to 5 seconds in 500 ns steps
	Sync Select	Selects one of the four sync inputs as the external reference	■ Sync 4 ■ Sync 3 ■ Sync 2 ■ Sync 1
	0dBFS Setting	Sets 0 dBFS level for digital to analog conversion	13 dB to 28 dB in 1 dB increments

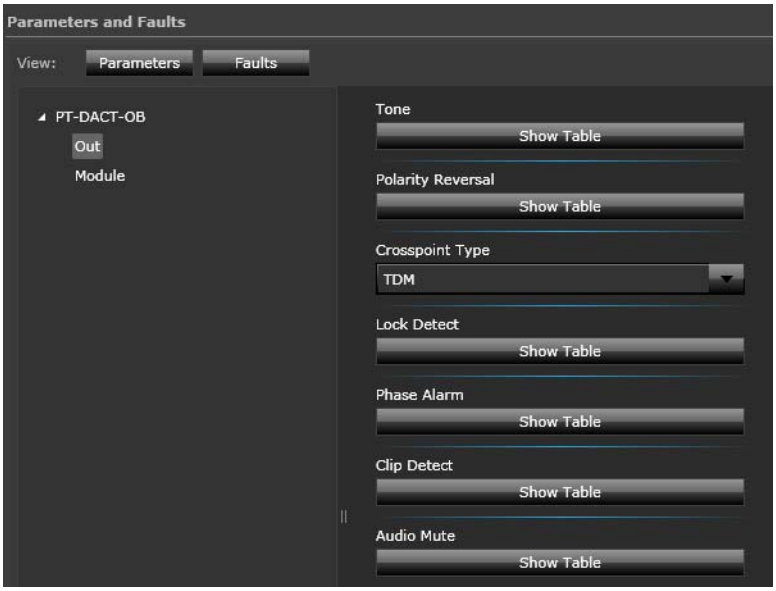


Figure 12-7 PT-DACT-OB Parameters

Functional Block Diagram

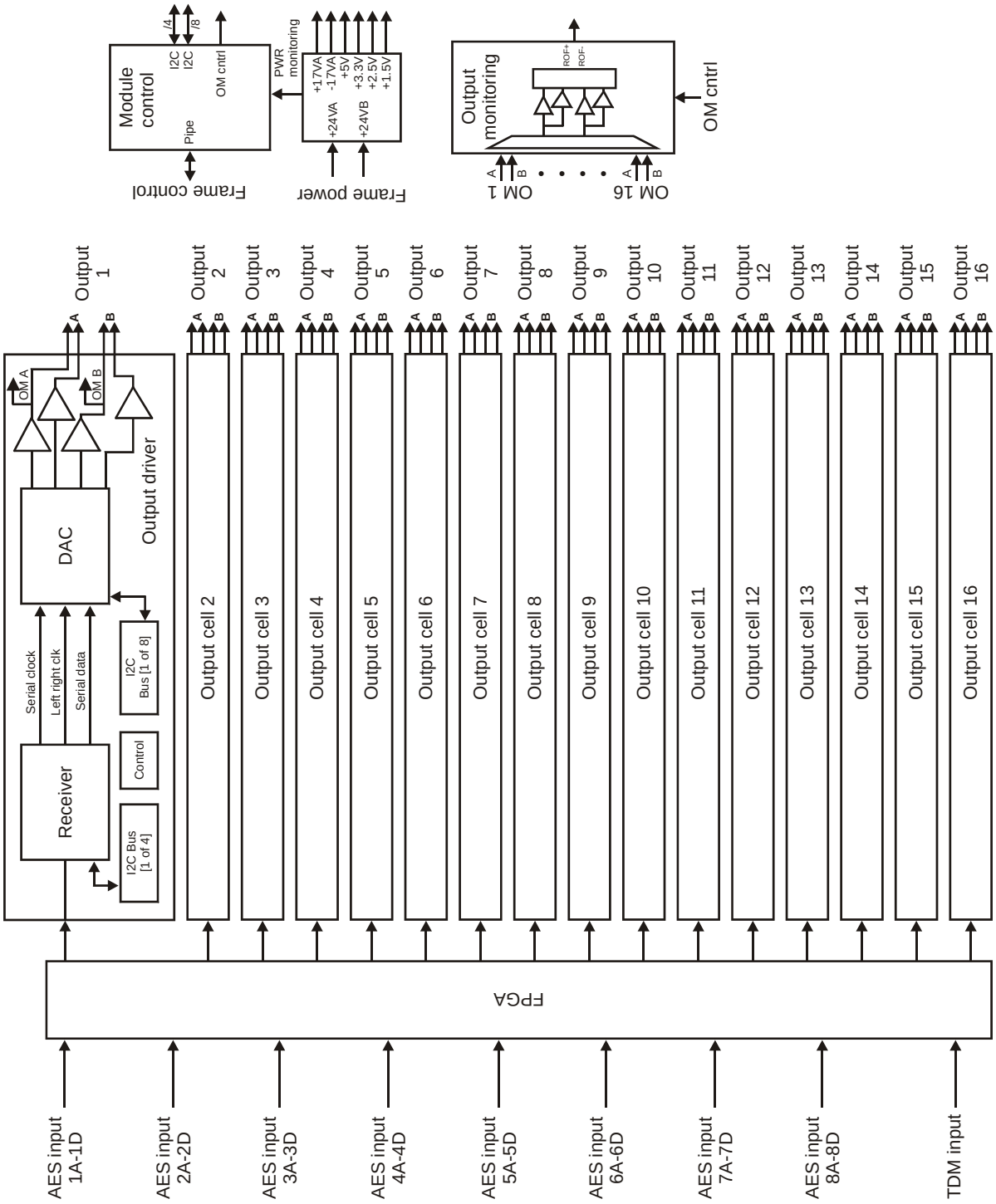
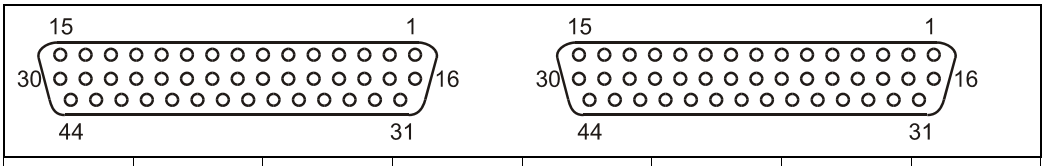


Figure 12-8 PM-DACT-OB/PT-DACT-OB Functional Block Diagram

Pinout Diagram

Table 12-6 PT-DACT-OB Pinout Information



Outputs 1 – 4	DB-44 Pin No.	Outputs 5 – 8	DB-44 Pin No.	Outputs 9 – 12	DB-44 Pin No.	Outputs 13 – 16	DB-44 Pin No.
1A+	15	5A+	8	9A+	15	13A+	8
1A-	30	5A-	7	9A-	30	13A-	7
1A Gnd	44	5A, 6A Gnd	22	9A Gnd	44	13A, 14A Gnd	22
1B+	43	5B+	36	9B+	43	13B+	36
1B-	28	5B-	21	9B-	28	13B-	21
1B Gnd	42	5B Gnd	35	9B Gnd	42	13B Gnd	35
2A+	14	6A+	6	10A+	14	14A+	6
2A-	13	6A-	5	10A-	13	14A-	5
2A Gnd	29	6B+	34	10A Gnd	29	14B+	34
2B+	41	6B-	19	10B+	41	14B-	19
2B-	26	6B, 7A Gnd	20	10B-	26	14B, 15A Gnd	20
2B Gnd	40	7A+	4	10B Gnd	40	15A+	4
3A+	12	7A-	3	11A+	12	15A-	3
3A-	11	7B+	32	11A-	11	15B+	32
3A Gnd	27	7B-	17	11A Gnd	27	15B-	17
3B+	24	7B Gnd	33	11B+	24	15B Gnd	33
3B-	39	8A+	1	11B-	39	16A+	1
3B, 4A Gnd	25	8A-	2	11B, 12A Gnd	25	16A-	2
4A+	10	8A, 8B Gnd	18	12A+	10	16A, 16B Gnd	18
4A-	9	8B+	31	12A-	9	16B+	31
4B+	23	8B-	16	12B+	23	16B-	16
4B-	38			12B-	38		
4B Gnd	37			12B Gnd	37		

Specifications

Specifications and designs are subject to change without notice.

Table 12-7 PT-DACT-OB Digital to Analog Audio Output – Standard Version

Item	Specification
Number of outputs	16
Output type	Balanced
Output connector	DB-44
Impedance	66Ω
Signal type	Stereo analog audio
Maximum output amplitude	+28 dBu
Full scale adjustment range	0 dBFS = +13 dBu to +28 dBu in 1 dB steps, ± 0.5 dB
DC offset	0V ± 0.05V
Conversion type	128x oversampling, fifth-order, delta-sigma
Resolution	24 bits
AES frame rates	32 kHz – 192 kHz
Gain stability	± 0.01 dB
Frequency response	± 0.25 dB, 20 Hz to 20 kHz
Linearity deviation	< ±0.5 dB
THD+N	< 0.01% @ 997 Hz, -1 dBFS = +23 dBu
Idle channel noise	< -100 dBFS CCIR-RMS
Dynamic range	> 100 dB CCIR-RMS
Crosstalk	> 90 dB isolation, 20 Hz to 20 kHz, all hostile, typical (hostile channels driven at –1 dBFS = +23 dBu)

Table 12-8 PT-DACT-OB Digital to Analog Audio Output – 600Ω Version

Item	Specification
Number of outputs	16
Output type	Balanced
Output connector	DB-44
Impedance	600Ω
Signal type	Stereo analog audio
Maximum output amplitude	+22 dBm
Full scale adjustment range	0 dBFS = +7 dBm to +22 dBm in 1 dB steps, ± 0.5 dB
DC offset	0 V ± 0.05 V
Conversion type	128x oversampling, fifth-order, delta-sigma
Resolution	24 bits
AES frame rates	32 kHz – 192 kHz
Gain stability	± 0.01 dB
Frequency response	± 0.25 dB, 20 Hz to 20 kHz
Linearity deviation	< ± 0.5 dB
THD+N	< 0.01% @ 997 Hz, -1 dBFS = +17 dBm
Idle channel noise	< -100 dBFS CCIR-RMS
Dynamic range	> 100 dB CCIR-RMS
Crosstalk	> 90 dB isolation, 20 Hz to 20 kHz, all hostile, typical (hostile channels driven at –1 dBFS = +17 dBm)

Power Consumption

Table 12-9 PT-DACT-OB Power Consumption

Power Consumption	14.7W

13 AES Balanced/Coaxial Modules with TDM Capability

AES Balanced/Coaxial Input Modules with TDM Capability (PT-AEBT-IB/PT-AECT-IB)

Operation

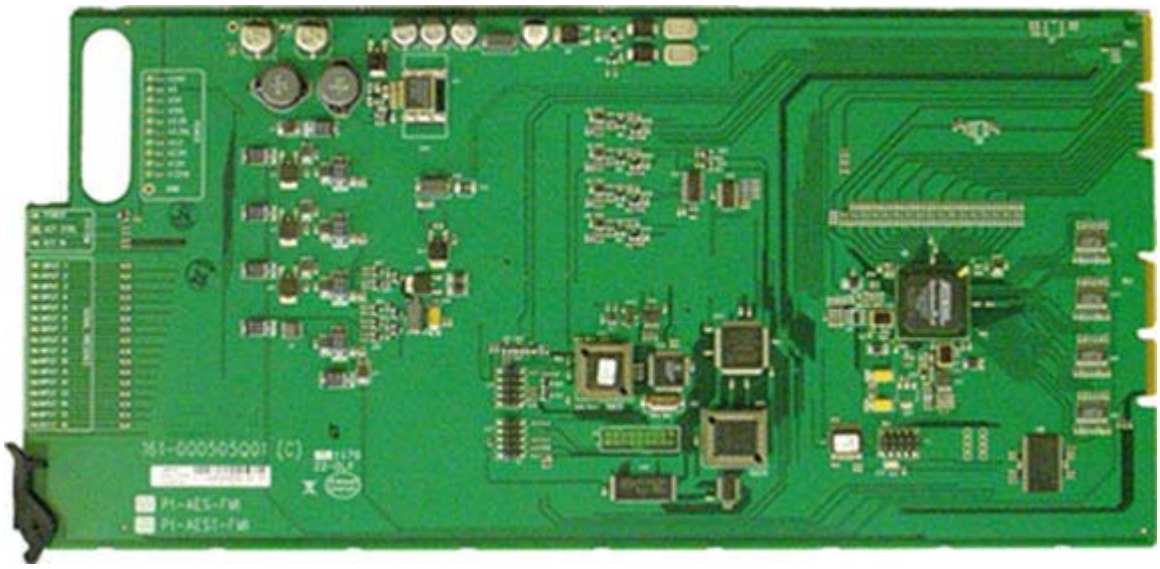


Figure 13-1 PT-AEBT-IB Module

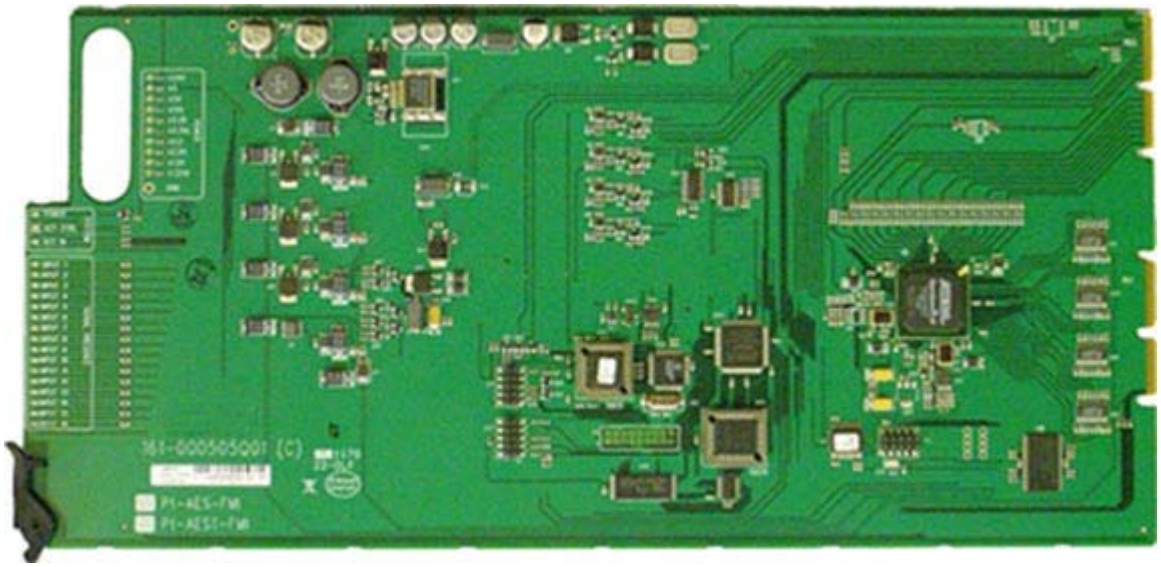


Figure 13-2 PT-AECT-IB Module

The AES input front module with TDM capability receives AES3 inputs with amplitude not exceeding 2 V from 2 Mb/s to 25 Mb/s terminated with 75Ω with the coaxial back module installed, with amplitude not exceeding 7 V from 2 Mb/s to 25 Mb/s terminated with 110Ω with the balanced back module installed. The front module recovers, reslices, and amplifies the signal before distributing it to the router's matrices. This module provides a TDM version of all input signals to be distributed to the audio-specific crosspoint module or, optionally, it can pass the first eight AES inputs to the wideband crosspoint. It allows for the connection of 16 channels of AES digital audio using either a balanced or unbalanced coaxial back module, routed within the Platinum platform. Using the optional 8- or 16-channel 110Ω balanced back module (PT-AEB-IBP), or 8- or 16-channel 75Ω coaxial unbalanced back module (PT-AEC-IBP), the AES input front module with TDM will accept up to 16 AES digital audio signals. Each of the inputs is presented to separate input buffers, which perform the basic signal recovery and internal conversion to balanced low voltage differential signals (LVDS) for use in the FPGA-based signal presence detection and router distribution circuitry. **Figure 13-5** on page 199 shows the functional block diagram for the AES input front module with TDM.

Back Panel I/O Module for PT-AEBT-IB/PT-AECT-IB

The PT-AEB-IBP back panel I/O module corresponds to the PT-AEBT-IB input modules. The PT-AEC-IBP back panel I/O module corresponds to the PT-AECT-IB input modules. DB-25 connectors are used on both the PT-AEB-IBP and PT-AEC-IBP back panel I/O modules. To provide the required BNC interface, the PT-AEC-BOC must be used in conjunction with the PT-AEC-IBP for connection to coaxial cables.

Figure 13-3 PT-AEC-BOC Cables

Installation

Input Module Installation

All input modules are installed at our manufacturing facility. If you need to purchase additional components, please contact your dealer or our Sales Department.

Back Panel I/O Module Installation

All back panel modules are installed at our manufacturing facility. If you need to purchase additional components, please contact your dealer or our Sales Department.

Control

This Module's parameters can be enabled and/or changed via CCS Navigator or the iP3 Controller.

Controllable Parameters

Table 13-1 PT-AEBT-IB/PT-AECT-IB User-Controllable Parameters List
[RO] = Read-only parameter

	Parameter	Description	Options
Module	Back Module Type	Displays the back module type connected to the PT-AEBT-IB or PT-AECT-IB module	■ PT-AEBT-BMI ■ PT-AECT-BMI ■ PT-AEB-BMI ■ PT-AEC-BMI
	Audio Reference	Selects AES reference input for source	■ Sync 4 ■ Sync 3 ■ Sync 2 ■ Sync 1
	Board Level Hysteresis	Sets hysteresis for parameters needing it	0 to 5 seconds in 500 ns steps
	Sync Select	Selects which physical sync port the module uses as a reference	■ Sync 1 ■ Sync 2 ■ Sync 3 ■ Sync 4

Table 13-1 PT-AEBT-IB/PT-AECT-IB User-Controllable Parameters List
[RO] = Read-only parameter

	Parameter	Description	Options
In	Tone (1-16) *(Table Parameter)*	Indicates type of tone to send out AES output	■ Pass input ■ Silence ■ 500 Hz ■ 1 K
	Polarity Reversal (1-32) *(Table Parameter)*	Reverses + and - to correct audio polarity in the analog domain	■ Normal polarity ■ Invert polarity
	SRC *(Table Parameter)*	Enables SRC, if licensed	■ No ■ Yes
	Signal Presence (1-16) [RO] *(Table Parameter)*	Reports presence or absence of valid signal	■ Signal absent ■ Signal present
	Phase Alarm (1-16) [RO] *(Table Parameter)*	Alarm set if left and right channels are out of phase	■ No phase error ■ Phase error
	Clip Detect (1-32) [RO] *(Table Parameter)*	Reports if signal on the input exceeds the maximum input amplitude	■ Signal OK ■ Signal clipping
	Bypass (1-16) *(Table Parameter)*	For signals routed to wideband xpt only - tells control to make switch regardless of signal presence	■ On ■ Off
	Swap/Copy (1-16) *(Table Parameter)*	Swap/Copy left and right audio channels (NOTE: This parameter is always applied after summing)	■ No swap ■ Swap left and right ■ Copy left to right ■ Copy right to left
	Level Adjust (1-32) *(Table Parameter)*	Indicates gain/attenuation applied to mono channel	10 dB to -30 dB in 0.5 dB increments
	Summing (1-16) *(Table Parameter)*	Add left and right audio samples, divide by 2 (NOTE: This parameter is always applied before swap/copy)	■ No summing ■ Right to left ■ Left to right ■ Both
Out	Crosspoint Type	Determines crosspoint matrix requirement	■ TDM XPT ■ Wideband ■ Both TDM and wideband ■ Undefined

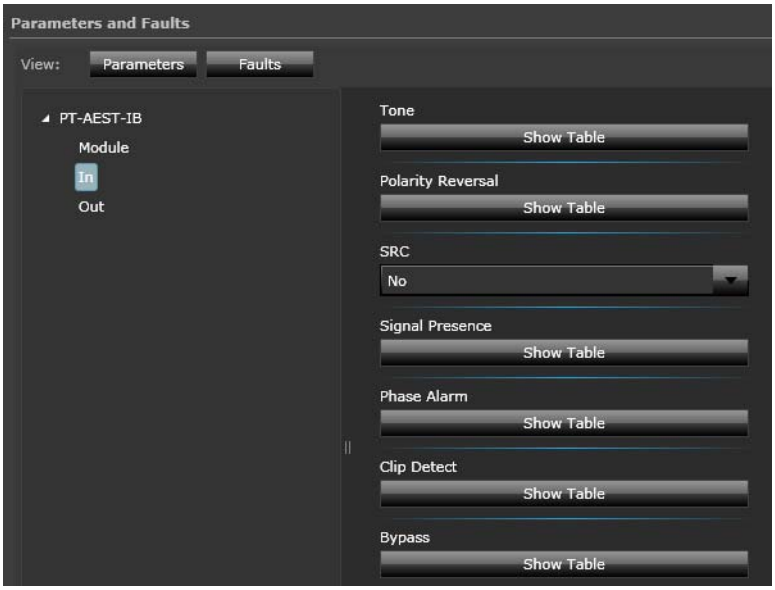


Figure 13-4 PT-AEST-IB Parameters

Functional Block Diagram

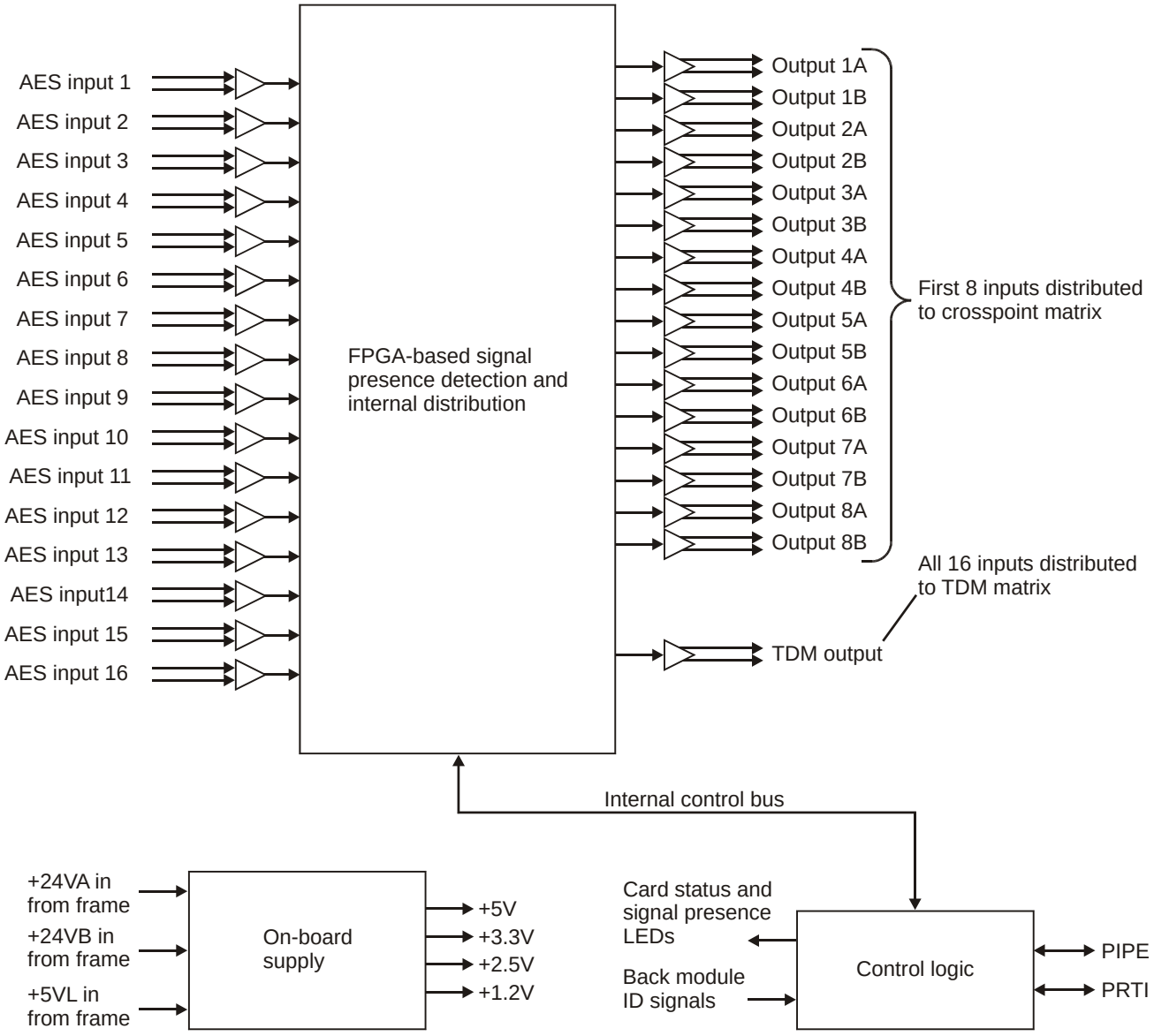


Figure 13-5 PM-AEBT-IB/PT-AEBT-IB/PM-AECT-IB/PT-AECT-IB Functional Block Diagram

Pinout Diagram

Table 13-2 PM-AEBT-IB/PT-AEBT-IB Pinout Information

J2 (Inputs 1 – 8)	DB-25 Pin No.	J1 (Inputs 9 – 16)	DB-25 Pin No.
1+	13	9+	13
1-	12	9-	12
1 Gnd	25	9 Gnd	25

Table 13-2 PM-AEBT-IB/PT-AEBT-IB Pinout Information

2+	24	10+	24
2-	23	10-	23
2 Gnd	11	10 Gnd	11
3+	10	11+	10
3-	9	11-	9
3 Gnd	22	11 Gnd	22
4+	21	12+	21
4-	20	12-	20
4 Gnd	8	12 Gnd	8
5+	7	13+	7
5-	6	13-	6
5 Gnd	19	13 Gnd	19
6+	18	14+	18
6-	17	14-	17
6 Gnd	5	14 Gnd	5
7+	4	15+	4
7-	3	15-	3
7 Gnd	16	15 Gnd	16
8+	15	16+	15
8-	14	16-	14
8 Gnd	2	16 Gnd	2
Spare Gnd	1	Spare Gnd	1

Specifications

AES Balanced Digital Audio

Specifications and designs are subject to change without notice.

Table 13-3 PT-AEBT-IB with PT-AEB-IBP for AES Balanced Digital Audio Inputs

Item	**Specification**
Number of inputs	16
Input type	Balanced, transformer coupled
Input connector	DB-25
Impedance	110Ω

Table 13-3 PT-AEBT-IB with PT-AEB-IBP for AES Balanced Digital Audio Inputs

Item	Specification
Signal type	AES3 AES frame rates 32 kHz to 192 kHz Other 40% - 60% duty cycle digital signals from 2 Mb/s to 25 Mb/s
Input amplitude	0.2 Vpp – 7 Vp-p
Nominal input amplitude	5 Vp-p ± 1 V

AES Coaxial Digital Audio

Table 13-4 PT-AECT-IB with PT-AEC-IBP for AES Coaxial Digital Audio Inputs

Item	Specification
Number of inputs	16
Input type	AC coupled
Input connector	75Ω BNC per IEC 169-8 (via adapter)
Impedance	75Ω
Signal type	AES3id, SMPTE 276M AES frame rates from 32 kHz to 192 kHz Other 40% - 60% duty cycle digital signals 2 Mb/s to 25 Mb/s
Input amplitude	0.1Vp-p to 2Vp-p
Nominal input amplitude	1.0Vp-p ± 10%
Return loss	> 30 dB, 0.1 MHz to 6 MHz > 25 dB, 6 MHz to 12 MHz

Power Consumption

Table 13-5 PT-AECT-IB/PT-AEBT-IB Power Consumption

Power Consumption	2.4W

AES Balanced/Coaxial Output Modules with TDM Capability (PT-AEBT-OB/PT-AECT-OB)

Operation

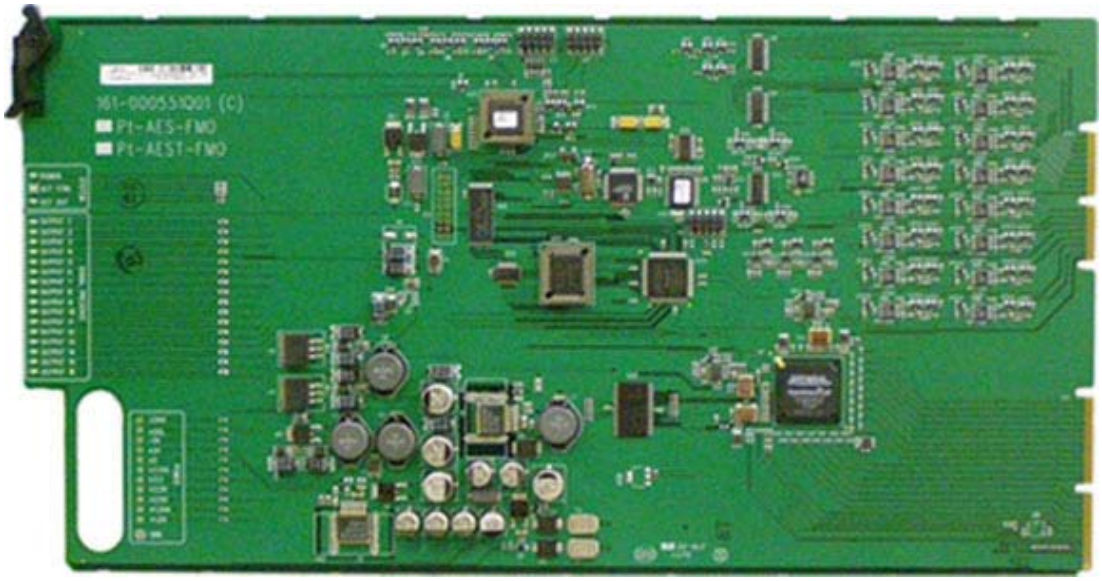


Figure 13-6 PT-AEBT-OB Module

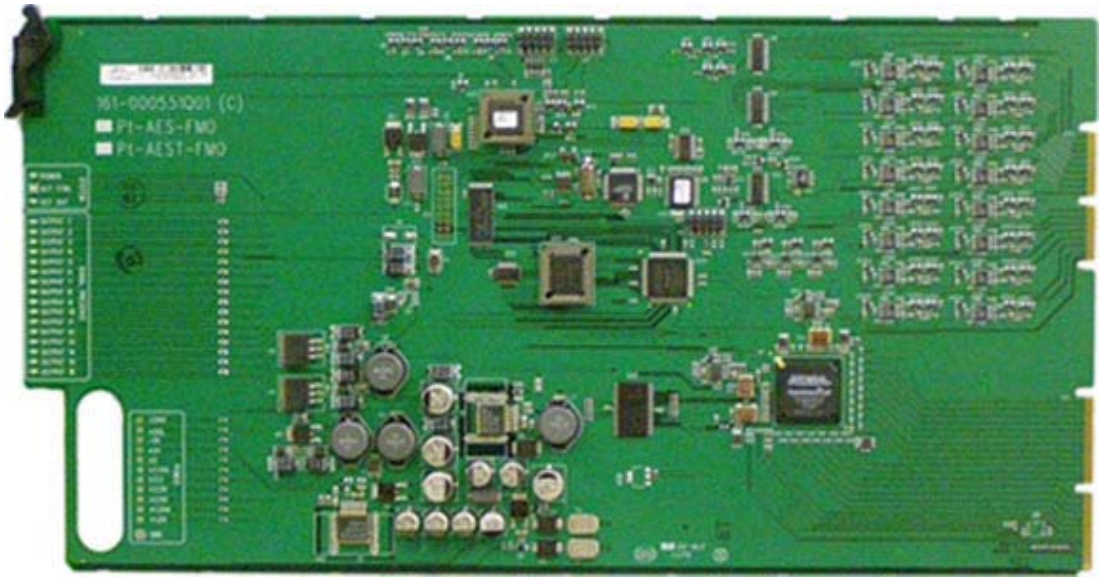


Figure 13-7 PT-AECT-OB Module

The AES TDM output module allows for the connection of 16 output channels of AES digital audio, using either a balanced or coaxial back module within the Platinum platform, and supports Time Division Multiplexed (TDM) AES routing.

Audio processing functions, as well as signal level conversion and presence detection, are handled within an FPGA-based circuit. The 16-channel TDM output module uses only one high speed LVDS signal to receive the various AES signals for presentation at the outputs.

The AES TDM output module also provides output presence detection and true output monitoring on each of the 16 channels.

Back Panel I/O Module for PT-AEBT-OB/PT-AECT-OB

The PT-AEB-OBP back panel I/O module corresponds to the PT-AEBT-OB output module. The PT-AEC-OBP back panel I/O module corresponds to the PT-AECT-OB output module. DB-25 connectors are used on the PT-AEB-OBP and PT-AEC-OBP back panel I/O modules. To provide the required BNC interface, the PT-AEC-BOC must be used in conjunction with the PT-AEC-OBP for connection to coaxial cables.

Figure 13-8 PT-AEC-BOC Cables

Installation

Output Module Installation

All output modules are installed at our manufacturing facility. If you need to purchase additional components, please contact your dealer or our Sales Department.

Back Panel I/O Module Installation

All back panel modules are installed at our manufacturing facility. If you need to purchase additional components, please contact your dealer or our Sales Department.

Control

This Module's parameters can be enabled and/or changed via CCS Navigator or the iP3 Controller.

Controllable Parameters

Table 13-6 PT-AEBT-OB/PT-AECT-OB User-Controllable Parameters List
[RO] = Read-only parameter

	Parameter	Description	Options
Module	Back Module Type	Reports coax or balanced back module	■ PT-AEBT-BMO ■ PT-AECT-BMO ■ PT-AEB-BMO ■ PT-AEC-BMO
	Audio Reference	Selects AES reference input for source	■ Sync 4 ■ Sync 3 ■ Sync 2 ■ Sync 1
	Parameter Hysteresis	Sets hysteresis for parameters needing it	0 to 5 seconds in 500 ns steps
	Sync Select	Selects which physical sync port the module uses as a reference	■ Sync1 ■ Sync2 ■ Sync3 ■ Sync4
Out	Tone (1-16)	Indicates type of tone to send out AES output	■ Pass input ■ Silence ■ 500 Hz ■ 1 K
	Polarity Reversal (1-32)	Reverses + and - to correct audio polarity in the analog domain	■ Normal polarity ■ Invert polarity
	Crosspoint Type	Determines crosspoint matrix requirement	■ TDM ■ Wideband
	Disconnect State	Select whether to transmit AES silence or a DC level when signal presence is lost	■ Silence ■ DC
	Lock Detect (1-16) [RO] *(Table Parameter)*	Reports if data is re-locked by reclocking stage	■ Not locked ■ Locked
	Phase Alarm (1-16) *(Table Parameter)*	Alarm set if right and left channels are out of phase	■ No phase error ■ Phase error
	Clip Detect (1-32) [RO] *(Table Parameter)*	Reports if signal on the input exceeds the maximum input amplitude	■ Signal OK ■ Signal clipping
	Audio Mute (1-16) *(Table Parameter)*	Sets mute for any data passing reclocking stage	■ Muted ■ Unmuted
	Swap/Copy (1-16) *(Table Parameter)*	Swap/Copy left and right audio channels (NOTE: This parameter is always applied after summing)	■ No swap ■ Swap left and right ■ Copy left to right ■ Copy right to left

Table 13-6 PT-AEBT-OB/PT-AECT-OB User-Controllable Parameters List
[RO] = Read-only parameter

	Parameter	Description	Options
	Level Adjust (1-32) *(Table Parameter)*	Indicates gain/attenuation applied to mono channel	1 0dB to -30 dB in 0.5 dB increments
	Summing (1-16) *(Table Parameter)*	Add left and right audio samples, divide by 2 (NOTE: This parameter is always applied before swap/copy)	■ No summing ■ Right to left ■ Left to right ■ Both
	Transition (1-16) *(Table Parameter)*	Determines type of transition on a given destination	■ Quiet switch ■ V-fade ■ Fade/cut ■ Cut/fade ■ Synchronous switch
	Duration (1-16) *(Table Parameter)*	Determines transition length	■ No duration ■ Shortest ■ Short ■ Medium short ■ Medium ■ Medium long ■ Long ■ Longest

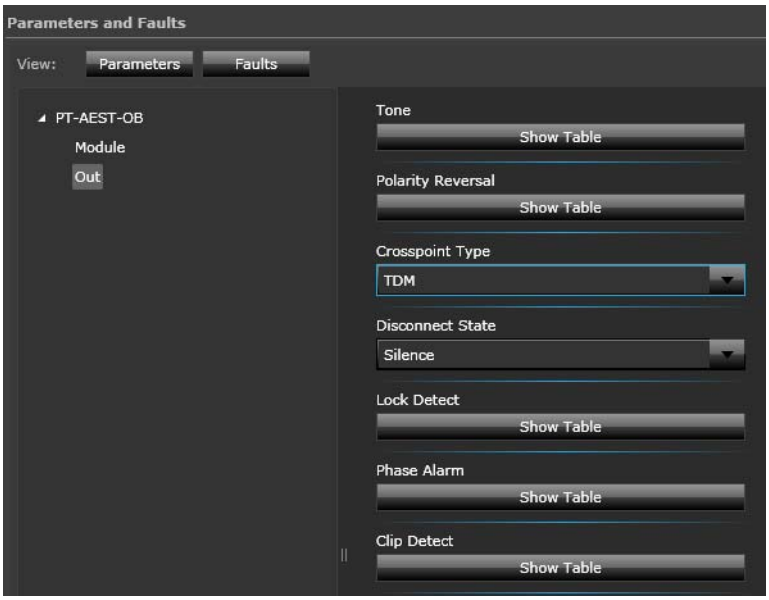


Figure 13-9 PT-AEST-OB Parameters

Functional Block Diagram

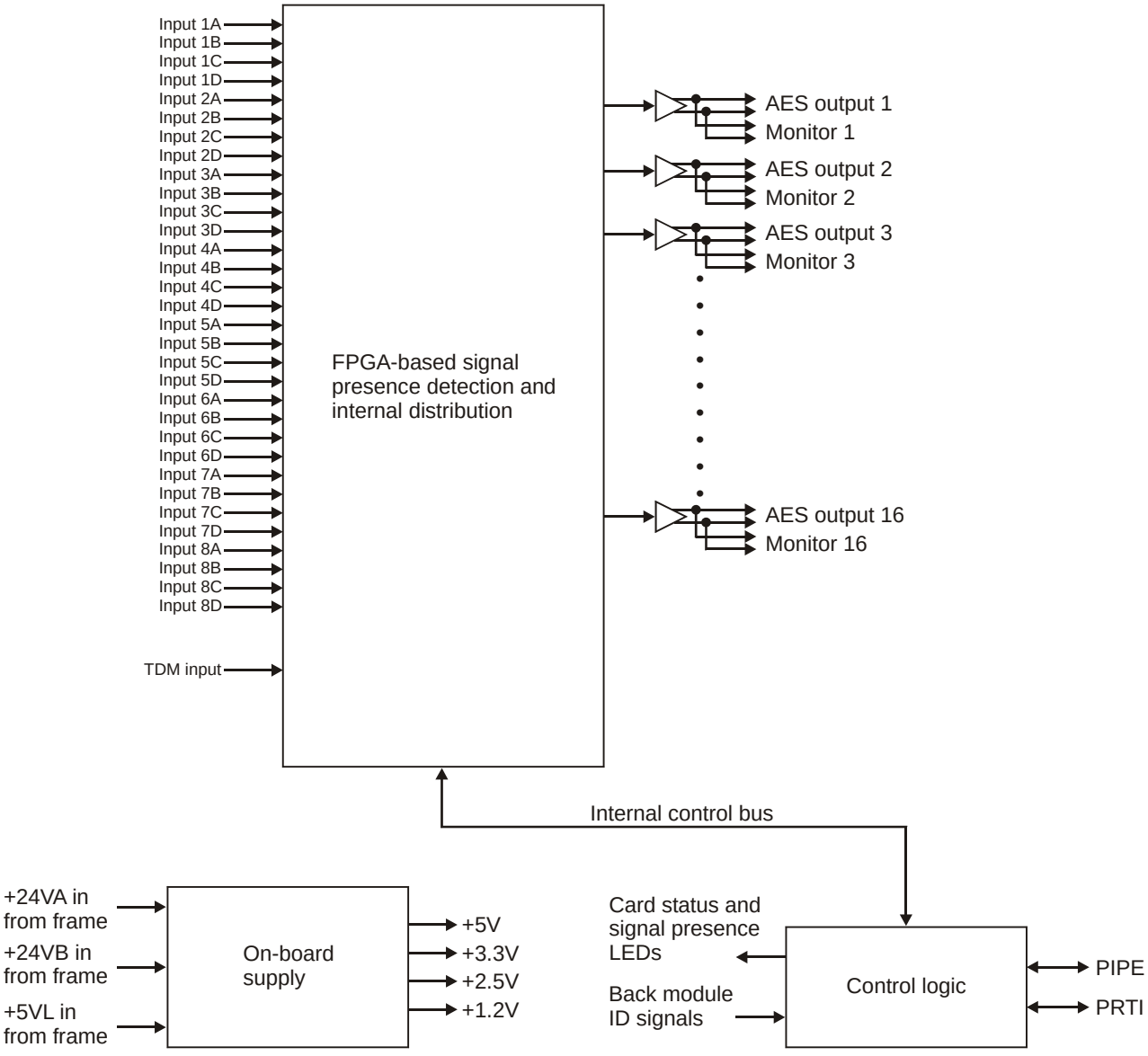
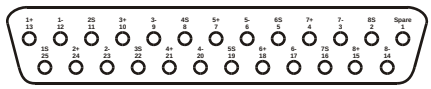
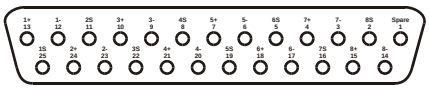


Figure 13-10 PT-AEBT-OB/PT-AECT-OB Functional Block Diagram

Pinout Diagram

Table 13-7 PM-AEBT-OB/PT-AEBT-OB Pinout Information

J2 (Outputs 1 – 8)	DB-25 Pin No.	J1 (Outputs 9 – 16)	DB-25 Pin No.
1+	13	9+	13
1-	12	9-	12
1 Gnd	25	9 Gnd	25
2+	24	10+	24
2-	23	10-	23
2 Gnd	11	10 Gnd	11
3+	10	11+	10
3-	9	11-	9
3 Gnd	22	11 Gnd	22
4+	21	12+	21
4-	20	12-	20
4 Gnd	8	12 Gnd	8
5+	7	13+	7
5-	6	13-	6
5 Gnd	19	13 Gnd	19
6+	18	14+	18
6-	17	14-	17
6 Gnd	5	14 Gnd	5
7+	4	15+	4
7-	3	15-	3
7 Gnd	16	15 Gnd	16
8+	15	16+	15
8-	14	16-	14
8 Gnd	2	16 Gnd	2
Spare Gnd	1	Spare Gnd	1

Specifications

Specifications and designs are subject to change without notice.

Table 13-8 PT-AEBT-OB AES Specifications

Item	Specification
Number of outputs	16
Output type	Balanced, transformer coupled
Output connector	DB-25
Impedance	110Ω
Signal type	AES3 AES frame rates from 32 kHz to 192 kHz Other 40% – 60% duty cycle digital signals from 2 Mb/s to 25 Mb/s
Jitter	< 5ns
Output amplitude	5 Vp-p ± 1 V into 110Ω load
DC offset	0 V ± 0.05 V
Rise/fall times	5 ns – 30 ns
Propagation delay	< 170 ns

Table 13-9 PT-AECT-OB Specifications

Item	Specification
Number of outputs	16
Output type	Unbalanced
Output connector	75Ω BNC per IEC 169-8 (via adaptor)
Impedance	75Ω
Signal type	AES3id, SMPTE 276M AES frame rates from 32 kHz to 192 kHz Other 40% – 60% duty cycle digital signals from 2 Mb/s to 25 Mb/s
Return loss	> 35 dB, 0.1 MHz to 6 MHz > 25 dB, 6 MHz to 12 MHz
Jitter	< 5 ns
Output amplitude	1.0 Vp-p ± 10% into 75Ω load
DC offset	0 V ± 0.05 V
Rise/Fall times	30 ns – 44 ns
Propagation delay	< 170 ns

Power Consumption

Table 13-10 PT-AECT-OB/PT-AEBT-OB Power Consumption

Power Consumption	6.5W

14 Analog Composite Video Modules

Analog Video to SDI Decoder Input Modules (PT-DEC-IB)

Operation

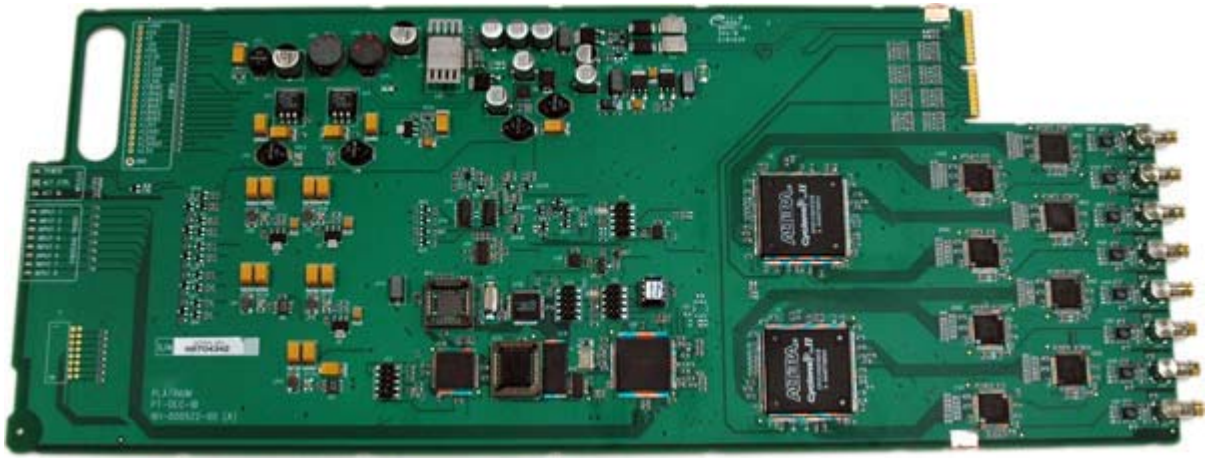


Figure 14-1 PT-DEC-IB Module

The PT-DEC-IB analog video to SDI decoder input module converts a block of eight composite NTSC or PAL video signals to high quality, 10-bit serial digital signals (SDI) for routing within the Platinum platform. This module also may be used for "analog to analog" video routing with the optional PM-ENC-OB or PT-ENC-OB encoder output module.

Hardware Reporting

Each of the eight channels will provide standard reporting of signal presence using a card-edge mounted LED in each channel for on-site troubleshooting and via the frame control system. These additional system LEDs are available:

- Power supply indicator
- Control system acknowledgment
- Input usage warning

Composite Analog Input Processing

The PT-DEC-IB accepts eight 1 Vpp analog NTSC or PAL video signals terminating into 75Ω BNC connectors. Using the built-in automatic (AGC) or manual gain settings, the input signal level can be adjusted ±6 dB in each channel to compensate for variances in upstream equipment. As well, each input is "back-porch" clamped to the proper blanking level prior to conversion in the analog to digital converter (ADC) and offers the ability to handle signals with a luminance pedestal (+7.5 IRE Setup).

Composite Analog to Digital Conversion

Once the analog clamping and level processing has taken place, each channel of video is presented to a 10-bit analog to digital converter, which is phase and frequency locked by an internal PLL. Considering that the desired conversion is to component digital on this card, the analog to digital converters are 2X oversampling at 27MHz (4:2:2 data rate of 13.5MHz times 2). As a benefit of the 2X oversampling, a half-band decimation filter is applied right after the digital conversion to reduce the data rate to 1X the pixel rate, which effectively adds up to 3dB to the overall signal to noise ratio (SNR). Although sampled at a component data rate, the digitized composite signal is band pass filtered into separate luminance and chrominance channels (Y/C). The chrominance channel is sent through a quadrature demodulator for further separation into the base component color difference channels (R - Y / B - Y). As the color demodulation process is likely to cause artifacts in the video, the R - Y and B - Y signals are sent through low-pass filters to reduce those artifacts and achieve optimum bandwidth, and through a five-line adaptive comb filter to compare possible color phase shift issues from line to line. As the next step in the color demodulation process, a color space converter is used to convert the red and blue color components to U and V color difference components (Cr/Cb) as needed for ITU-R 601i and SMPTE-125M type signals.

The RGB to YUV color space conversion is defined in the following system of equations:

- Y = 0.299R + 0.587G + 0.114B
- U = -0.172R - 0.339G + 0.511B + 512
- V = 0.511R - 0.428G - 0.083B + 512

In cases where the U/V bandwidth needs to be limited, as to prevent aliasing or chrominance crosstalk, a set of user-adjustable notch filters is provided. Although more of an issue in the companion encoder / digital to analog (DAC) cards, careful attention has to be paid to the implementation of these filters as a trade-off between frequency response and out of band noise is often encountered. In the interest of keeping the luminance or Y signal bandwidth, a peaking filter is available to the user. There are also controls for the user to set the brightness, contrast, sharpness, color saturation, and hue of the incoming video signal. Once the chrominance signals have been processed, they are reunited with the luminance (Y) channel to complete the 10-bit YUV component digital signal.

Component Digital Packaging

The parallel 10-bit component output of the ADC conversion is presented to the next process, where it is packaged with the digitized sync information and given the proper start of active video (SAV) and end of active video (EAV) headers for a SMPTE-125M compliant parallel output signal. Along with the parallel 10-bit video signal, a 27 MHz clock signal is provided for latching the data words in the downstream serializer device.

Parallel to Serial Converter

The parallel 10-bit video and clock signal are presented to the FPGA-based serializer for conversion to SMPTE-259C serial digital component video at 270 Mb/s. The 10-bit parallel word is latched into the serializer on the rising edge of the accompanying 27 MHz clock signal and serialized at 10 times the data rate (270 MB/s). As the serial data is used to clock downstream devices, the serial signal is scrambled and encoded using a non-return to zero (NRZI) algorithm to ensure that clock transitions occur during long periods of all 1s or 0s to keep the receiving PLLs locked.

The NRZI / scramble polynomial is defined as

G1 (X) = X9 + X4 + 1 and G2 (X) = X + 1

The completed NRZI serial signal is buffered into two copies of itself for distribution to the crosspoint module(s) within the frame.

Back Panel I/O Module for PM-DEC-IB/PT-DEC-IB

The PT-V-BP back panel I/O module corresponds to the PT-DEC-IB module.

Installation

Input Module Installation

All input modules are installed at our manufacturing facility. If you need to purchase additional components, please contact your dealer or our Sales Department.

Back Panel I/O Module Installation

All back panel modules are installed at our manufacturing facility. If you need to purchase additional components, please contact your dealer or our Sales Department.

Control

This Module's parameters can be enabled and/or changed via CCS Navigator or the IP3 Controller.

Controllable Parameters

Table 14-1 PT-DEC-IB User-Controllable Parameters List

	Parameter	**Description**	**Options**
Module	Parameter Hysteresis	Sets hysteresis for parameters needing it	0 to 5 seconds in 500 ns steps (**1 s**)
	Sync Select	Selects which physical sync port the module uses as a reference	■ Sync 1 ■ Sync 2 ■ Sync 3 ■ Sync 4

Table 14-1 PT-DEC-IB User-Controllable Parameters List

	Parameter	Description	Options
In	Signal Presence (1-8) [RO] *(Table Parameter)*	Reports presence or absence of valid input signal	■ Signal absent ■ Signal present
	Video Standard (1-8) *(Table Parameter)*	Sets video standard	■ **Auto** ■ NTSC ■ PAL B ■ PAL M ■ Combination PAL N ■ NTSC 4.43 ■ SECAM ■ PAL 60
	Pedestal Enable (1-8) *(Table Parameter)*	When Enabled, removes 7.5 IRE video setup level; when Disabled, leaves the incoming signal level as is	■ **Enabled** ■ Disabled
	Luminance Filter Type (1-8) *(Table Parameter)*	Enables or disables luminance adaptive comb filter type	■ **Luminance adaptive comb filter enabled** ■ Trap filter enabled ■ Both filters disabled
	Brightness (1-8) *(Table Parameter)*	Sets brightness level	0 - 255 (**128**)
	Contrast (1-8) *(Table Parameter)*	Sets contrast level	0 - 255 (**128**)
	Chrominance Saturation (1-8) *(Table Parameter)*	Sets chrominance saturation level	0 - 255 (**128**)
	Chrominance Hue (tint) (1-8) *(Table Parameter)*	Sets chrominance hue level	–180° to +180° (**0**°)
	Chrominance Adaptive Comb Filter (1-8) *(Table Parameter)*	Enables chrominance adaptive comb filter	■ **Enabled** ■ Disabled
	Wideband Chrominance Lowpass Filter (1-8)	Color lowpass filter selection	■ **Enabled** ■ Disabled
	Chrominance Notch Filter Select (1-8) *(Table Parameter)*	Color notch filter selection	■ **Disabled** ■ Notch 1 ■ Notch 2 ■ Notch 3
	Bypass (1-8) *(Table Parameter)*	Bypasses Platinum auto crosspoint mute if signal is not present	■ **No** ■ Yes

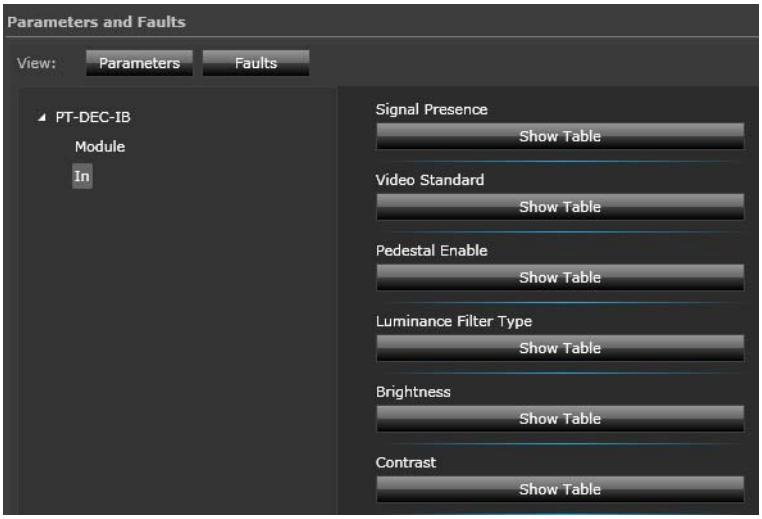


Figure 14-2 PT-DEC-IB Parameters

Functional Block Diagram

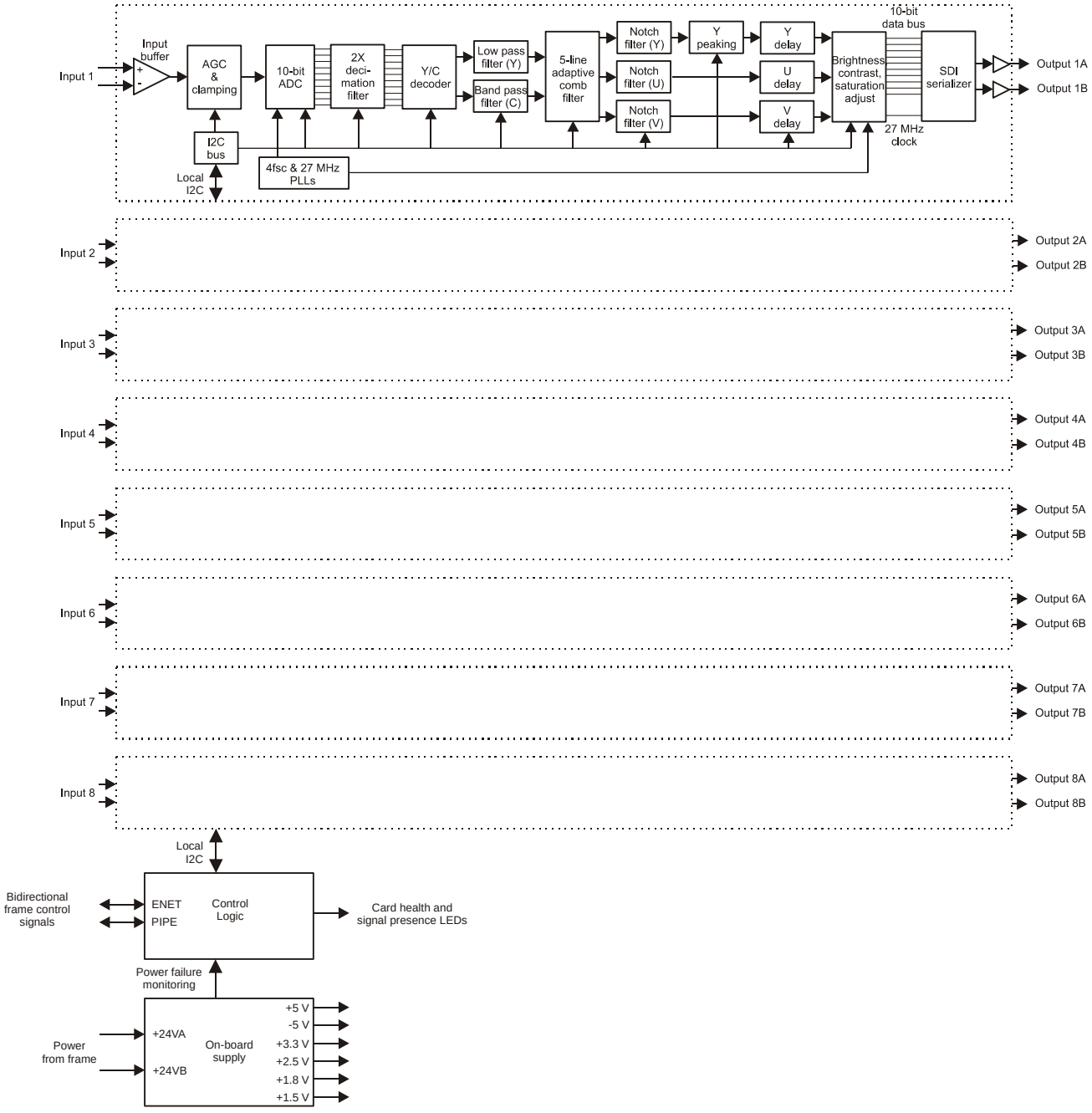


Figure 14-3 PT-DEC-IB Functional Block Diagram

Specifications

Specifications and designs are subject to change without notice.

Table 14-2 PT-DEC-IB Specifications

Item	Specification
Number of inputs	8
Input connector	75Ω BNC per IEC 169-8
Impedance	75Ω
Signal type	NTSC, PAL
Input coupling	DC coupled
Maximum input amplitude	2.0 Vpp
Nominal input amplitude	1.0 Vp-p ± 10%
Return loss	Better than 40 dB, DC to 5.75 MHz
Clamping	Automatic
Quantization	10 bits
Filter	Five line adaptive comb, notch, or trap
Output data rate	270 Mb/s per SMPTE 259C
Frequency response	± 0.1 dB to 5.75 MHz
Differential gain	< 1%
Differential phase	< 1°
Signal to noise ratio	> 65 dB
Bulk delay	< 80 μs typically

Power Consumption

Table 14-3 PT-DEC-IB Power Consumption

Power Consumption	13W

SD to Analog Video Encoder Modules (PT-ENC-OB)

Operation

Figure 14-4 PT-ENC-OB Module

The PT-ENC-OB is a SD-to-analog video encoder output module that converts a block of eight serial SD digital signals to composite NTSC or PAL video signals.

The PT-ENC-OB module accepts 32 serial digital (SD) video signals from the crosspoint module, which are presented to four FPGA-based deserializer chips. Within each of the deserializer chips are two 4×1 multiplexers that switch the signals to the receiver blocks.

The two receiver blocks within each of the deserializer chips perform the functions of extracting and locking all conversion functions to the bit-serial clock. To do this they:

- Use the internal and external PLL circuitry to descramble the SMPTE non-return to zero (NRZI) SDI stream
- Find the "x3FF" start of active video/end of active video (EAV / SAV) frame boundaries
- Load the decoded data stream into a "serial in/parallel out" (SIPO) shift register for exporting the data in 10-bit parallel form

The 10-bit parallel data is loaded into the encoder chip on the rising edge of a 27 MHz pipeline clock, where it is processed for digital noise reduction (DNR) to reduce low-amplitude, high-frequency noise. Gamma correction, sub-alias filtering (SAF), and user-based color adjustments are performed in the "parallel CCIR-601" domain. The signal is then separated into its chrominance and luminance components, sent through the low-pass filters (LPF) to reduce aliasing effects incurred as a process of encoding the signal, and resampled at 2X to further reduce aliasing. The oversampled parallel signal is finally converted to analog composite video within the 10-bit DAC stage, sent through a 4-pole low pass filter, and buffered for presentation to the output BNC connector.

Through the control system, you can control the low-pass and notch filter selection, NTSC or PAL video standard, video pedestal, internal test signal generator, chrominance level and hue (NTSC only), brightness, sharpness, and digital noise reduction.

You must be careful when implementing the notch and low pass filters, as a "tradeoff" between frequency response and out of band noise often takes place.

Each of the eight channels provide standard reporting of signal presence via card-edge mounted LEDs (Output 1 – Output 8) and via the control system. Additional system LEDs indicate the following:

- The power supply indicator (POWER) shows that +24V is present on the module.
- The control system acknowledgment indicator (ACT CTRL) shows that the control system is communicating with the module.
- The Output Active warning indicator (ACT OUT) indicates that a valid input signal has been switched to an output on this module.

Back Panel I/O Module for PT-ENC-OB

The PT-V-BP back panel I/O module corresponds to the module.

Output Monitoring Module

The optional PT-HSR-OM and PT-HSRAEC-OM modules provides output monitoring for the PT-ENC-OB.

Installation

Output Module Installation

All output modules are installed at our manufacturing facility. If you need to purchase additional components, please contact your dealer or our Sales Department.

Back Panel I/O Module Installation

All back panel modules are installed at our manufacturing facility. If you need to purchase additional components, please contact your dealer or our Sales Department.

Output Monitoring Module Installation

All output monitoring modules are installed at our manufacturing facility. If you need to purchase additional components, please contact your dealer or our Sales Department.

Control

This Module's parameters can be enabled and/or changed via CCS Navigator or the IP3 Controller.

Controllable Parameters

Table 14-4 PT-ENC-OB User-Controllable Parameters List

	Parameter	Description	Options
Module	Board Level Hysteresis	Sets hysteresis for parameters needing it.	0 to 5 seconds in 500 ns steps
	Sync Type	Selects which physical sync port the module uses as a reference	■ Sync1 ■ Sync2 ■ Sync3 ■ Sync4
Out	Video Standard (1-8) *(Table Parameter)*	Sets video standard	■ NTSC ■ PAL-B/D/G/H/I ■ PAL-N
	Chrominance Filter Type (1-8) *(Table Parameter)*	Sets chrominance filter type	■ 1.3 MHz ■ 0.65 MHz ■ 1 MHz ■ 2 MHz ■ Reserved ■ CIF ■ QCIF ■ 3 MHz
	Luminance Filter Type (1-8) *(Table Parameter)*	Enables or disables luminance filter type	■ NTSC low pass ■ PAL low pass ■ NTSC notch ■ PAL notch ■ Extended ■ CIF ■ QCIF ■ Reserved
	Pedestal Enable (1-8) *(Table Parameter)*	Enables 7.5 IRE video setup level	■ Enable ■ Disable
	DNR (1-8) *(Table Parameter)*	Enables or disables digital noise reduction	■ Enable ■ Disable
	Brightness (1-8) *(Table Parameter)*	Sets brightness level	–7° to 22°
	Contrast (1-8) *(Table Parameter)*	Sets contrast level	0-192
	Chrominance Saturation (1-8) *(Table Parameter)*	Sets chrominance saturation level	0-1255
	Lock Detect (1-8) *(Table Parameter)*	Reports presence or absence of valid signal	■ Signal absent ■ Signal present
	Mute (1-8) *(Table Parameter)*		■ On ■ Off

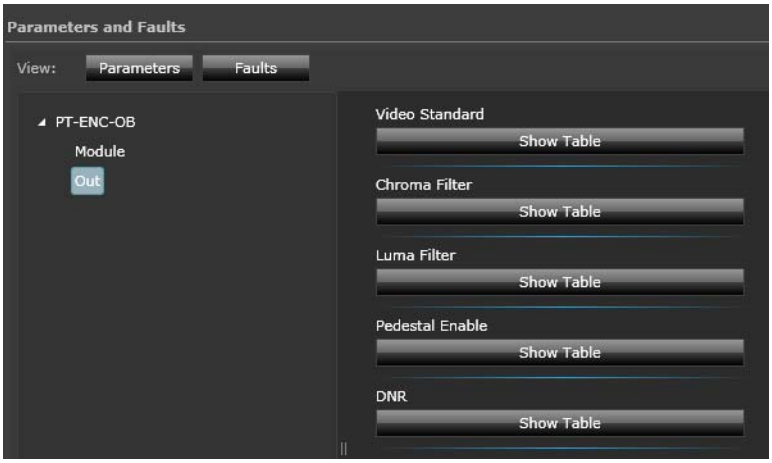


Figure 14-5 PT-ENC-OB Parameters

Functional Block Diagram

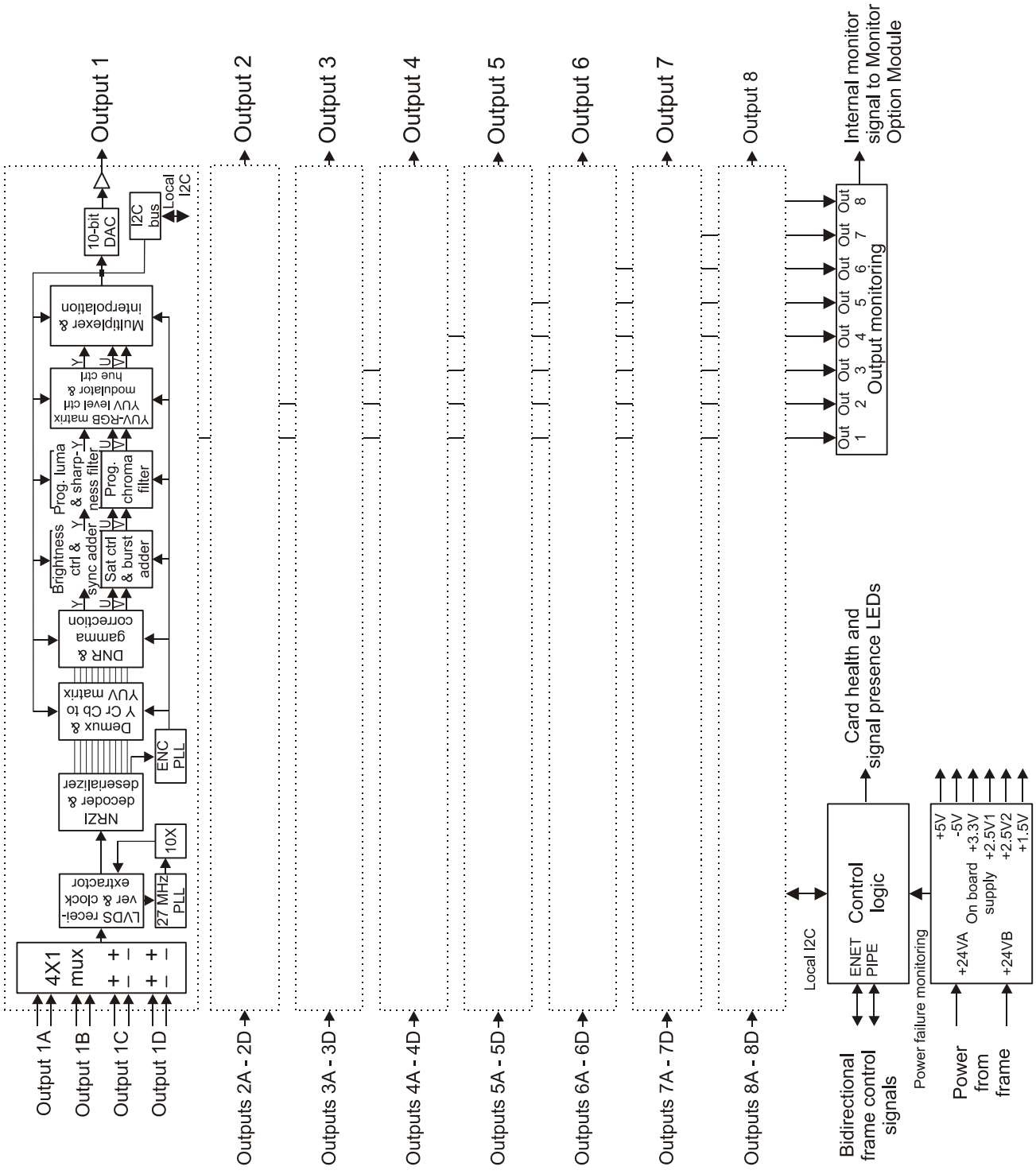


Figure 14-6 PT-ENC-OB Functional Block Diagram

Specifications

Specifications and designs are subject to change without notice.

Table 14-5 PT-ENC-OB Specifications

Item	Specification
Number of outputs	8
Output connector	75Ω BNC per IEC 169-8
Impedance	75Ω
Signal type	NTSC, PAL
Output amplitude	1.0Vp-p ± 10%
Return loss	> 40 dB, DC to 5.75 MHz
Filtering	CCIR-601 compliant
Resolution	10 bits
Frequency response	± 0.05 dB to 5.2 MHz
Differential gain	< 0.8%
Differential phase	< 0.6 °
Bulk delay	< 80 µs
Signal to noise ratio (RMS)	> 65 dB unified - weighting
DC offset	0 V ± 0.025 V

Power Consumption

Table 14-6 PT-ENC-OB Power Consumption

Power Consumption	10W

15 1500 Watt Power Supply and External Power Supply Frame

Power Supplies Overview

- See **Power Supplies (PX-PS)** for information on the R-1500 Power Supplies that come with the PX-FR-28 frame.
- See **External Power Supply Frame (PX-FR-EXPS)** for information on the optional Power Supply Frames.
- See **External Power Supply Frame (PX-FR-EXPS)** on information on Power Distribution Modules that interface between the R-1500 power supplies and the PX-FR-EXPS
- See **Installing Power Supplies** for Power Supply Installation information.

Power Distribution Zones

The Platinum IP3 frame (PX-FR-28) is divided into four 24V Power Zones and two 5V Power Zones, to manage power distribution and loading within the frame.

For low power modules such as the PX-HSR9C-IBG or PX-HSR16C-OBG, 2N redundancy can be achieved with a second PX-PS plugged into a Power Zone. For high power modules such as the HV-SXP-16x3 or PT-FSDMX-IBG, redundancy may require the External Power Supply Frame (PX-FR-EXPS) depending upon the number of modules plugged into that Power Zone.

Each PX-PS has a 24V and 5V output power rail. When a PX-PS is plugged into the IP3 frame or External Power Supply Frame, its 24V output will connect to one of the four 24V power zones and its 5V output one of the two 5V power zones.

Table 15-1 lists the core modules that can be plugged into the frame and which 24V Power Zone they are connected to.

Table 15-1 Power Distribution Zones

FRONT LOADING		**REAR LOADING**	
Module Component	**Power from Zone**	**Module Component**	**Power from Zone**
Primary Video Crosspoint	Zone 1 and 2	Alarm Expansion Card	Zone 1 or 2
Data Switch Card	Zone 1 or 2		
ATDM Crosspoint Card	Zone 1	Redundant ATDM Crosspoint	Zone 2
Redundant Video Crosspoint Card	Zone 3 and 4		

Table 15-1 Power Distribution Zones

FRONT LOADING		REAR LOADING	
Module Component	**Power from Zone**	**Module Component**	**Power from Zone**
Redundant Data Switch Card	Zone 3 or 4	Output Monitoring Card	Zone 1 or 2
Top Front Fan Module	Zone 1 or 2	Top 4 Rears Fans	Zone 1 or 2
Bottom Front Fan Module	Zone 3 or 4	Bottom 3 Rears Fans	Zone 3 or 4
Resource Module	Zone 1 or 2		
Redundant Resource Module	Zone 1 or 2		
Sync Module (Left)	Zone 1		
Sync Module (Right)	Zone 2		

Power Zones

Power distribution is split into four separate zones.

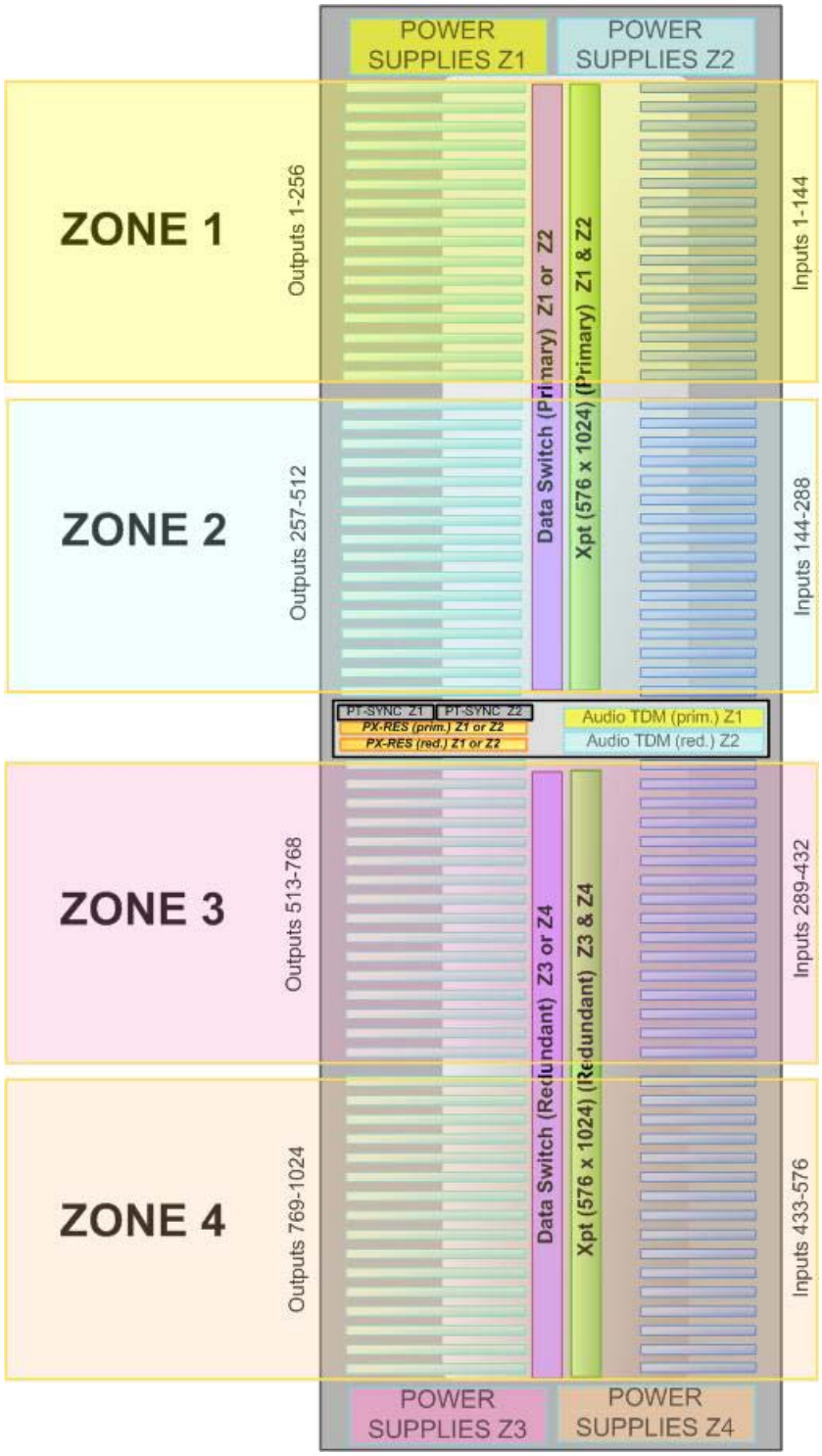


Figure 15-1 Power Zones

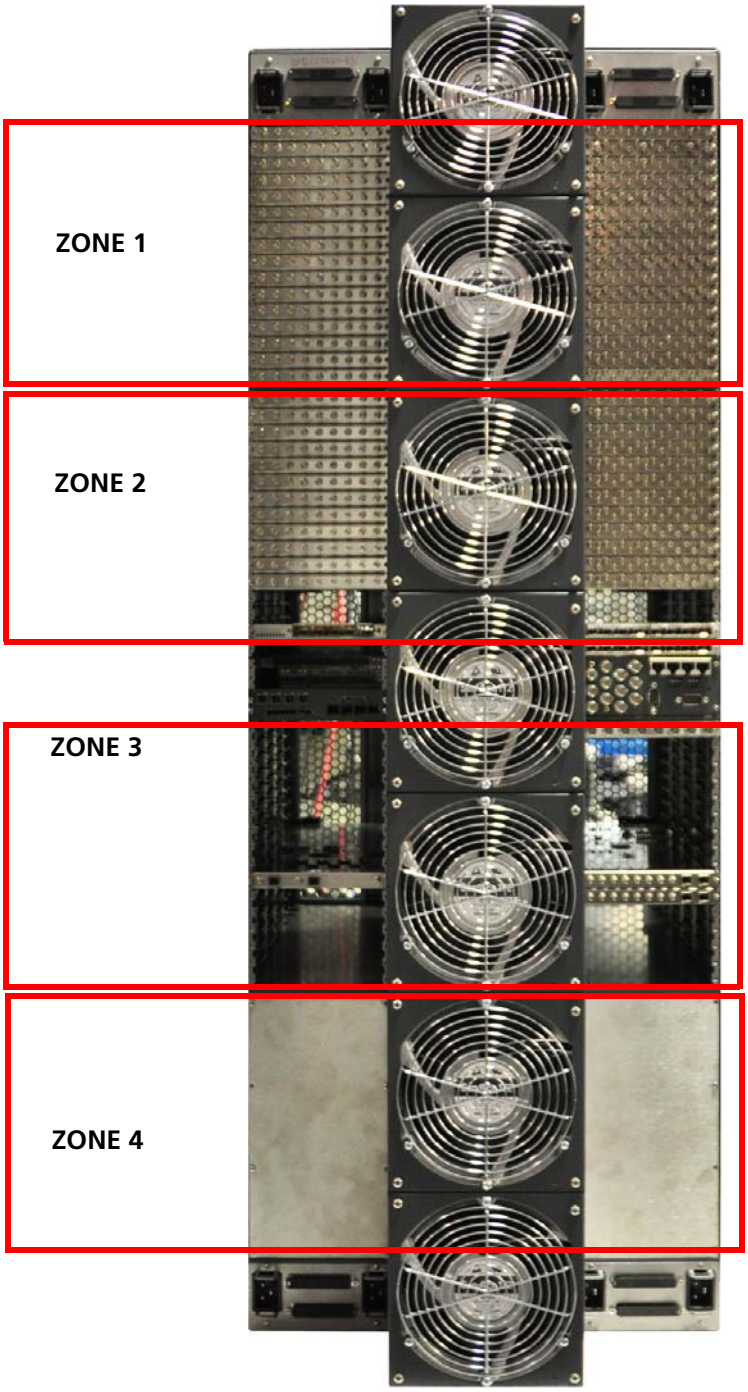


Figure 15-2 Power Zones

Power Supplies (PX-PS)

The IP3 Frame (**PX-FR-28**) comes with **4 Power Supplies** (**PX-PS**) - 2 at the top of the frame (at each corner) and 2 at the bottom of the frame (at each corner). The **PX-PS** Power Supply provides up to 1500W of power.

You can optionally install 4 additional power supplies (2 at the top of the frame, and 2 at the bottom of the frame) for a total of 8 Power Supplies in the Frame.
See **Figure 15-3** and **Figure 15-4**.

See **Installing Power Supplies** for instructions on installing additional power supplies.

Power Supply Modes

The Power Switch on the front of the power supply puts the power supply into **Standby** mode or **ON** mode.

- In **Standby** mode, the power supply is energized internally but not driving power into the frame.
- In **ON** mode, the power supply is supplying power to frame.

Once an AC power cord is attached to a power supply, its becomes energized (partially operational internally).

Power Supply LEDs

There are four LEDs on the front of the power supply: **5V**, **24V**, **AC,** and **FAN**, which are used to indicate failure on the DC and AC power rails or Fan failure.

Note: *The R-1500 Power Supplies are hot-pluggable.*

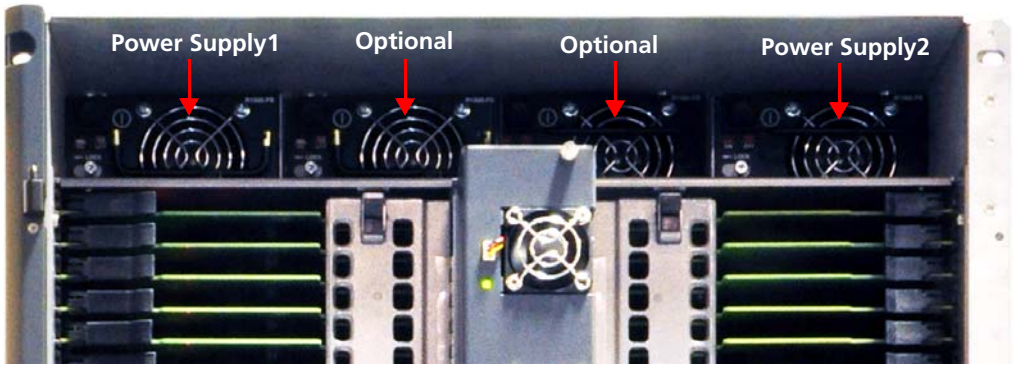


Figure 15-3 R-1500 Power Supplies at the top of the IP3 Frame

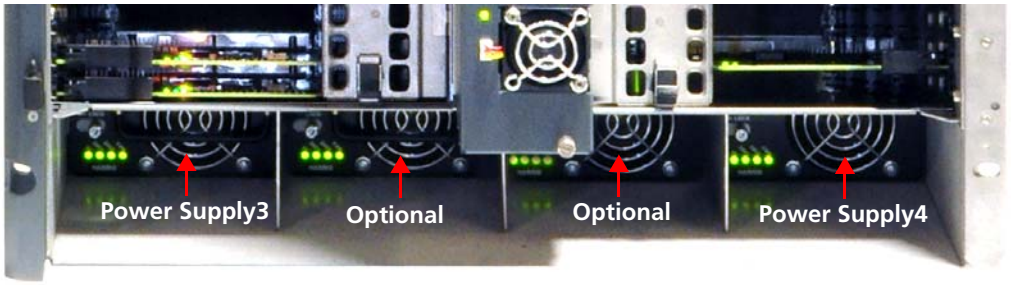


Figure 15-4 R-1500 Power Supplies at the bottom of the IP3 Frame

Figure 15-5 R-1500 Power Supply

External Power Supply Frame (PX-FR-EXPS)

A separate External Power Supply Frame (**PX-FR-EXPS**) is available to provide additional power. The external power supply frame contains the following:

- PX-PD-TOP power distribution board
- 4 adapter boards

Note: *The PX-FR-EXPS does not come with any Power Supplies. These have to be purchased and installed separately. See* **Installing Power Supplies**.

The **PX-FR-EXPS** External Power Supply Frame is connected to the **PX-FR-28** IP3 frame using four DC power cables: 165-100036Q00 (24") or 165-100037Q00 (90"). You can have up to 2 External Power Supply frames connected to one IP3 frame, and these need to be installed either both above the IP3 Frame, or one above and below the Frame - this is dependent on the length of the cables (24" or 90") used to connect the **PX-FR-EXPS** to the **PX-FR-28**. See **External Power Supply Frame (PX-FR-EXPS)**.

To simplify field upgrade and the manufacturability of the power section, the External Power Supply connectors are located directly on the rear of the frame (with a plastic cover when not in use). To accomplish this, a separate module is used to interconnect the MI (power distribution section) to the rear metalwork with a card edge on one side and a right angle connector on the other (with retention to the metalwork).

Required Equipment

Note: *In order to minimize the risk of damage to components, the IP3 frame must be powered down during PX-FR-EXPS installation. This unit contains Electro Static Discharge Sensitive (ESDS) devices, recognized handling precautions should be observed.*

- One Platinum IP3 Frame (PX-FR-28)
- Two PX-FR-EXPS
- One Flash light
- Screw Drivers and other hand tools

Power Cables

The PX-FR-28 IP3 frame does not need to be specifically configured for the PX-FR-EXPS external power supplies. 24" or 90" DC power cables must be connected between the PX-FR-28 and PX-FR-EXPS frames. AC Power Cords also need to be connected between the IP3 Frame and the External Power Supply Frame.

24" Male to Male Combination D-Sub (165-100036Q00)

Standard length cable that connects the PX-FR-28 Frame to the PX-FR-EXPS.

Note: *Four 24"cables are included when you buy the PX-FR-EXPS frame. 24" cables are recommended to minimize power loss in the system.*

If 24" cables are used to connect the PX-FR-EXPS to the PX-FR-28, one PX-FR-EXPS unit must be installed **above and one below** the PX-FR-28.

90” Male to Male Combination D-Sub (165-100037Q00)

90” cables are a customer orderable option.

If 90” cables are used to connect the PX-FR-EXPS to the PX-FR-28 frame, **both** PX-FR-EXPS units can be installed **above or below** the PX-FR-28.

Power Cable Installation Steps

CAUTION All AC power lines should be disconnected before attaching the Interface (DC power) cables to the rear of the frames.

Note the orientation of the Combination D-Sub (green) connectors (with gold contacts) on the Rear panel (see **Figure 15-6**). One is rotated 180 degrees from the other. Keep this in mind when attaching the Interface (DC power) cables.

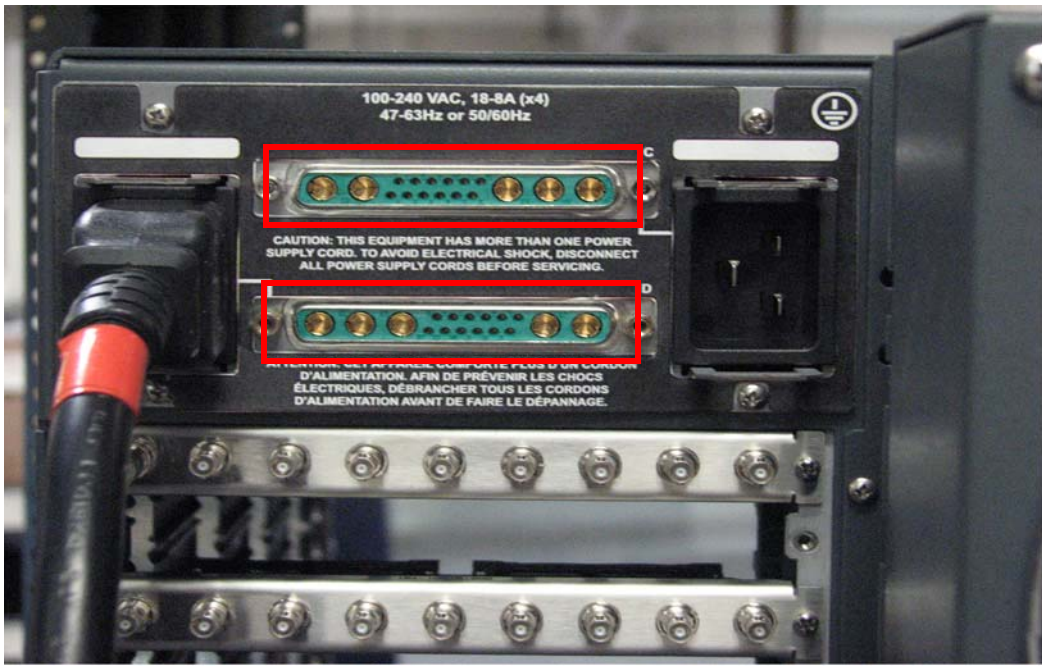


Figure 15-6 Rear View of the PX-FR-28 frame showing the D-Sub connectors

1 Mount the **PX-FR-EXPS** above the **PX-FR-28** frame as shown in **Figure 15-7**.

2 Connect all four connectors (A,B,C,D) on the **PX-FR-EXPS** to the corresponding connectors (A,B,C,D) on the **PX-FR-28.**

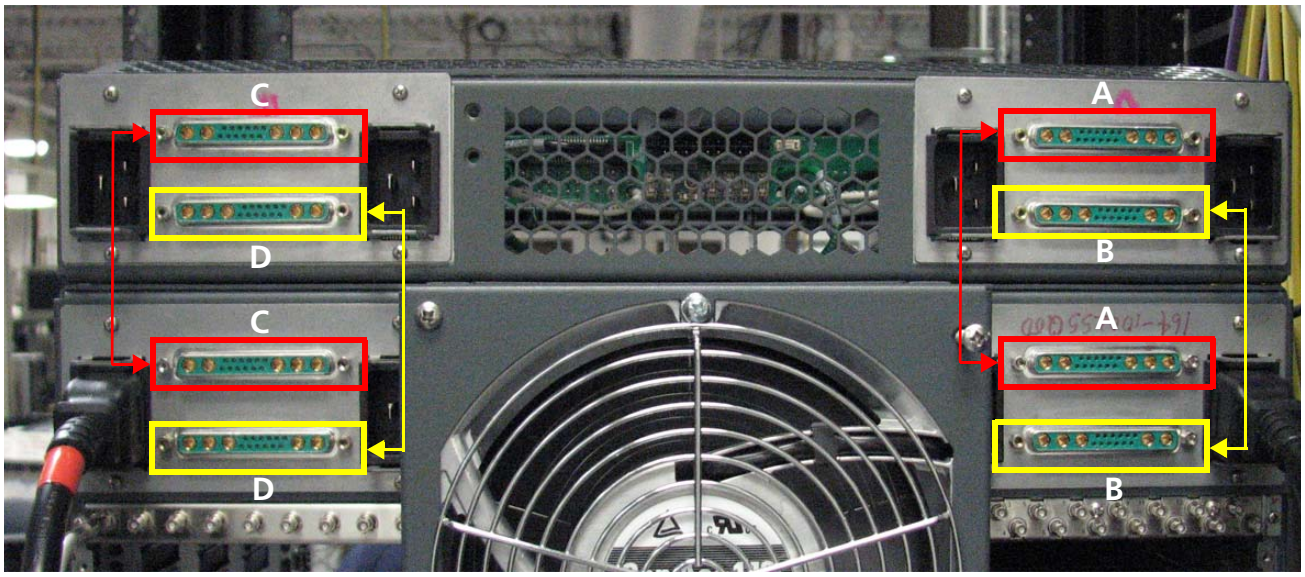


Figure 15-7 PX-FR-EXPS unit mounted above PX-FR-28

3 Attach the Interface (DC power) cables between the PX-FR-28 and PX-FR-EXPS as shown in **Figure 15-8**.

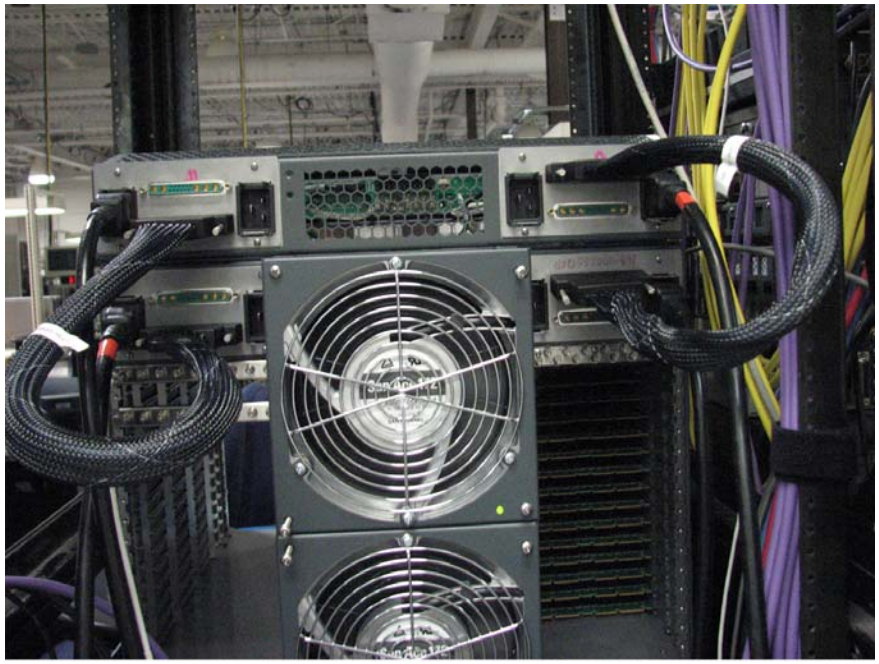


Figure 15-8 DC Power Cables connected between PX-FR-28 and PX-FR-EXPS

4 Secure the DC power cables to the mating Combination D-Sub connector by tightening the screws shown in Figure 6.

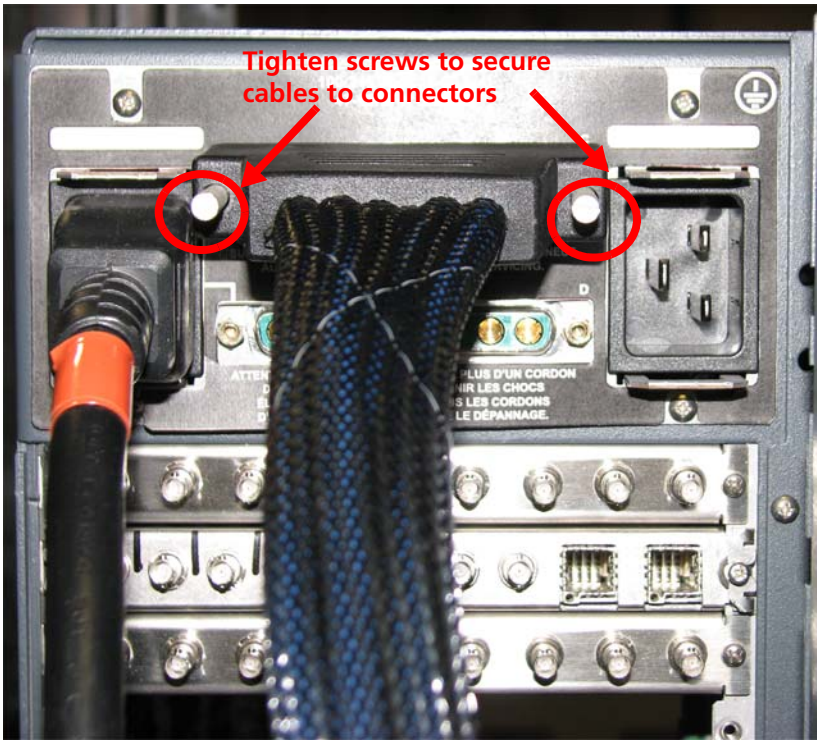


Figure 15-9 Locking Screws to secure DC Power Cables connected to PX-FR-28

Figure 15-10 shows the 90" DC power cables attached to the bottom of the PX-FR-28 frame.

Figure 15-10 Bottom of PX-FR-28 with 90" DC Cables attached

5 Mount the second **PX-FR-EXPS** below the **PX-FR-28** frame.

6 Repeat the above steps to connect the A,B,C,D connectors on the bottom **PX-FR-EXPS** to the corresponding connectors on the frame bottom.

Installing Power Supplies

CAUTION: The latch on the Power Supply (PX-PS) must be in the unlocked position (latch on the right side of the slot) before it is slid into the frame. This prevents damage to the frame and latch.

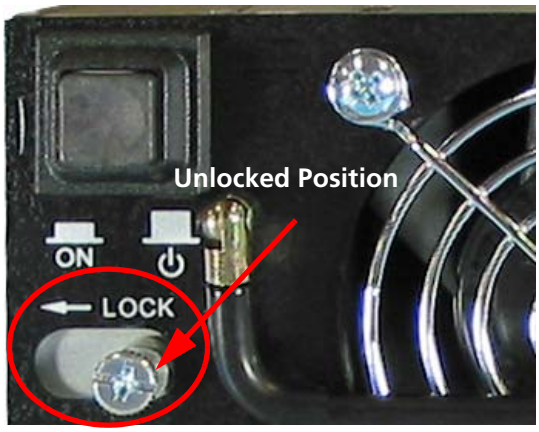


Figure 15-11 Power Supply with Latch in Unlocked Position

Power Supplies in PX-FR-28

The **PX-FR-28 IP3** Frame comes with 4 Power Supplies (at the four corners of the frame). You can install an additional 4 Power Supplies in this Frame (2 on top and 2 at the bottom). See **Installation Instructions**.

Power Supplies in PX-FR-EXPS

The PX-FR-EXPS External Power Supply Frame does not come with any Power Supplies. You need to purchase power supplies separately and then install them in this Frame. See **Installation Instructions**.

Installation Instructions

To install a Power Supply:

1. Align a Power Supply (PX-PS) with the slot on the Frame.
2. Gently slide the Power Supply (PX-PS) into place; it should snap into the Frame.

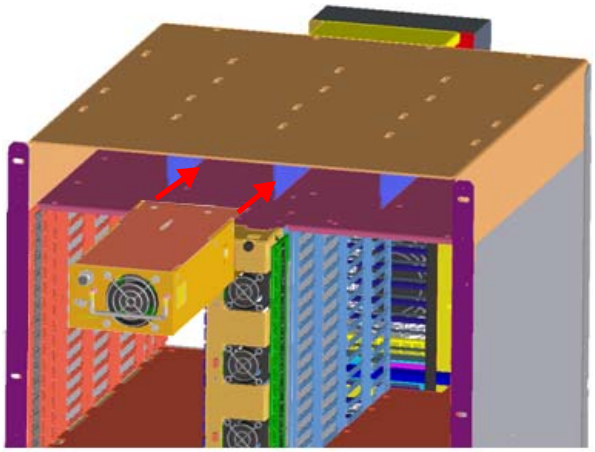


Figure 15-12 Power Supply being inserted into Frame

3. After the Power Supply (PX-PS) is fully inserted into the frame:
   - Loosen the thumbscrew on the latch of the Power Supply (turn counter-clockwise)
   - Push the latch on the Power Supply all the way to the left to lock the Power Supply into place
   - Tighten the thumbscrew (turn clockwise) to lock the latch in place.

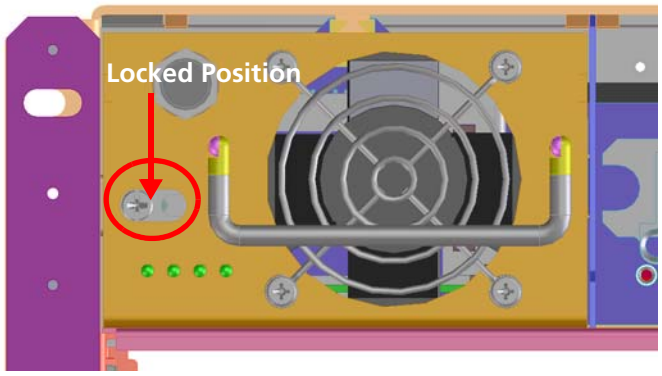


Figure 15-13 Power Supply with Latch in Locked Position

Power Supply Specs, LEDs, and Pinouts

Power Supply Mechanical Specification

Table 15-2 Power Supply Mechanical Specifications

Item	Specification
Dimensions	4.5 Inches by 2.6 Inches by 10.25 Inches
Cooling	Forced Air Cooled, Front to Back Airflow, Variable Fan Speed Control
Mounting	Slides into existing cavity in the Platinum IP3 and External Power Supply frames. Mechanically locks in place.
Field Swappable Fan	Replaceable Cooling Fan Assembly. Power supply incapable of powering up with cooling fan assembly removed.
Temperature	Maintains full power at temperatures from 0 to 50 degrees Celsius
Humidity	0 to 95% Humidity, Non-Condensing

Power Supply Electrical Specification

Table 15-3 Power Supply Electrical Specifications

Item	Specification
Input Voltage	Universal AC Input (90VAC to 265VAC)
Input Frequency	47 - 63Hz
Power Factor Correction	>96% Efficient, Active, Meets EN61000-3-2 as a Class A Device when under 50% Load, Max Test Voltage 230VAC
Inrush Current	Less than or equal to 50 Amps peak at 264VAC
Power Supply Efficiency	Meets 80Plus Gold Efficiency Standard at Input Voltage of 230VAC. Greater Than 80% Over Input Voltage Range
Output Voltages	V1 = 5VDC, V2 = 24VDC
Output Currents	5VDC @ 10Amps, 24VDC
Output Fusing	24VDC Outputs (Pins 3 and 26 of Power Connector) each to be Fused to Prevent Output Current from Exceeding 40 Amps
Output Power	1500 Watts (Continuous)
Line Regulation	< +/- 0.1%
Load Regulation	+/- 2.0% for 24VDC Output, +6.0/-2.0% for 5VDC Output
Output Noise	100mV P-P (20Mhz Bandwidth, Measured across 0.1uF and 10 uF capacitors connected in parallel)
Overcurrent Protection	Non-destructively limit current to 110% rated maximum output, Square Current Limit with Automatic Recovery

Table 15-3 Power Supply Electrical Specifications

Item	Specification
Overvoltage Protection	Entire power supply shuts down if any output rail reaches 15% above rated voltage
Current Sharing	Active, All Outputs, N+1 Hot Swappable (Diode Isolation), 20% Tolerance on Loads greater than 50%, Current Shares with Present Power Supply Model
Holdup Time	16 milliseconds at One-Half Maximum Output Power
Indicators	LEDs indicating 5VDC, 24VDC, and Fan Fail present on front cover. LEDs indicate complete failure of Voltage Rails, or Fan not operating, or deviation from specified voltages, or Fan speed not nominal
Alarms	Alarm PCB to monitor both voltage rails and Cooling Fan and make four status signals available at the Main Connector for Remote Monitoring
I2C Communications	Serial communications to provide all parameters listed in Table 2. Reference Table 1 for pin assignments. R1500 to be configured as Slave device. If CLK or DATA lines are pulled to GND or VCC power supply operation must not be affected
MTBF	> 250,000 Hours @ 30 Degrees Celsius (Excludes Fan Life)

Power Supply LED Operation

Figure 15-14 LEDs on PX-PS

Table 15-4 Power Supply LED Operation

LED	Behavior	Condition
5V	OFF	No AC power supplied to the power supply
	Solid AMBER or BLUE	AC power supplied to the power supply but switch off
	Solid GREEN	5VDC standby voltage is present and good (NOTE: Only possible when AC power is supplied and power switch is on)
	Flashing RED at 2 Hz	Fault condition on secondary is detected
24V1	OFF	Power switch is off or AC power is not present
24V2	Solid GREEN	Corresponding 24VDC is present and good

Table 15-4 Power Supply LED Operation

LED	Behavior	Condition
	Flashing RED at 2 Hz	Failure condition detected on the corresponding 24VDC output. Possible causes: ■ Corresponding 24VDC output is shorted ■ Over-current on corresponding 24VDC output ■ Under-voltage on corresponding 24VDC output ■ Fuse blown on corresponding 24VDC output
FAN	OFF	Power switch is off or AC power is not present
	Solid GREEN	The fan is operating normally
	Flashing RED at 2 Hz	Fan failure detected Could also be used to indicate over temperature.

Power Connector Pinout

Table 15-5 Power Connector Pinout ELCON Model #298-08-01100

Pin	Rated Current	Design Spec Current	Nomenclature	Power Supply Wire Color	Signal
1	35A	18A	Line Input	Black	AC Line
2	35A	N/A	Neutral	White	AC Return
3	35A	31A	+24A	Red	24V Supply
4	35A	31A	-24A	Green	24V Return
6	10A	10mA	I2C	Orange	CLK
8	10A	4A	+5	Red	5V Supply
9	10A	10mA	24 A Fail C	Green	Opto Collector
10	10A	10mA	24 A Fail E	Purple	Opto Emitter
12	10A	10mA	5 Fail C	Blue	Opto Collector
13	10A	10mA	5 Fail E	Brown	Opto Emitter
15	10A	10mA	I2C	Green	DATA
18	10A	10mA	Fan Fail C	Black	Opto Collector
19	10A	10mA	Fan Fail E	Gray	Opto Emitter
20	10A	4A	-5	Black	5V Return
21	10A	10mA	24B Fail C	Red	Opto Collector
22	10A	10mA	24B Fail E	Orange	Opto Emitter
24	10A	1mA	Chassis Sense	Violet	Power Level Detect
26	35A	31A	+24B	Orange	24V Supply
27	35A	31A	-24B	Green	24V Return
28	35A	N/A	AC Safety Ground	Green	AC Ground

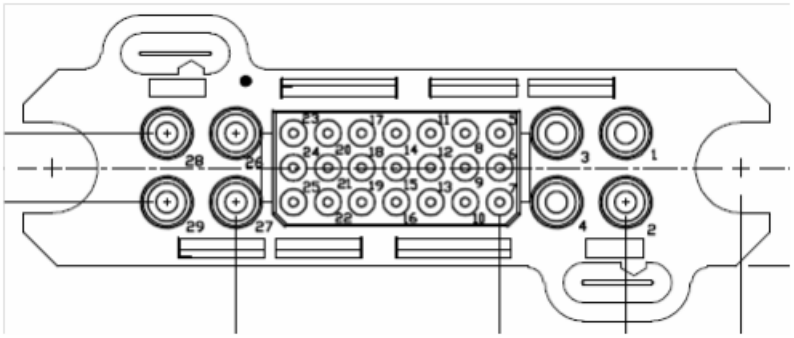


Figure 15-15 Connector Pin Numbering

Power Distribution Modules

Power Distribution Modules are the interface between **PX-PS Power Supplies** in the **PX-FR-28** frame and the **PX-FR-EXPS**. Power Distribution Modules are connected to the **PX-BP-28 MI** backplane, eliminating the need for the separate connectors and wiring.

Top Power Distribution Module (PX-PD-TOP)

The **Top Power Distribution Module** (**PX-PD-TOP**) is used both in the **PX-FR-28** IP3 frame and in the **PX-FR-EXPS** External Power Supply Frame.

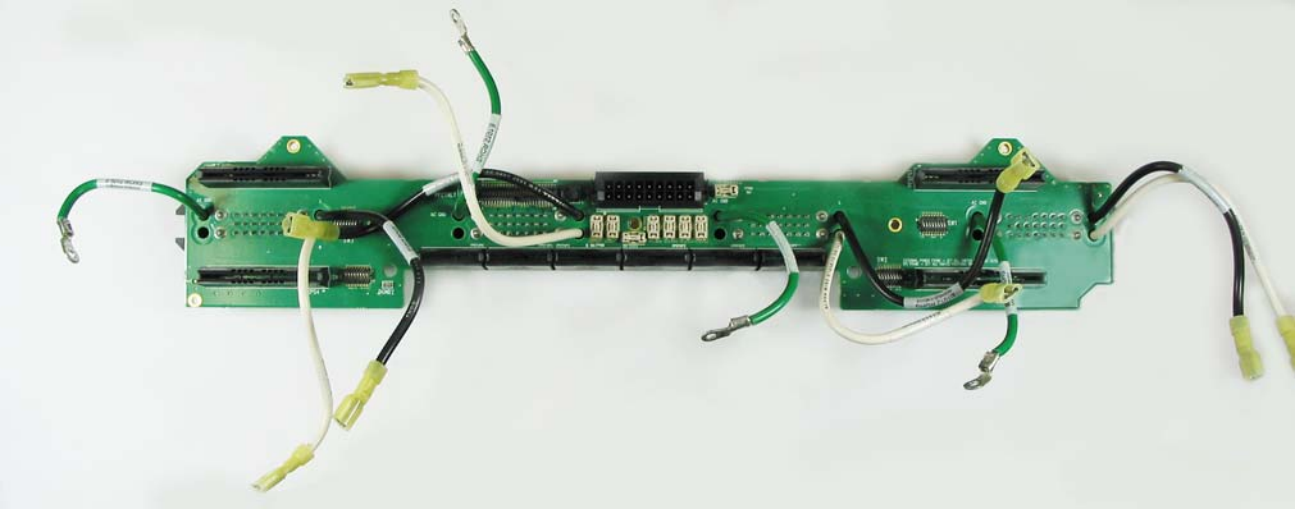


Figure 15-16 PX-PD-TOP - Power Distribution Module (shown with wires)

DIP Switches on the PX-PD-TOP

There are **four DIP switches**, **SW1 to SW4**, on the PX-PD-TOP Top Power Distribution board.

CAUTION: The DIP Switch must be in a specific position depending on whether the PX-PD-TOP is used in the IP3 frame or the PX-FR-EXPS External Power Supply Frame.

- When the **PX-PD-TOP** is used in the PX-FR-EXPS frame, all switch positions should be set to **CLOSED/ON**.
- When the **PX-PD-TOP** is used in the IP3 frame, switch positions should be set to **OPEN/OFF.**

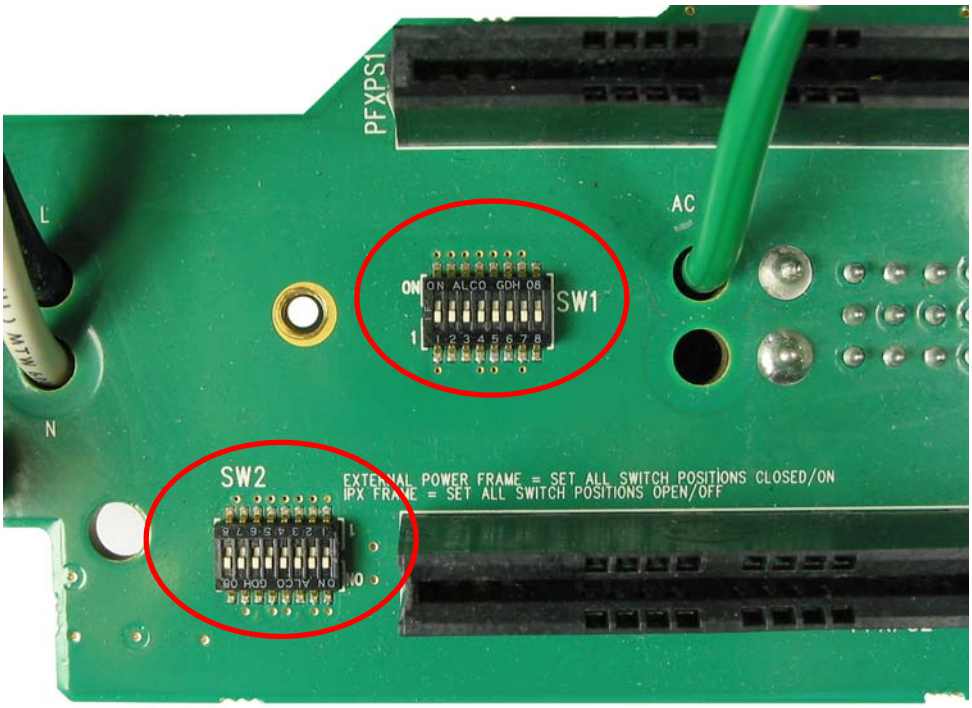


Figure 15-17 Dip Switches SW1 and SW2 on the PX-PD-TOP when installed in the External Power Supply frame (PX-FR-EXPS)

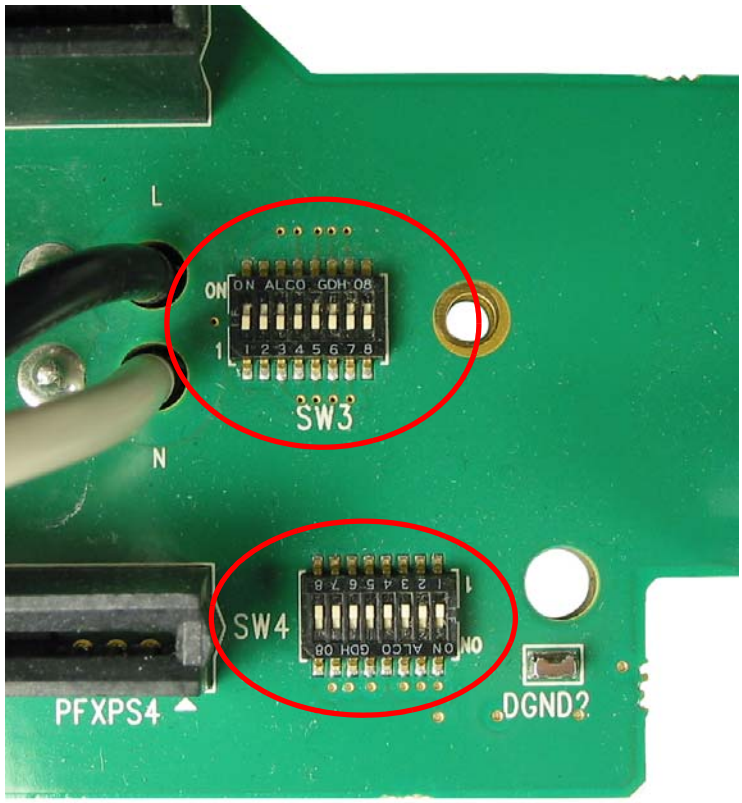


Figure 15-18 Dip Switches SW3 and SW4 on the PX-PD-TOP when installed in the External

Power Supply frame (PX-FR-EXPS).

Fuses on the PX-PD-TOP

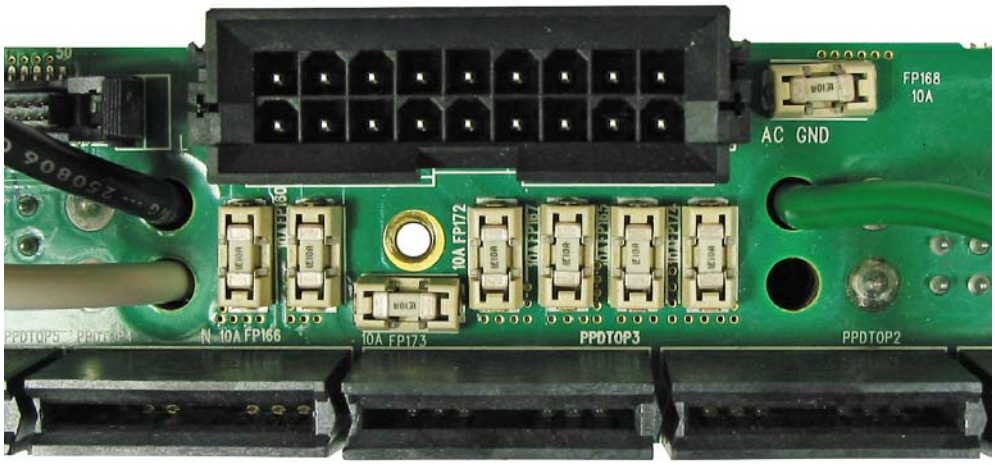


Figure 15-19 Fuses on the PX-PD-TOP

Table 15-6 PX-PD-TOP Fuse Ratings

Fuse Type	Fuse Rating	Part Number
Fastblow	10 Amps	127-100013Q00

Bottom Power Distribution Module (PX-PD-BOT)

The **PX-PD-BOT Bottom Power Distribution Module** is used only in the IP3 frame and not in the External Power Supply PX-FR-EXPS.

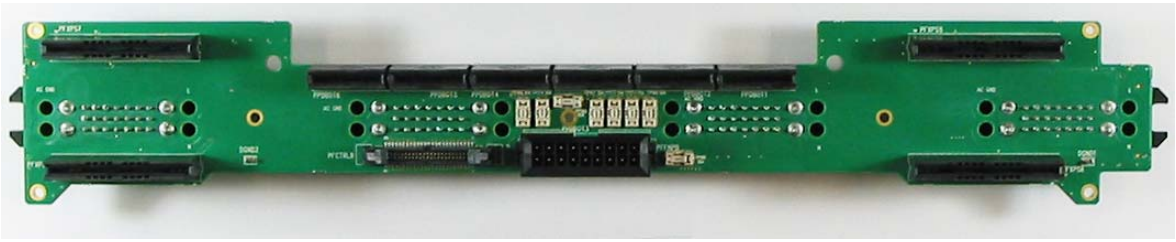


Figure 15-20 PX-PD-BOT - Power Distribution Module

Fuses on the PX-PD-BOT

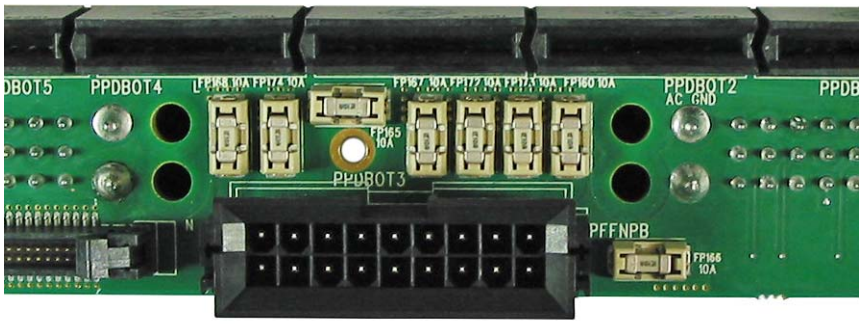


Table 15-7 PX-PD-BOT Fuse Ratings

Fuse Type	Fuse Rating	Part Number
Fastblow	10 Amps	127-100013Q00

16 PX-FRONT-FAN and PX-REAR-FAN Modules

Overview

The IP3 Video Crosspoint and Data Switch modules are cooled by two separate hot-swappable PX-FRONT-FAN modules; one is located at the top of the frame, and one at the bottom (the two modules are mirror- images of each other and are not interchangeable). Each Front Fan module contains six individual fans. There are seven large fans that exhaust heat from the rear of the frame. The Rear Fan modules provide the main cooling for the entire frame (power supplies and modules).

Operation of the Fan Modules

Each PX-FRONT-FAN module contains six 40 mm^2 fans. The temperature of the IP3 Video Crosspoint (PX-576x1024-3G) module is communicated to the Front Fan modules; the speed of the fans is adjusted to 25%, 50%, or 75% of their full speed based upon the temperature of the Video Crosspoint module. If the Front Fan module detects a fan failure or loss of communication with the Resource module, the other five fans in the array are automatically set to 75% speed. (100% speed does not affect cooling performance.)

CAUTION: Front Fan modules are the main source of cooling for the Video Crosspoint modules. In the event of a fan failure, ensure that you replace the fan as soon as possible to prevent overheating.

The rear fans automatically switch to 75% speed if one of the fans fails, or is disconnected.

Fan failures are indicated by alarms to the IP3 Controller, and by lit LEDs beside the fans themselves (see **Table 16-1** and Figure 16-2 on page 247).

If either of the Front Fan modules is disconnected from the IP3 frame for a period of time, the Rear Fan speeds will be increased to compensate, to keep the IP3 Video Crosspoint and Data Switch modules cool.

The top and bottom Front Fan modules each have a recessed Reset button located next to the status LEDs. When activated, this button forces the fan module into Failsafe mode. To put the Front Fan module into Failsafe mode for firmware reprogramming, insert a paper clip into the small hole, and then press and hold the button for three seconds. Then use the IP3 Controller to upgrade the firmware on the Front Fan module.

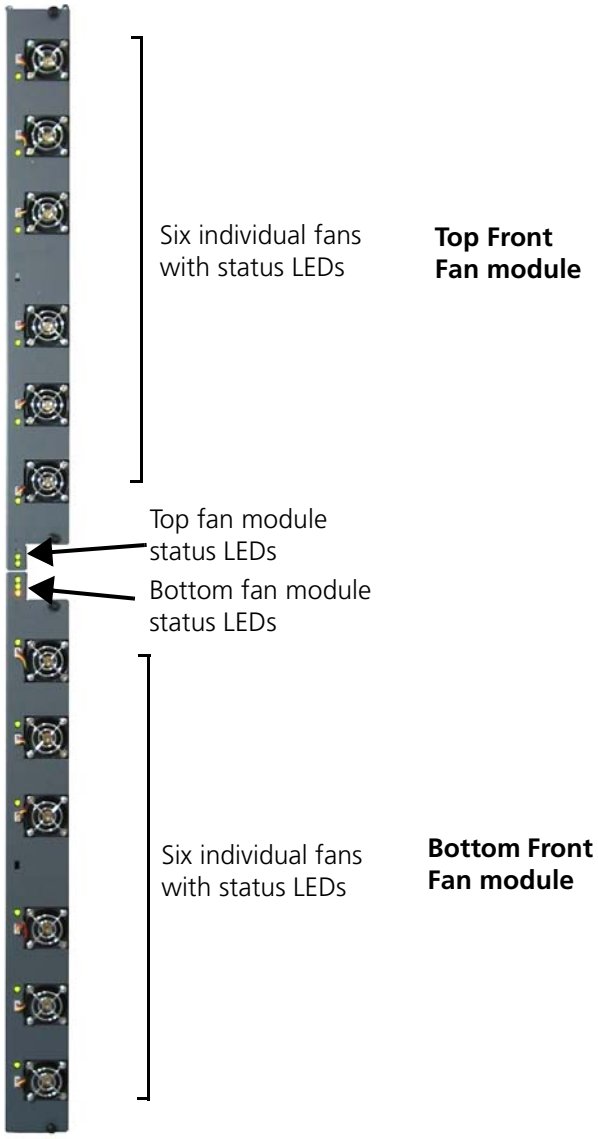


Figure 16-1 Top and Bottom Front Fan Modules

Table 16-1 Fan LED Indicators

LED Name	LED Color	Description	Alarm Level
Power	Red	The 24 VDC power supply is missing.	Major
	Green	The module is receiving 24 VDC and 5 VDC power.	None
	Off	No power is present on the Front Fan module.	Major
ACT CTRL	Red	The module has not communicated with the Resource module (PX-RES) for 5 seconds, or a power failure has occurred.	Major
	Green	The Front Fan module is operating normally and communicating with the Resource module via the PX-ALARM module.	None
	Off	The module has lost standby power and is not communicating with the resource module.	Major
Fans 1 to 6	Green	The fan is operating normally.	Info
	Flashing Red and Green	The fan has failed or is disconnected.	Major

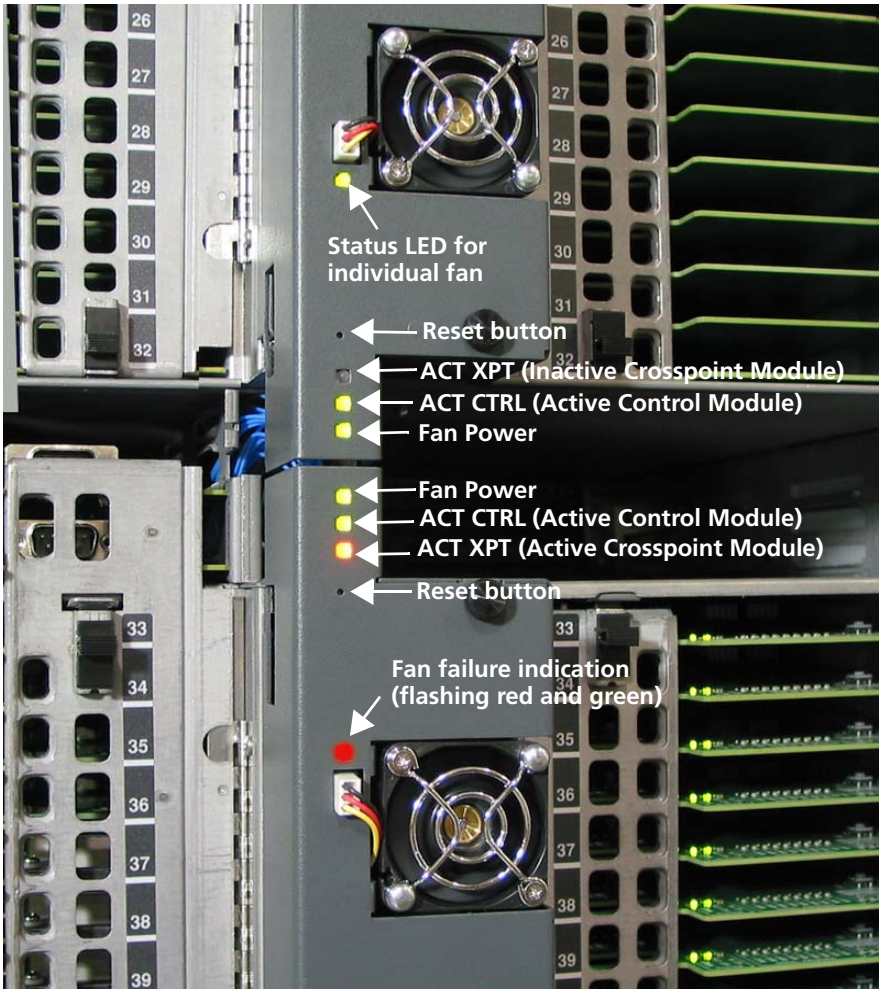


Figure 16-2 Front Fan Module LEDs

Servicing the Fans

The following fan parts can be replaced in the field:

- Top PX-FRONT-FAN array module
- Bottom PX-FRONT-FAN array module
- Individual front fan units
- Individual rear fan units

Front Fan Module

To replace a Front Fan module, follow these steps:

1 After opening the front door of the frame, locate the faulty fan module.
2 Loosen the two thumbscrews, and then swing the module to the left.

Figure 16-3 Front Fan Module Array (Top Module Shown)

3 Disconnect the wiring harness by squeezing the white connector tabs together and gently pulling apart the connector.

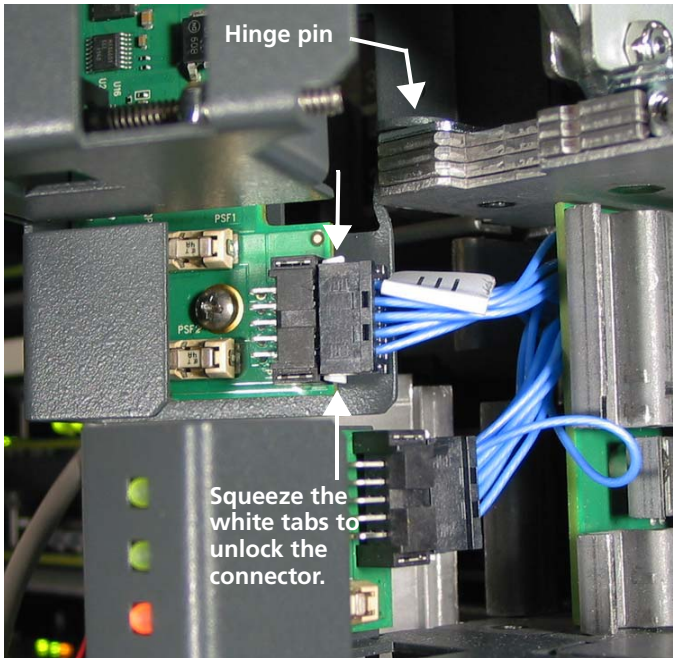


Figure 16-4 Unlocking Wire Connector

4 Lift the module up and out of its hinge.
5 Swing open the other fan module array to ease the replacement process.

6 Insert the replacement module.
7 Reconnect the wiring harness. (Note: the connector has a key slot; see **Figure 16-5**.)

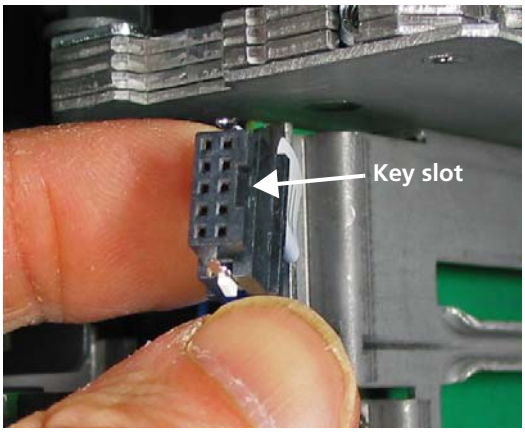


Figure 16-5 Wire Connector

8 Swing the module closed, and then tighten the two thumbscrews.
9 Close the other fan array module.

Individual Fan

To replace an individual front fan, follow these steps:

1 Open the front door of the frame and locate the faulty fan (indicated by a red LED).
2 Remove the two screws in the fan, and unplug the wire harness using tweezers or needle nose pliers (**Figure 16-6**).

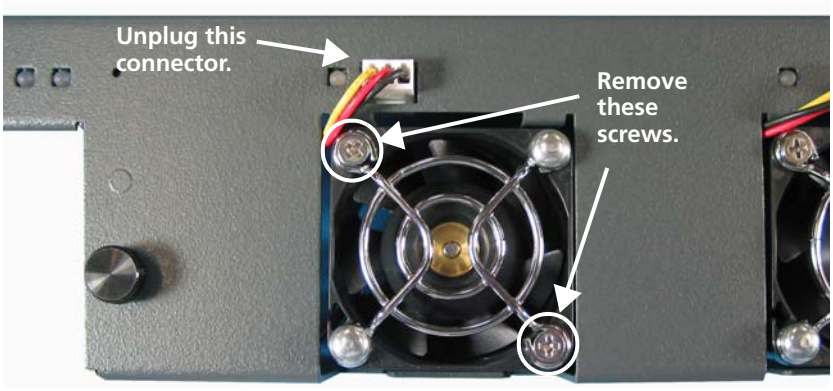


Figure 16-6 Removing Individual Front Fan

3 Insert the replacement fan, screw the fan into place, and then re-connect the wire harness.
4 Verify that the fan status LED is lit green.
5 Close the front door of the frame.

Rear Fans

A failed Rear Fan module is indicated by a red LED as in **Figure 16-7**.

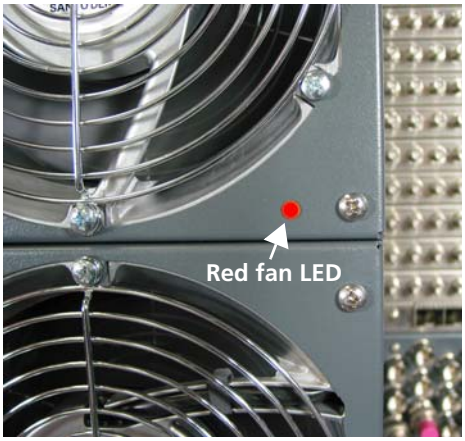


Figure 16-7 Rear Fan LED

To remove and replace a Rear Fan Module, follow these steps:

1 Remove the four captive screws in the corners of the fan unit.

Figure 16-8 Rear Fan

2 Carefully slide the fan straight out.

3 Confirm the correct orientation of the replacement fan (the electrical connector should be in the bottom left corner), then slide the new fan into position.

4 Secure the Rear Fan module to the frame by tightening the four captive screws.

5 Verify that the Rear Fan status LED is green.

CAUTION: The black shutters located behind the fans are necessary to prevent warm air from recirculating back into the frame. Ensure the shutters are not removed.

Fuses

Front and rear fans on the IP3 are protected by fuses. If a fan fuse blows, a serious electrical fault has occurred; the fuse should not be replaced until the electrical fault has been corrected. Use tweezers or needle-nose pliers to lift the fuses straight out of their sockets.

CAUTION: Fuses on the Front Fan module and Rear Fan Adapter boards should not be removed or replaced in a live (powered) IP3 frame.

Table 16-2 Fan Fuses

Location		Fuse Type	Part Number
Front	PSF1	4 A, Slowblow	127-100006Q00
	PSF2	4 A, Slowblow	127-100006Q00
	FC1	750 mA, Slowblow	127-100004Q00
Rear	PSF1	5 A, Slowblow	127-100010Q00
	PSF2	5 A, Slowblow	127-100010Q00
	PSF3	750 mA, Slowblow	127-100004Q00

Fuses on Front Fan Modules

Front Fan fuses are visible inside the Front Fan module array. To inspect or remove fuses, first remove the array as described on page 248. Then remove the fuses by lifting them straight out of their sockets.

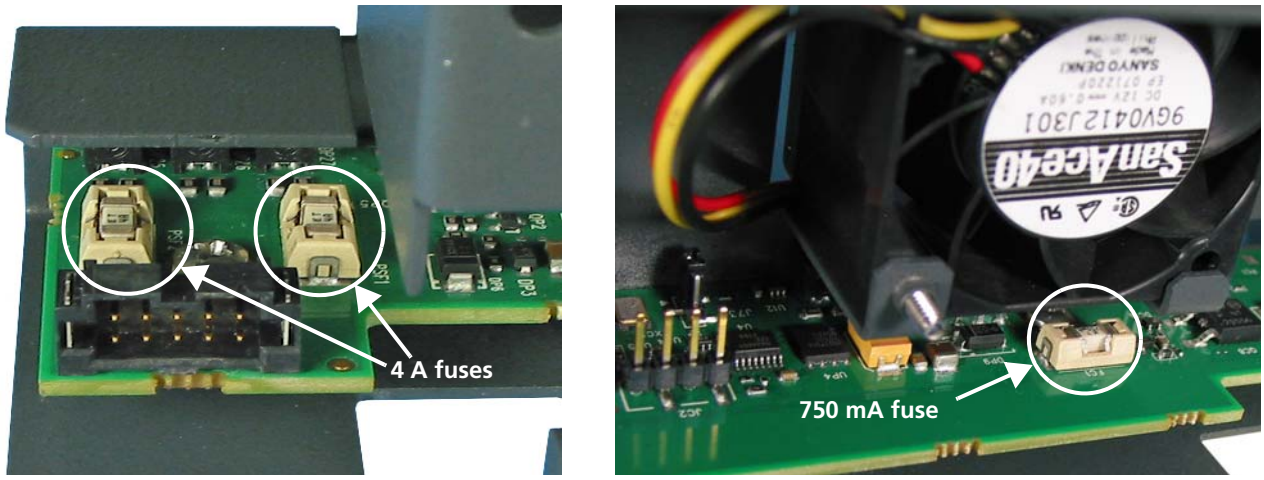


Figure 16-9 Front Fan Fuses (Top Module Shown)

Fuses on Rear Fan Adapter Boards

Fuses are located under the base of the black shutter assembly found behind each rear fan.

To gain access to the rear fan fuses, carefully grasp the two tabs on the sides of the shutter assembly. Then slide the shutter assembly towards you, tilting out the bottom, so that the assembly pivots around the small studs at the top of the opening. When replacing the shutter assembly, ensure the top of the assembly is inserted *behind* these studs.

CAUTION: Ensure you disconnect the two power cables shown in Figure 16-11 when replacing rear fan fuses in a live (powered) IP3 frame.

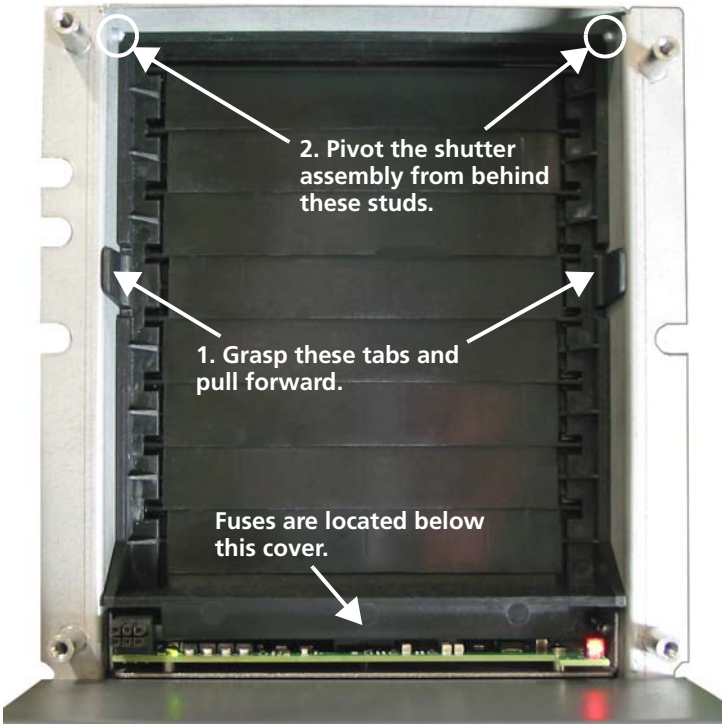


Figure 16-10 Rear Shutter Assembly

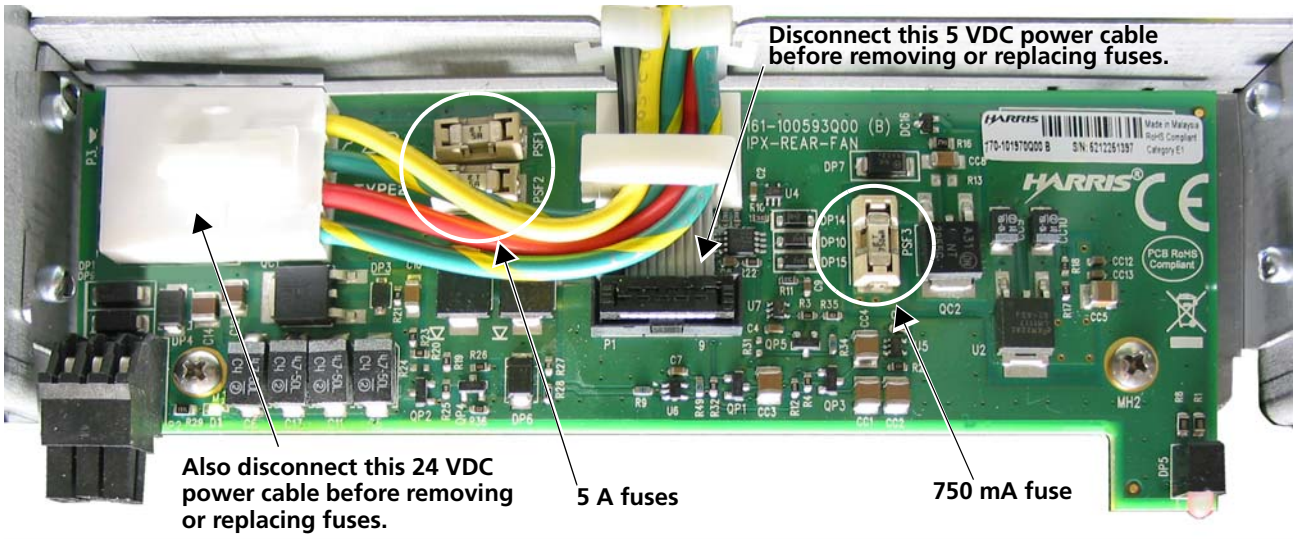


Figure 16-11 Rear Fan Fuses

Power Consumption

Table 16-3 FANS Power Consumption

	PX-FRONT-FAN-TOP	PX-FRONT-FAN-BOT	PX-REAR-FAN-ADPTR	PX-REAR-FAN
24V Power Rail	55.2W	55.2W	0	67W
5V Power Rail	0.82W	0.82W	0.15W	0
Total per Module	56.02W	56.02W	0.15W	67W
				(Note: Includes 172 mm fan)

17 Module LEDs

Card Edge LED Diagnostics

There are multiple card edge LEDs on IP3 **Input Modules (PX-IB)** and **Output Modules (PX-OB)** Modules.

LED Labels

LEDs are labeled as follows:

Input Modules	**INPUT 1** to **INPUT 9**
Output Modules	**OUTPUT 1** to **OUTPUT 16**

Under normal working conditions, all the LEDs are used to indicate signal presence status.

Under certain abnormal conditions, for instance if a module is improperly installed, or the wrong kind of module is plugged in a slot (designed to host another type of module), card edge LEDs are used to show diagnostic information.

LED States

There are three possible states indicated by each LED:

Table 17-1 LED States

State	Description
Off	No signal present
On	Signal present and reclocker locked to signal
Flashing	Signal present but reclocker could not lock to signal

Input Module LEDs

Input 1 and Input 2

INPUT 1 and INPUT 2 flash to indicate abnormal hardware status in the slot. Note that they are NOT turning on/off at the same time.

Input 3, Input 4, Input 5

These LED inputs indicate module configuration.

Table 17-2 LED Inputs 3, 4, 5

INPUT 3	INPUT 4	INPUT 5	Description
OFF	ON	OFF	■ Front Module is SD (270Mbps) only. ■ Works only with specific Back Modules designed for the Platinum system
ON	ON	OFF	■ Front Module is SD/HD/3G. ■ Works only with specific Back Modules designed for the Platinum system
OFF	OFF	ON	■ Front Module is SD (270Mbps) only. ■ Works only with specific Back Modules designed for the IP3 system
ON	OFF	ON	■ Front Module is SD/HD/3G. ■ Works only with specific Back Modules designed for the Platinum system

Input 6, Input 7, Input 8, Input 9

These LED inputs indicate Back Module types.

Table 17-3 LED Inputs 6, 7, 8, 9

INPUT 6	INPUT 7	INPUT 8	INPUT 9	Description
ON	ON	ON	ON	■ No Back Module installed at the back of this slot, OR ■ Front Module not correctly mated with Back Module
OFF	OFF	OFF	OFF	■ Back Module contains 9x HD-BNC connectors
ON	OFF	OFF	OFF	■ Back Module contains 1x DensiShield socket and 1x HD-BNC connector
OFF	ON	OFF	OFF	■ Back Module contains 5x SFP sockets
ON	ON	OFF	OFF	■ Back Module contains 8x BNC connectors

Output Module LEDs

Output 1 - Output 6

LEDs OUTPUT 1 to OUTPUT 6 flash to indicate abnormal hardware status in the slot. Note that they are NOT turning on/off at the same time.

Output 7, Output 8, Output 9

Table 17-4 LED Outputs 7, 8, 9

OUTPUT 7	OUTPUT 8	OUTPUT 9	Description
OFF	ON	OFF	■ Front Module is SD (270Mbps) only. ■ Works only with specific Back Modules designed for the Platinum system
ON	ON	OFF	■ Front Module is SD/HD/3G. ■ Works only with specific Back Modules designed for the Platinum system
OFF	OFF	ON	■ Front Module is SD (270Mbps) only. ■ Works only with specific Back Modules designed for the IP3 system
ON	OFF	ON	■ Front Module is SD/HD/3G. ■ Works only with specific Back Modules designed for the IP3 system

Output 13, Output 14, Output 15, Output 16

These LED outputs indicate Back Module types.

Table 17-5 LED Outputs 13, 15, 15, 16

OUTPUT 13	OUTPUT 14	OUTPUT 15	OUTPUT 16	BM Types
ON	ON	ON	ON	■ No Back Module installed at the back of this slot, OR ■ Front Module not correctly mated with Back Module
OFF	OFF	OFF	ON	■ Back Module contains 16x HD-BNC connectors
ON	OFF	OFF	ON	■ Back Module contains 8x SFP sockets
OFF	ON	OFF	ON	■ Back Module contains 2x DensiShield sockets and 8x HD-BNC connectors
ON	ON	OFF	ON	■ Back Module contains 2x DensiShield sockets and 4x SFP sockets
OFF	OFF	ON	ON	■ Back Module contains 8x BNC connectors
ON	OFF	ON	ON	■ Back Module contains 2x DensiShield sockets
OFF	ON	ON	ON	■ Back Module contains 4x SFP sockets

18 Module Interconnect (PX-BP-28)

Module Interconnect (PX-BP-28) Overview

The **PX-BP-28 Module Interconnect (MI)** is the central interconnect module for the IP3 frame. The Input, Output, Crosspoint, Resource, Alarm and other modules are interconnected by copper traces in the Backplane. Also, DC power, +24V and +5VL, are distributed within the Backplane to all module's connector.

While the PX-BP-28 is a passive module with no active components on the Module Interconnect, there are fuses next to each module's connector. These fuses are to prevent damage to module connectors and the Backplane. See **Fuses on the Module Interconnect (PX-BP-28)** for more details.

PX-BP-28 Module Slots

The following module slots are present on the PX-BP-28:

Table 18-1 Module Slots on the PX-BP-28

Slot Type	Number of Slots
Input Module Slots	64
Output Module Slots	64
Video Crosspoint Module Slots	2
Audio TDM Crosspoint Module Slots	2
Data Switch Module Slots	2
Resource (Control) Module Slots	2
Sync Distribution Module Slots	2
Output Monitoring Module Slot	1
Alarm Expansion Module Slot	1
Auxiliary Module Slot	1
Power Distribution Slots	2

Fuses on the Module Interconnect (PX-BP-28)

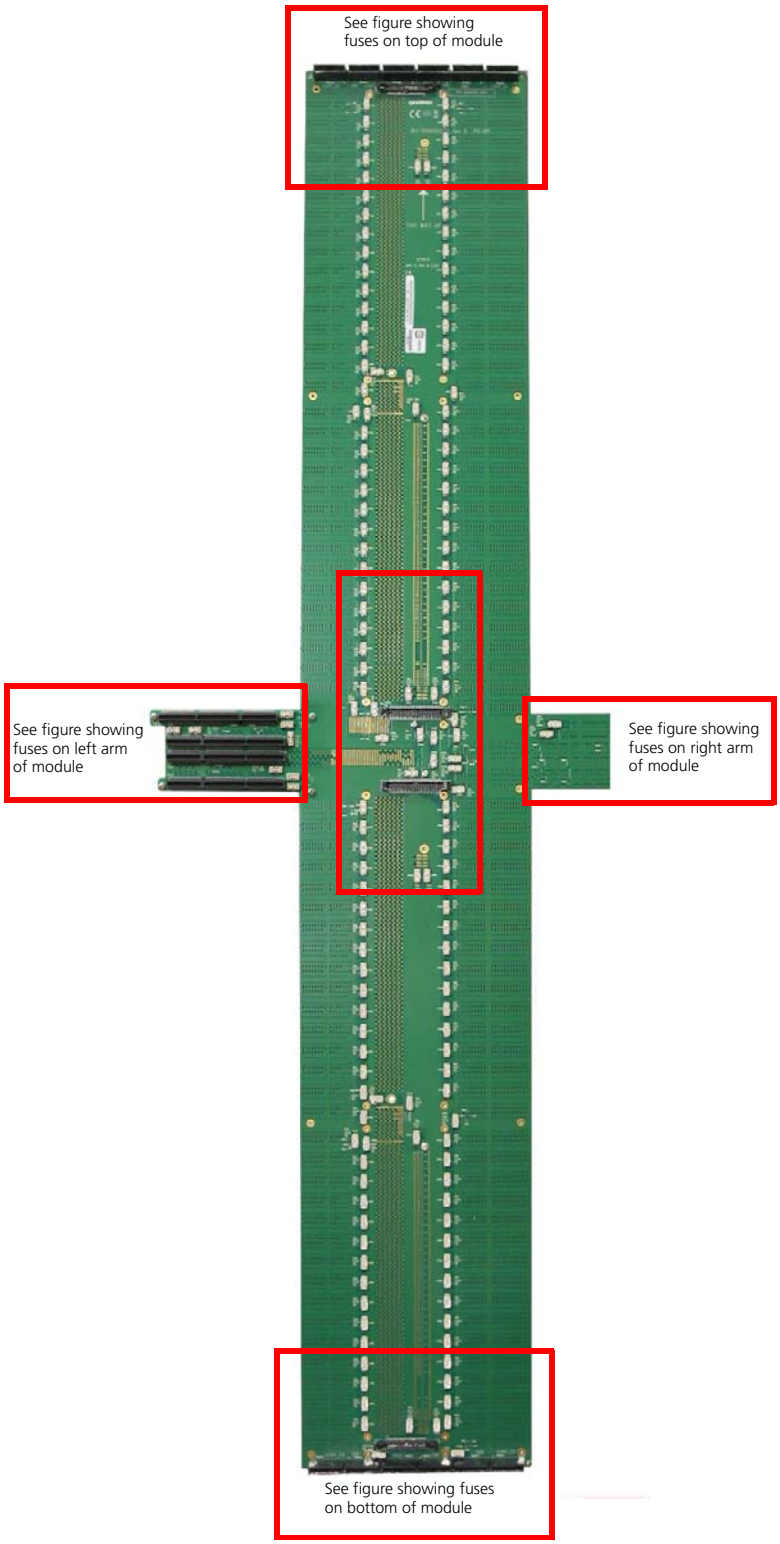


Figure 18-1 Fuses on the PX-BP-28 MI Backplane

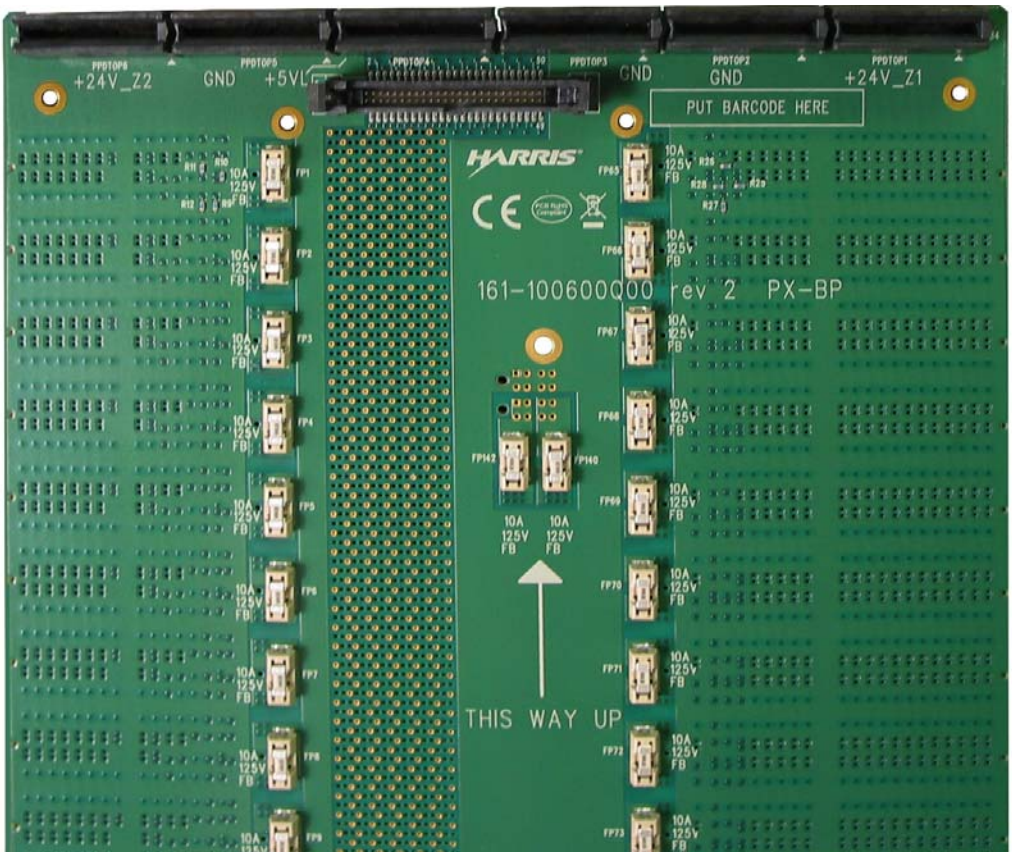


Figure 18-2 Fuses at the top of PX-BP-28

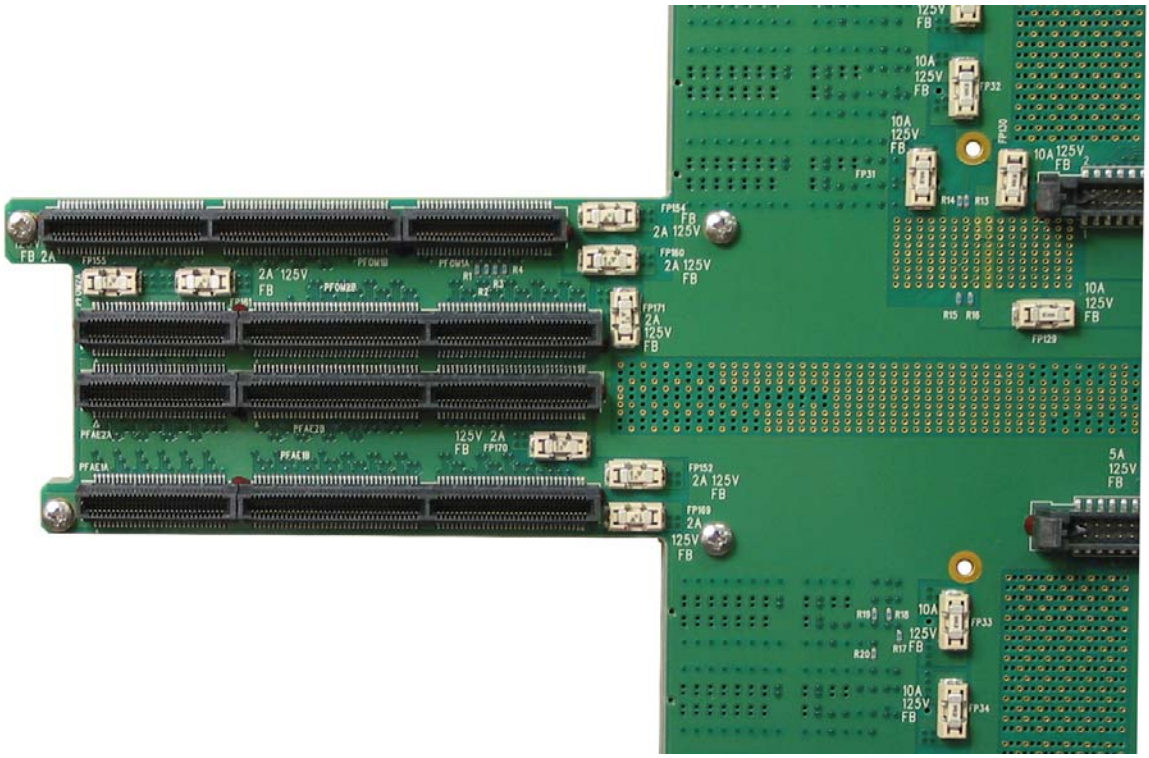


Figure 18-3 Fuses on left arm of PX-BP-28

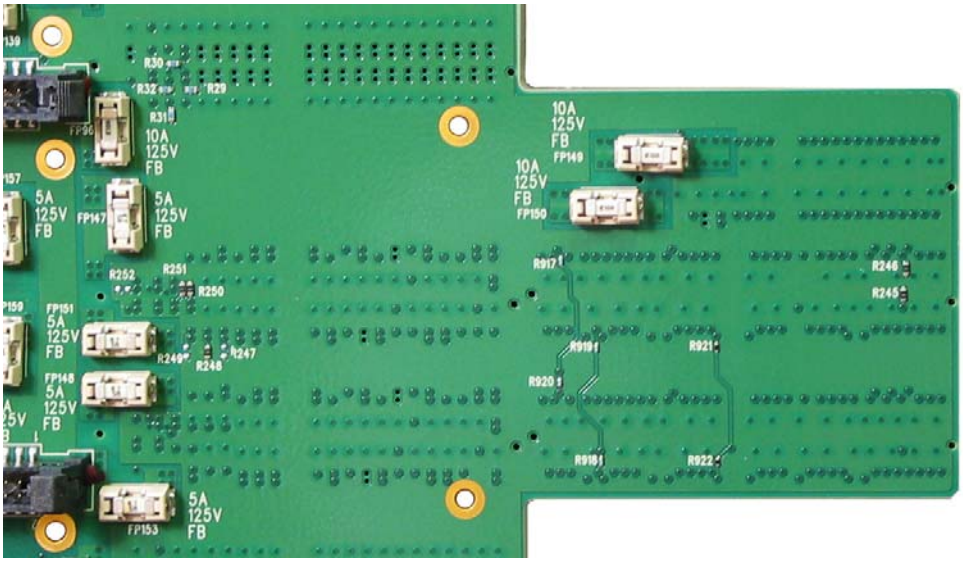


Figure 18-4 Fuses on right arm of PX-BP-28

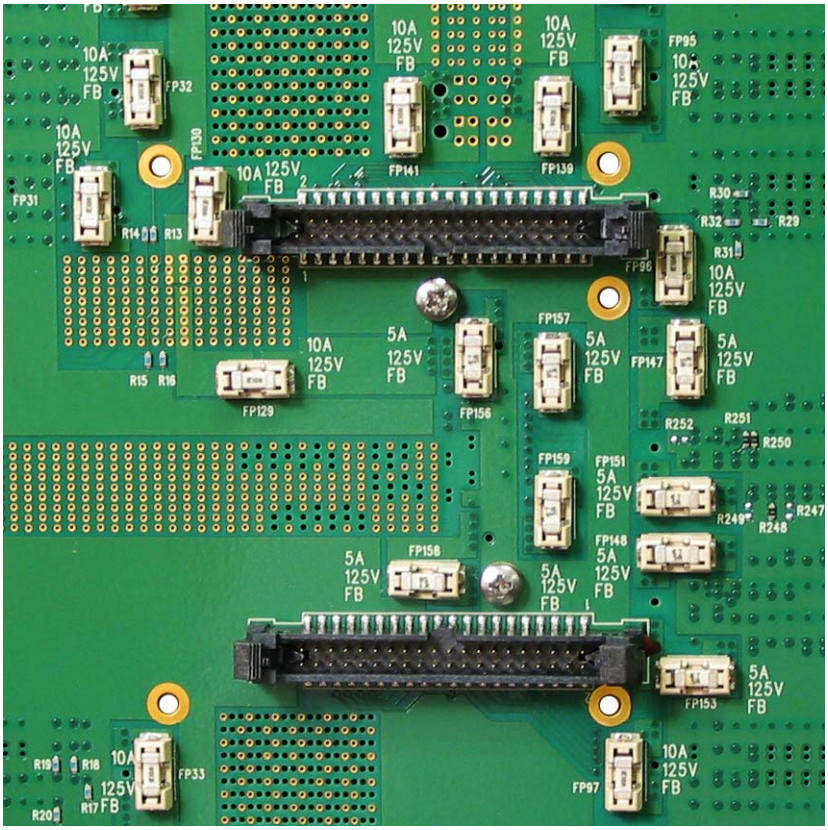


Figure 18-5 Fuses at the center of the PX-BP-28

Table 18-2 Fuses on the PX-BP-28

Fuse Type	Fuse Rating	Present on	Part Number
Slowblow	5 Amps	Resource Card Slots	127-100010Q00
Slowblow	2 Amps	Alarm Card Slots Output Monitoring Slots	127-100001Q00
Fastblow	10 Amps	All Other Slots	127-100013Q00

Module Interconnect Installation

The **PX-BP-28** Module Interconnect is installed into the IP3 frame at Harris' manufacturing facility. This module cannot be replaced in the field

Fuses can be replaced in the field, however the Frame and External Power Supply frame must be powered down.

19 Auxiliary Module (PX-AUX)

Auxiliary Module (PX-AUX) Overview

The Auxiliary Module (**PX-AUX)** provides connectivity between MI/Backplane (PX-BP-28) and the Front Fan modules. The PX-AUX module is plugged into a card slot, in the very center of the frame.

The PX-AUX module contains fuses and Transient Voltage Suppressor (TVS) diodes for over-current and Transient Voltage protection respectively. Besides these components the PX-AUX is passive.

The module connects power and communication signals from the IP3 MI/backplane to the Front Fan Modules.

It connects 24VDC, 5VDC power and a one-wire interface signal to the two Front Fan Modules.

Figure 19-1 PX-AUX Module

The **PX-AUX** has 3 connectors:

- One to the MI backplane
- One to the Bottom Fan
- One to the Top Fan

WARNING

The PX-AUX module is hot pluggable, however, it is recommended that the frame is powered down first.

PX-AUX Fuses

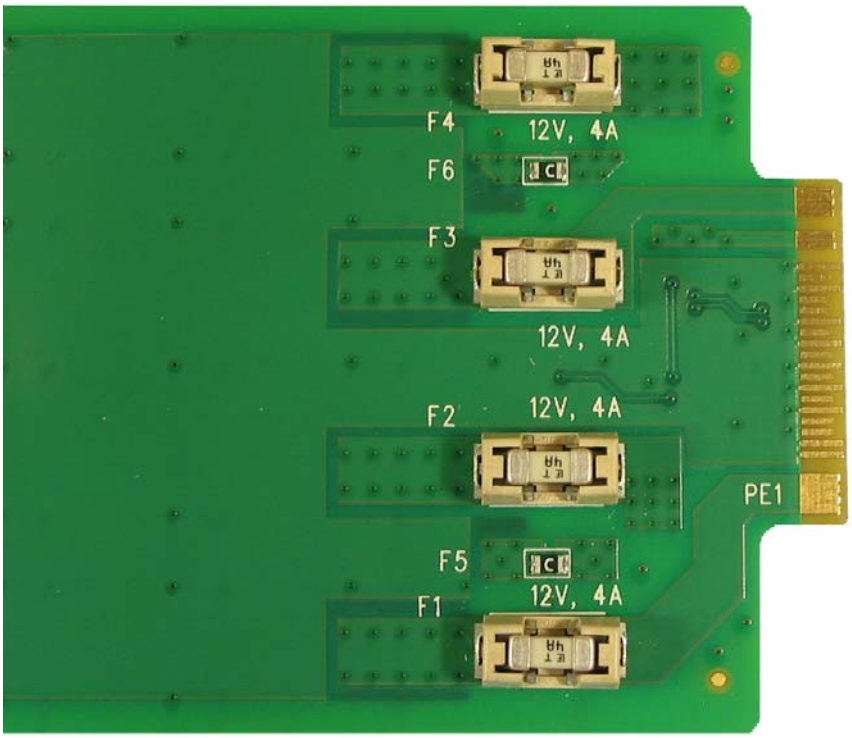


Figure 19-2 Fuses on the PX-AUX Module

Table 19-1 PX-AUX Fuse Ratings

Fuse Name	Fuse Type	Fuse Rating	Part Number
F3, F1	Slowblow	4 Amps	127-100006Q00
	Resettable	0.2 Amps	127-100005Q00

PX-AUX Block Diagram

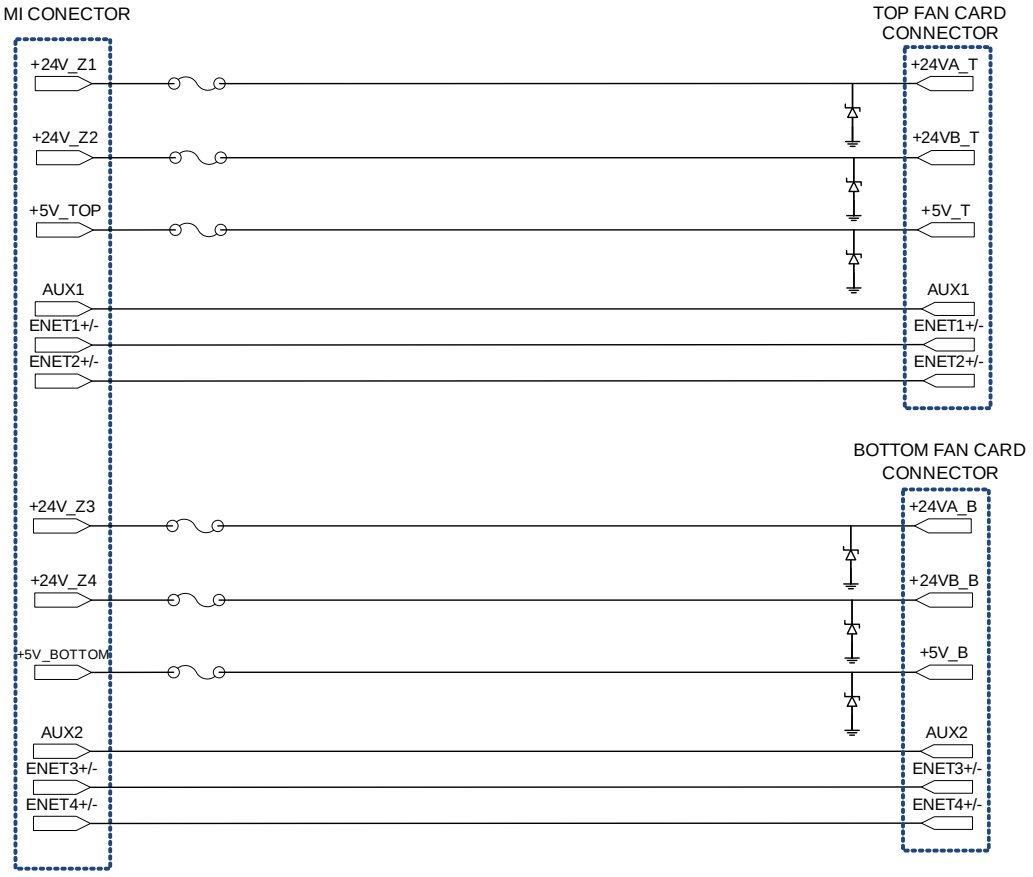


Figure 19-3 PX-AUX block diagram

20 Sync Module Interconnect (PX-SYNC-MI)

Sync Module Interconnect (PX-SYNC-MI) Overview

The **PX-SYNC-MI** is a passive module with four connectors.The module provides a passive connection between the MI/Backplane (PX-BP-28), PT-SYNC cards, and Communications Backplane (PX-CBP).

The PX-SYNC-MI Sync Module:

- Connects the 4 Sync/Reference input signals on the PX-CBP to both PT-SYNC slots
- Connects the Sync/Reference signals from the PT-SYNC modules to the MI/Backplane (PX-BP-28)
- Connects +24V and +5VL from the MI/Backplane to both PT-SYNC slots.

Also, serial communication from the Resource module (PX-RES) is connected through the MI/Backplane, through the PX-SYNC-MI to the PT-SYNC slots.

Provision has also been made to support:

- Genlock over Ethernet, by routing a Sync signal (RES_SYNC) from the Resource module to the PT-SYNC slots
- Audio synchronization of two IP3 frame

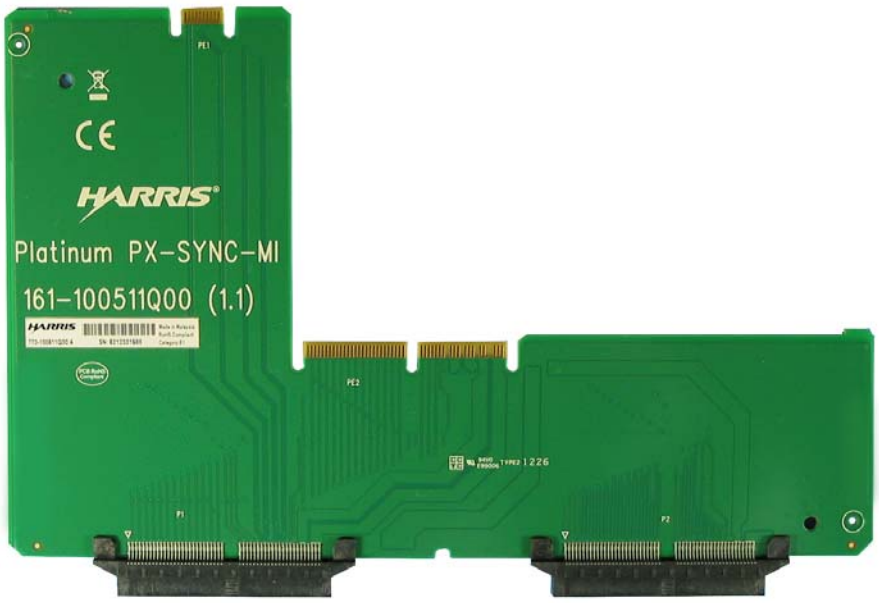


Figure 20-1 PX-SYNC-MI Module

21 Power Adapter Module (PX-PWR-ADPTR)

Power Adapter (PX-PWR-ADPTR) Overview

The Power Adapter Module (PX-PWR-ADPTR) connects DC power (+24V and +5VL) and control signals (I2C and Alarm) from the External Power Supply Frame (PX-FR-EXPS) to the Power Distribution modules (PX-PD-TOP and PX-PD-BOTTOM). Two Power Adapter boards are assembled into the AC/DC Rear Panel. There are four AC/DC Rear Panels assembled to the IP3 frame; two at the top and two at the bottom.

The Power Adapter module contains fuses and Transient Voltage Suppressors (TVS) diodes for over-current and Transient Voltage protection respectively. Besides these components the Power Adapter module is passive.

Eight Power Adapter modules are installed in the frame, so that two PX-FR-EXPS frames can be connected to the IP3 frame for power redundancy.

When the IP3 frame is shipped, plastic covers are placed over the Combo D-sub miniature (Dsub) connector to protect the pins from damage. The plastic covers should only be removed if the PX-FR-EXPS is connected to the IP3 frame.

WARNING

24V and 5V are exposed on D-sub connectors. Keep plastic covers on when not used for connection to PX-FR-EXPS, to avoid accidental shorting that could disturb the IP3 system.

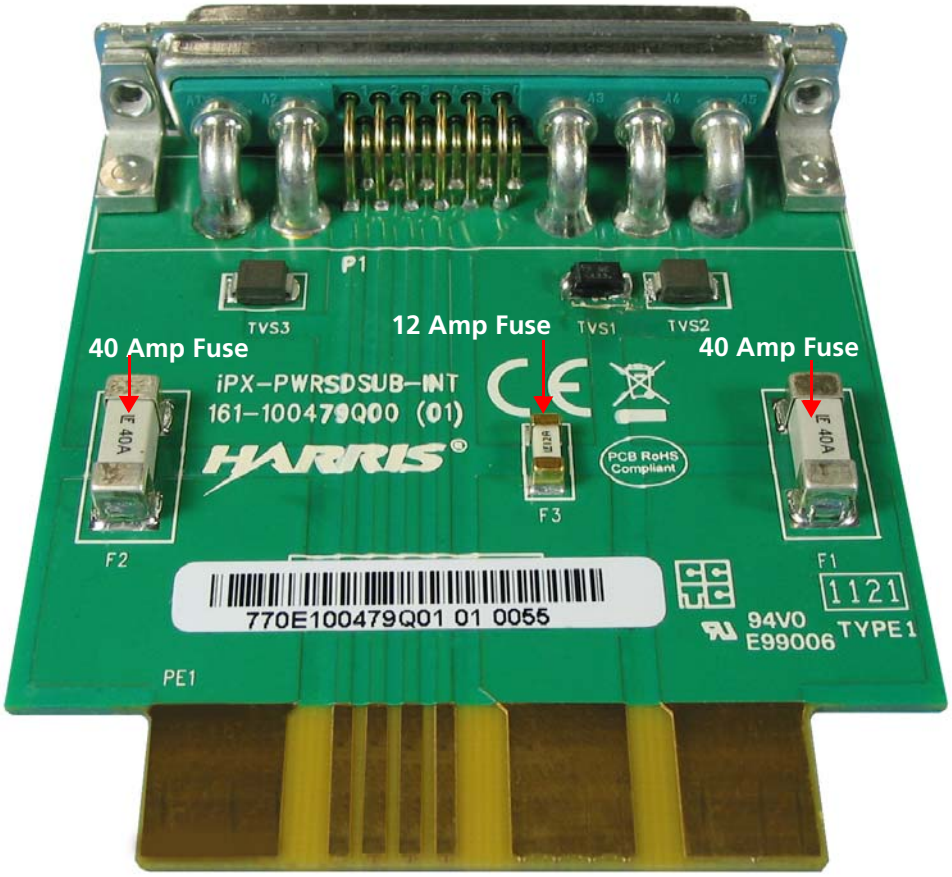


Figure 21-1 PX-PWR-ADPTR Module

WARNING

This module is not hot-pluggable. The Frame must be powered down if you need to remove this Module.

Fuses on the Power Adapter PX-PWR-ADPTR

Table 21-1 PX-PWR-ADPTR - Fuse Ratings

Fuse Name	Fuse Type	Fuse Rating	Part Number
F1, F2	Fastblow	40 Amps	127-100014Q00
F3	Fastblow	12 Amps	127-100015Q00

22 Multiviewer Modules

For details on Multiviewer Modules, refer the **HView SX Pro** Documentation.

A Audio Embedding

Audio Embedding Overview

Each video channel has an audio embedder component composed of several smaller subcomponent blocks:

- One ancillary data stripper (ADS)
- Four audio embedding subcomponents

The first subcomponent is an ancillary data stripper (ADS). This block removes all ancillary data packets in the input SDI stream, prior to embedding. Following the ADS block are four separate audio-embedding subcomponents. Each subcomponent has the ability to operate on only one audio group, either appending or overwriting a predetermined group onto the SDI stream.

Emebedding Mode Options

Table A-1 briefly describes the **Append**, **OverWrite**, and **Auto** options available from each of the embedding modes.

Table A-1 Embedding Mode Options

Options	Description
Append	Attempts to insert the audio data and control packets immediately following the last existing audio data/control packet in the horizontal ancillary region (***Append Embedding*** on page 276)
OverWrite	Attempts to overwrite existing audio data and control packets of the same group number with the new audio data (see ***Overwrite Embedding*** on page 277)
Auto	Attempts first to overwrite existing audio data and control packets of the same audio group number; failing that, it appends the new audio data and control packets immediately following the last existing audio data/control packet (refer to the **Audio Group** (1–4) **Exists** parameters to determine what audio groups are already present in the incoming SDI signal)

Append Embedding

When you select Append embedding, the module attempts to insert the audio data and control packets immediately following the last existing data/control packet in the horizontal ancillary data space (ADS). Append embedding is only valid if the audio group to be embedded does not already exist.

Figure A-1 shows how append embedding will appear in the ancillary data space when there is no previous audio or other data.

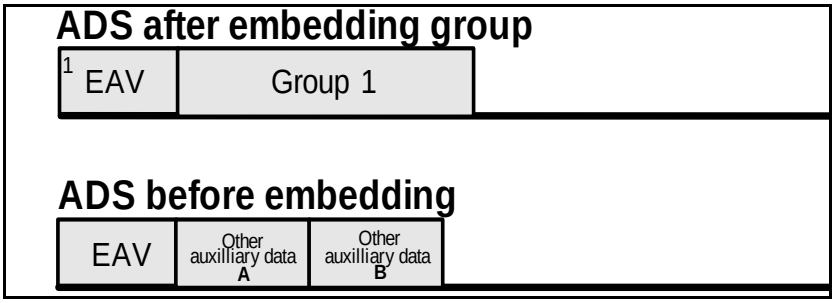


Figure A-1 Append Embedding Mode, Adding Group 1 When No Other Data Present

When auxiliary data exists in the ancillary data space, appended audio appears following that data, as shown in **Figure A-2**.

Figure A-2 Append Embedding Mode, Adding Group 1 When Auxiliary Data Present

If you attempt to insert audio into Group 1 when Group 1 audio data already exists in the ancillary data space, no audio will be embedded, as shown in **Figure A-3**.

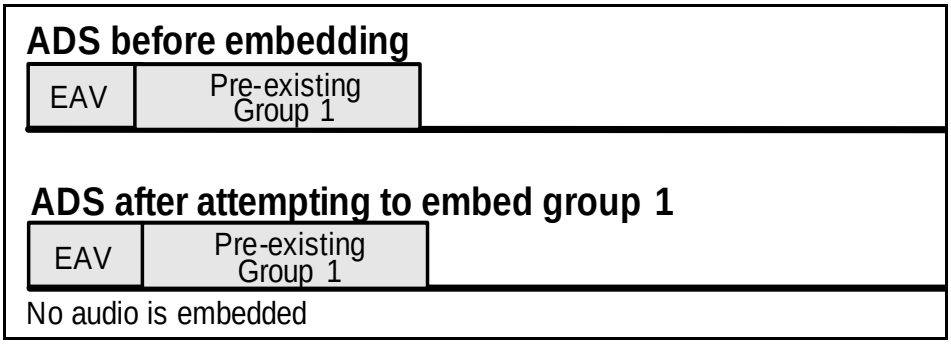


Figure A-3 Append Embedding Mode - Adding Group 1 and a Group 1 Already Exists

If you insert Group 2 audio when there is pre-existing Group 1 audio in the ancillary data space and no Group 2 audio, the Group 2 audio will be inserted following the Group 1 audio, as shown in **Figure A-4**.

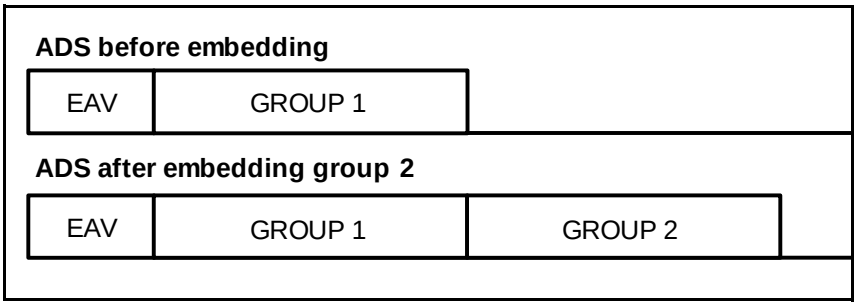


Figure A-4 Append Embedding Mode, Adding Group 2 Following Group 1

If you insert Group 1 audio when there is pre-existing Group 2 audio in the ancillary data space and no Group 1 audio, the Group 1 audio will be inserted following the Group 2 audio, as shown in **Figure A-5**.

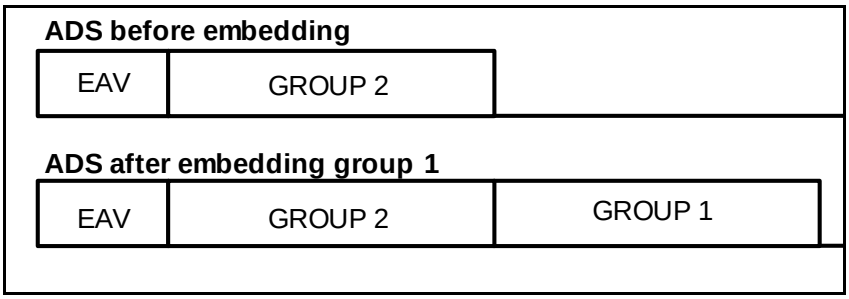


Figure A-5 Append Embedding Mode, Adding Group 2 Following Group 1

An audio group cannot be divided. In Append embedding, the audio group is always added following the last block in the ADS. If there is not enough room to append the audio group following the last block of auxiliary data or audio in the ADS, no audio will be embedded, as shown in **Figure A-6**.

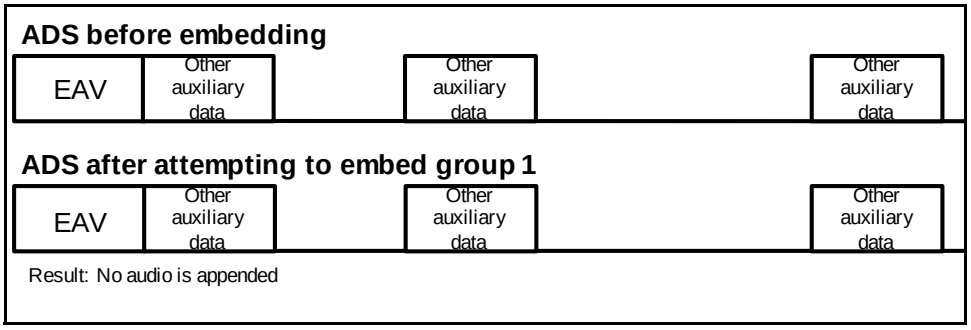


Figure A-6 Append Embedding Mode Fails to Append When Auxiliary Data Exists in all Audio Groups

Overwrite Embedding

When you select Overwrite embedding, the module attempts to overwrite any existing audio data and control packets of the same group number with the new audio data. This setting is valid only if the audio group to be embedded already exists. If the new sample distribution does not exactly match the existing audio data packet sample distribution, the embedder will mark some audio data packets for deletion (DID word will be set to 180h).When you attempt Overwrite embedding and there is no previous audio (as in **Figure A-7**), no audio is embedded because there is nothing to overwrite.

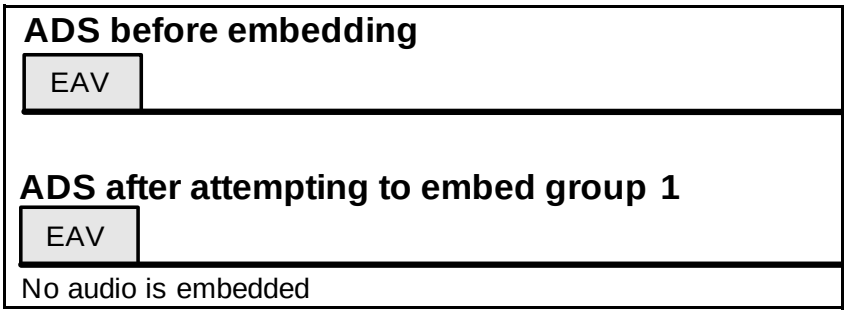


Figure A-7 Overwrite Embedding Mode When There is No Pre-existing Audio

Figure A-8 shows how overwrite embedding will appear in the ancillary data space when there is auxiliary data where Group 1 should be inserted.

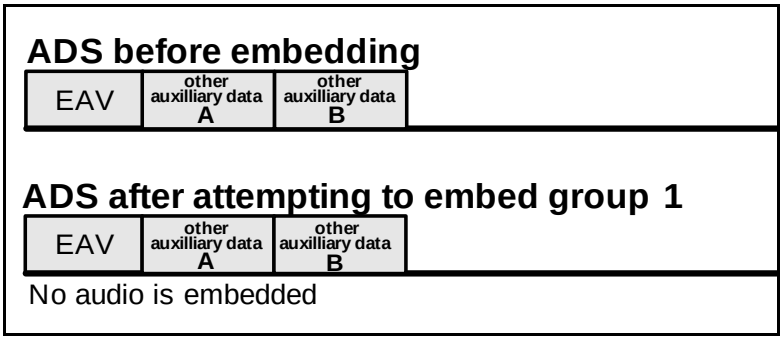


Figure A-8 Overwrite Embedding Mode When There is Auxiliary Data on Group 1

Figure A-9 shows how overwrite embedding will appear in the ancillary data space when there is pre-existing Group 1 audio. This operation is successful.

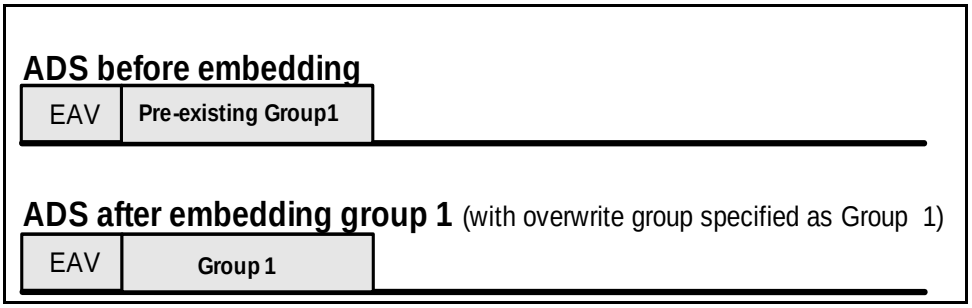


Figure A-9 Overwrite Embedding Mode When There is Group 1 Audio in the Group 1 Space

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