



MDoG-6060 Series

USER MANUAL



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Safety Info

- Do not use this apparatus near water.
- Clean only with lint free dry cloth.
- Do not block any ventilation openings.
- Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
- Do not defeat the safety purposes of the grounding- type plug. A ground type plug has two blades and a third grounding prong. The third prong is provided for your safety. If the provided plug does not fit in to your outlet, consult an electrician for replacement of the obsolete outlet.
- Install in accordance with the MultiDyne® installation instructions.
- Install all peripheral equipment (cameras, routers, etc.) in accordance with the manufacturer’s instructions and safety requirements.
- Protect the power cord from being walked on or pinching particularly at plugs, convenience receptacles, and point where they exit from the apparatus.
- Only use attachments/accessories specified by MultiDyne®.
- Use only with the cart, rack, stand, tripod, bracket, or table specified by MultiDyne®, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.
- Follow all local Electrical Codes for Grounding, Lightning, Arrestment and Surge Protection. Unplug this apparatus during lightning storms or when unused for extended periods of time.
- All Electrical Work to the facility must be performed by a qualified Licensed Electrician. All local Electrical Codes must be followed and, if necessary, must be inspected by a Local or State Inspector.
- All servicing of MultiDyne equipment must be performed at the factory by a MultiDyne trained service technician or engineer.
- Throughout this manual, several Warnings and Cautions and Notes may be presented to alert the user to important safety or operating information.
- Always adhere to local building, safety and fire prevention codes during the installation and operation of this product.
- Use only power cords that were shipped with specified for this product and certified for the country of use.
- Connect the unit only to a power source with the specified voltage rating.
- Unless otherwise stated in the Installation Instructions, and in adherence to local Electrical Codes MultiDyne® Equipment should only be plugged into a standard 15 amp dedicated circuit.

	Warning –indicate danger that requires proper procedures or practices to prevent injury or death to personnel.
	Cautions indicate proper procedures or practices to prevent damage to equipment or property.
	Warning –The safe operation of this product requires that a protective earth connection be provided. A grounding conductor in the equipment’s mains supply cord provides this protective earth. To reduce the risk of electrical shock to the operator and service personnel, this ground conductor must be connected to an earthed ground. The mains plug shall remain readily operable.
	Warning –The apparatus shall not be exposed to dripping or splashing and that no objects filled with liquids, such as vases, shall be placed on the apparatus.
	Warning - This symbol on the equipment indicates for use at altitudes not exceeding 2000 m.
	Warning - Contact your local authority for further details on the correct disposal of this waste, in accordance with your national legislation.

1. Overview

The MDog-6060 Series from MultiDyne provides advanced SDI-to-ST2110 encapsulation and ST2110-to-SDI de-encapsulation within the award-winning openGear platform. This series supports multichannel, bi-directional conversion between SDI and ST2110, offering a range of configurations, including 3x3 3G-SDI with dual 10 GbE SFPs and 6x2 3G-SDI with dual 25 GbE SFPs. Full support for ST2022-7 hitless redundancy ensures uninterrupted signal integrity in critical applications.

Each channel within the MDog-6060 Series processes:

- One video flow
- Four audio flows (each supporting up to 16 audio channels)
- One ANC data flow

SDI inputs are frame-synced prior to encapsulation, ensuring seamless integration into IP workflows. For applications requiring TR-08 JPEG-XS compression, the MDog-6061 builds upon the capabilities of the MDog-6060, delivering enhanced functionality to address bandwidth efficiency and high-quality video compression requirements.

The MDog-6060 Series is designed for scalability, reliability, and flexibility, making it the ideal choice for modern broadcast and production environments where seamless transitions between SDI and IP-based workflows are essential

1.1 Quick Start Guide

- Identify the appropriate card frame slot on your openGear frame.
- Remove the corresponding Blank Plate for your installation.
- Install the designated rear panel for the MDoG-606x card in the chosen slot.
- Insert the MDoG-606x card into the frame, ensuring proper alignment with the rear panel.
- Use Dashboard™ control to configure and manage card settings.

1.2 Purpose and Applications

The MDoG-6060 series is engineered to meet the growing demands of media production and distribution sectors that require high flexibility and reliability in video and audio transmissions. It supports seamless transitions between SDI interfaces and fully networked video over IP, aligning with modern broadcast standards. This makes the MDoG-6060 especially suited for applications including but not limited to live event coverage, studio operations, and broadcast truck installations, where both legacy SDI and ST2110 workflows converge.

1.3 Key Features

- **Multi-Channel Support:** Each MDoG-6060 card can handle multiple channels of video and audio, supporting conversions from SDI to complex 25G network interfaces.
- **Bi-Directional Conversion:** Offers both SDI to ST2110 encapsulation and vice versa, providing flexible workflow solutions.
- **High Compatibility:** Fully supports ST2022-7 hitless redundancy for critical broadcasting scenarios ensuring continuous signal integrity.
- **Frame Synchronization:** Incorporates frame syncing of SDI inputs before encapsulation to ensure alignment of audio, video, and ancillary data streams.

1. OVERVIEW

- **Network Management:** Utilizes NMOS for in-band control and configuration, coupled with the openGear DashBoard™ for remote monitoring and firmware upgrades, ensuring ease of use and adaptability to existing network infrastructures.
- **JPEG-XS Ready:** The MDoG-6061 variant (related to MDoG-6060) supports TR-08 JPEG-XS for high-quality video compression needs, suitable for bandwidth-limited connections.

This overview provides a succinct introduction to the capabilities and key functions of the MDoG-6060 series, setting the stage for more detailed discussions in the subsequent sections of the manual.

2. SDI and ST2110 Signal Handling

2.1 SDI to ST2110 Encapsulation

The MDoG-6060 series excels in converting traditional SDI signals into the SMPTE ST2110 standard for video over IP, facilitating modern broadcasting needs. This encapsulation process involves several critical steps:

- **Frame Synchronization:** Before encapsulation, each SDI input is synchronized to ensure the alignment of video, audio, and ancillary data streams. This synchronization is crucial for maintaining the quality and coherence of the media content across various distribution networks.
- **Protocol Conversion:** The series uses advanced algorithms to convert SDI signals into ST2110 packets. This includes separating video, audio, and data components, which are then packetized and timestamped to ensure synchronized playback across IP networks.
- **Network Adaptation:** Adaptation to network conditions is a key feature, with the MDoG-6060 dynamically adjusting packet sizes and timing to optimize bandwidth usage and minimize latency, crucial for live broadcast environments.

2.2 ST2110 to SDI De-encapsulation

Converting back from ST2110 to SDI is just as pivotal for studios and broadcast centers that still operate with SDI infrastructure:

- **Stream Reassembly:** The de-encapsulation process involves the reassembly of SDI streams from IP packets. This includes the precise ordering and timing of packets to reconstruct the original SDI stream without any loss in fidelity or synchronization.
- **Jitter Correction:** To ensure the highest quality output, the MDoG-6060 implements sophisticated jitter correction algorithms that compensate for timing variations introduced by the IP network, delivering a stable and broadcast-quality SDI output.

2.3 Signal Re-clocking and Integrity

Maintaining signal integrity is vital, especially when dealing with high-definition and ultra-high-definition video formats:

- **Re-clocking Mechanisms:** The MDoG-6060 series features advanced re-clocking mechanisms that remove any timing errors and jitter from the SDI signals, ensuring compliance with broadcast standards and preventing signal degradation over long cable runs.
- **Bypass Reliability:** In critical broadcasting situations, the ability to bypass normal processing and directly route SDI signals through predefined paths ensures continuity of service without interruption, a vital feature during power outages or equipment failure.

2.4 Advanced Monitoring and Control

The openGear DashBoard™ software provides advanced monitoring and control capabilities that allow for comprehensive management of the encapsulation and de-encapsulation processes:

- **Real-Time Monitoring:** Operators can monitor the status of each channel in real time, including signal presence, data rate, and error states. This immediate feedback is essential for managing live broadcasts and ensuring the reliability of the transmission.

2. SDI AND ST2110 SIGNAL HANDLING

- **Configurable Flow and IP Settings:** The system allows for detailed configuration of each flow's functionalities and IP settings, enabling precise control over the operational parameters of the network.

Integration with Modern IP Workflows

Integrating SDI and ST2110 workflows allows facilities to leverage their existing investments in SDI technology while embracing the flexibility and scalability of IP-based networks. The MDoG-6060 series facilitates this integration by providing seamless interoperability between these two dominant media transport formats, ensuring that media organizations can migrate to IP at their own pace without disrupting ongoing operations.

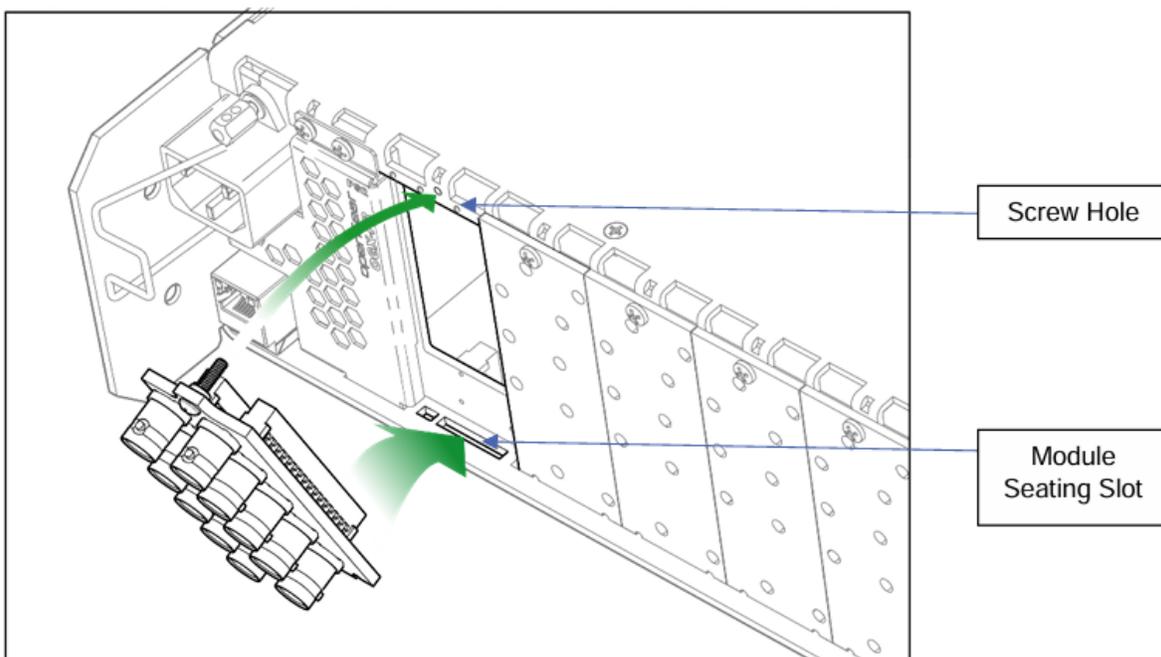
3. INSTALLATION INSTRUCTIONS

3. Installation Instructions

3.1 Installing a Rear Module

Before installing the MDoG-6060 card, it's crucial to properly install the rear module in the openGear frame. Here's how:

- 1 **Locate the card frame slots** at the rear of the openGear frame where the module will be installed.
- 2 **Remove the Blank Plate** from the selected slot to make space for the new module.
- 3 **Install the Rear Module:** Slide the bottom of the rear module into the module seating slot at the base of the frame's backplane. Make sure it is seated firmly and aligned correctly as shown below.



- 4 **Secure the Module:** Align the top hole of the Rear Module with the screw on the top edge of the frame backplane. Using a Phillips screwdriver, fasten the rear module to the backplane using the supplied screws. It is important not to overtighten the screws to avoid damaging the module or the frame.
- 5 **Ensure Proper Ventilation:** After installation, check that all rear frame slots are covered with either rear modules or blank plates to ensure proper cooling and ventilation of the openGear frame.

3.2 Installing the MDoG-6060 Card

Once the rear module is securely installed, you can proceed to install the MDoG-6060 card:

- **Preparation:** Before handling the MDoG-6060 card, ensure you are grounded to prevent any static damage. Static electricity can damage the sensitive electronic components on the card.
- **Position the Card:** Hold the MDoG-6060 card by its edges and carefully align it with the guide rails of the previously installed rear module.

3. INSTALLATION INSTRUCTIONS

- **Insert the Card:** Carefully slide the card into the frame until the card's rear connection plug is properly seated in the rear module. Make sure the card is securely in place and fully connected to the rear module.
- **Check Indicators:** Once the card is installed, verify the operational status by observing the LEDs on the edge of the MDoG-6060 card facing the front panel. These LEDs provide crucial diagnostics and confirm that the card is powered and functioning correctly.

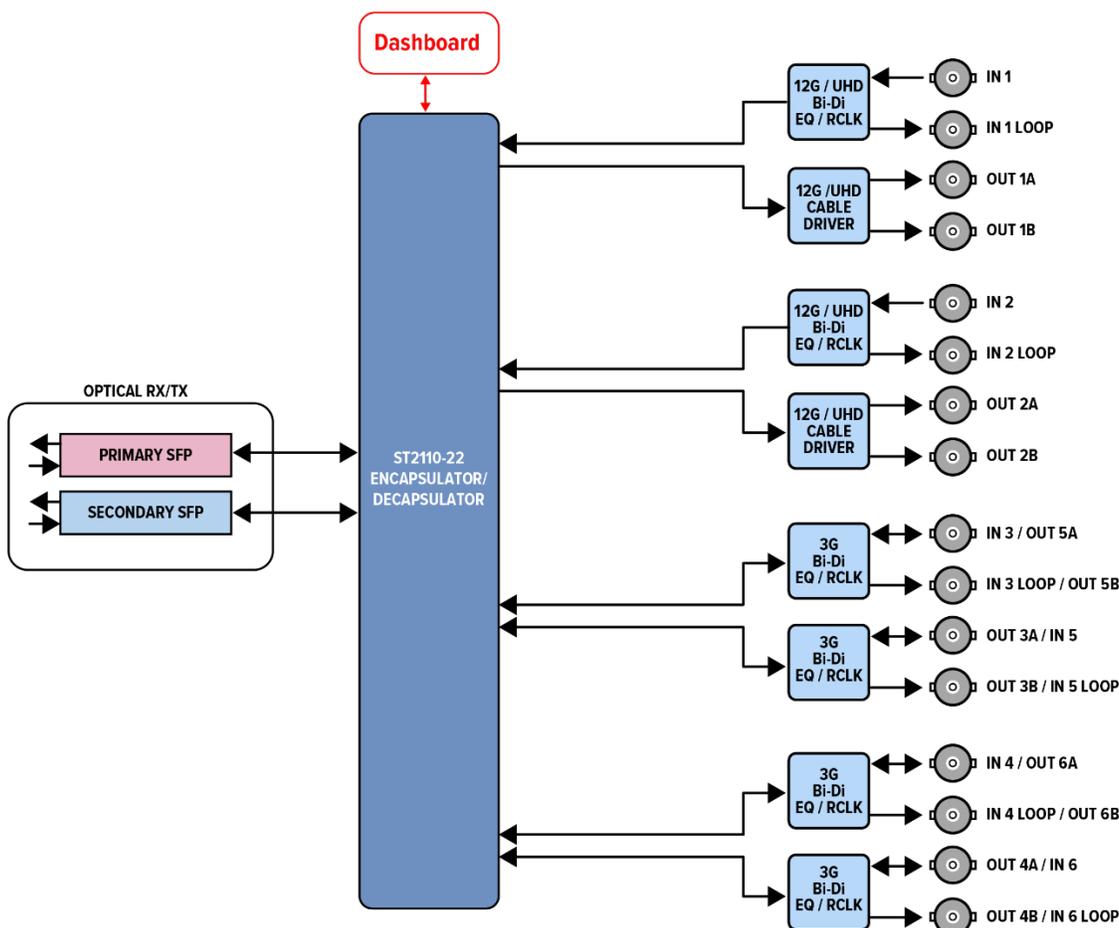
3.3 Final Checks and Power Up

After the card is installed:

- **Inspect Installations:** Double-check all connections and mounting to ensure everything is secure and correctly positioned.
- **Power Up:** Power up the openGear frame if it was turned off during installation. Observe the initialization process to ensure that the MDoG-6060 boots up without issues.
- **Verify Functionality:** Use the openGear DashBoard™ software to verify that the card is recognized and functioning as expected. Check for any firmware updates that might be required and ensure all settings are configured according to your operational needs.

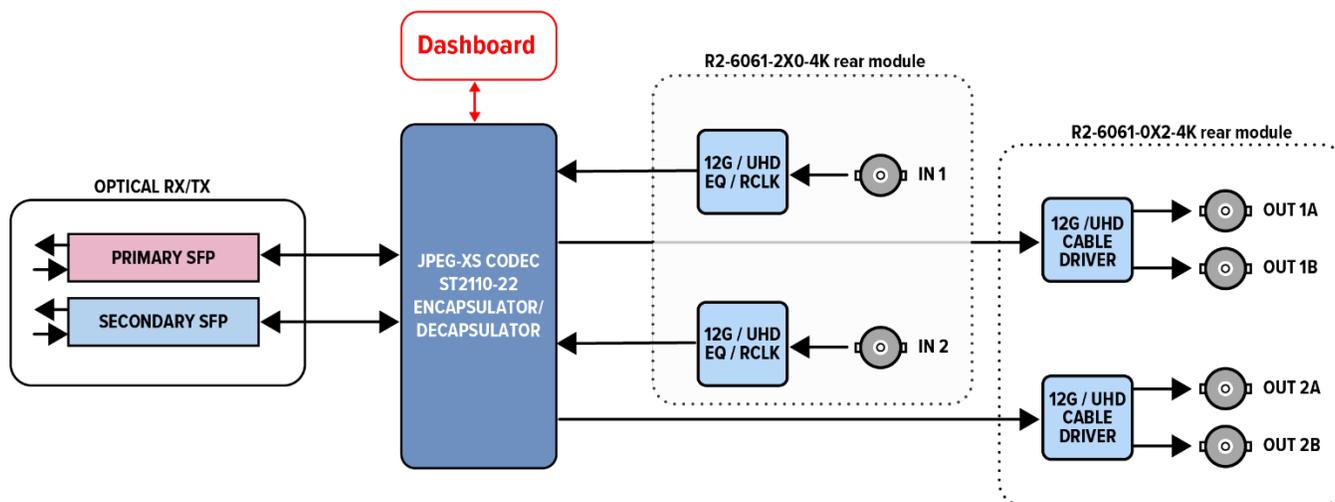
3.4 Block Diagrams

3.4.1 MDoG-6060



3. INSTALLATION INSTRUCTIONS

3.4.2 MDoG-6061



4. Configuration

The DashBoard™ software facilitates straightforward configuration of the MDOG-606x series cards, allowing users to tailor settings to their specific broadcast needs. It ensures that all adjustments are securely saved to the card's non-volatile memory, maintaining configurations even after power cycles. This capability guarantees that the system's setup remains consistent and reliable, regardless of external interruptions.

4.1 DashBoard™ Control Overview

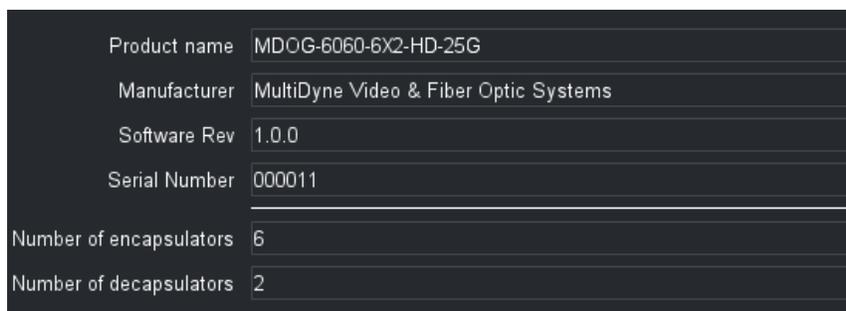
The openGear DashBoard™ provides a comprehensive interface for effectively managing and configuring the MDOG-6060 series cards. This interface is clearly structured into two main panels, simplifying the setup and ongoing management of system hardware, network settings, and media flow options:

4.1.1 Left Panel Overview

The left panel serves as the primary access point for device-specific settings and diagnostics, organized through the following tabs:

- **Card Information:** Displays essential information about the card's status and connectivity.
- **Hardware:** Provides diagnostics and status reports of the physical hardware components.
- **SFP Primary:** Details about the primary SFP module installed.
- **SFP Secondary:** Information about the secondary SFP module.

A) Card Information



Product name	MDOG-6060-6X2-HD-25G
Manufacturer	MultiDyne Video & Fiber Optic Systems
Software Rev	1.0.0
Serial Number	000011
Number of encapsulators	6
Number of decapsulators	2

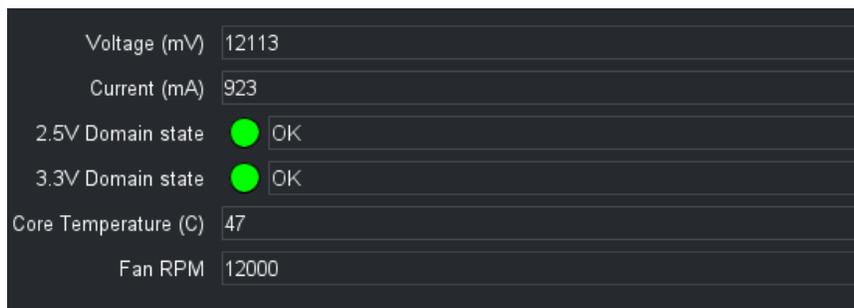
The "Card Information" tab within the openGear DashBoard™ provides a detailed overview of the MDOG-6060 series card's key identification details. This tab is crucial for managing and documenting the hardware within your broadcasting setup:

- **Product Name:** Shows the specific model of the card, which in this example is MDOG-6060-6X2-HD-25G. This helps in identifying the exact capabilities and configuration of the card.
- **Manufacturer:** Indicates that the card is produced by MultiDyne Video & Fiber Optic Systems, ensuring it meets the high standards expected from MultiDyne products.
- **Software Revision:** Displays the current firmware version installed on the card, which is 1.0.0 in this case. Keeping this updated is essential for maintaining compatibility and functionality with the latest features and security patches.

4. CONFIGURATION

- **Serial Number:** Lists the unique identifier for the card, which is used for support, warranty, and tracking purposes.
- **Number of Encapsulators/Decapsulators:** Provides specific information about the number of encapsulating and decapsulating channels the card supports, critical for planning the capacity and layout of your network's video and audio streams.

B) Hardware Tab



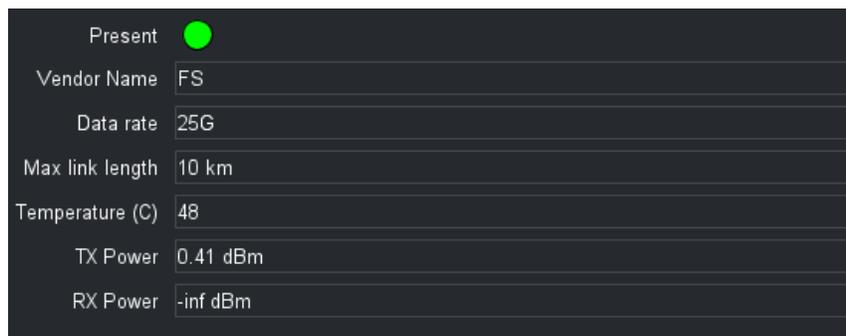
Voltage (mV)	12113
Current (mA)	923
2.5V Domain state	● OK
3.3V Domain state	● OK
Core Temperature (C)	47
Fan RPM	12000

The "Hardware" tab in the openGear DashBoard™ is designed to provide comprehensive diagnostic information that helps ensure the MDoG-6060 series cards are operating within safe and optimal parameters. Here's what the tab covers:

- **Voltage (mV):** Displays the current voltage supplied to the card which is crucial for detecting any power supply issues that could affect performance.
- **Current (mA):** Shows the amount of current being drawn by the card, measured at 923 mA. This helps in monitoring power consumption and ensuring that it does not exceed the specified limits.
- **2.5V & 3.3V Domain State:** These indicators provide a quick health check of the card's critical voltage domains. Both are marked as OK, confirming that the card is receiving stable power across these domains.
- **Core Temperature (°C):** Lists the core temperature of the card's processing unit, which is 47 degrees Celsius. Monitoring this temperature is vital to prevent overheating that could lead to hardware failure.
- **Fan RPM:** Shows the rotational speed of the card's cooling fan, which is 12000 RPM in this case, ensuring that the card is adequately cooled during operation.

4. CONFIGURATION

C) SFP Primary and Secondary tab



Present	●
Vendor Name	FS
Data rate	25G
Max link length	10 km
Temperature (C)	48
TX Power	0.41 dBm
RX Power	-inf dBm

The "SFP Primary" and "SFP Secondary" tabs on the openGear DashBoard™ offer detailed diagnostics and status information about the Small Form-factor Pluggable (SFP) modules used in the MDoG-6060 series. These tabs are instrumental in ensuring that the network connections are stable and performing optimally. Key data points include:

- **Presence:** A green indicator shows that an SFP module is currently installed and operational.
- **Vendor Name:** Identifies the manufacturer of the SFP module, in this case, "FS", which helps in verifying compatibility and performance standards.
- **Data Rate:** Displays the data transmission rate supported by the SFP module which should 10G or 25G depending on MDoG-6060 version for handling high-speed data transfers efficiently.
- **Max Link Length:** Indicates the maximum distance the SFP can transfer data within the link budget, suitable for configurations that require extended network setups.
- **Temperature (°C):** Monitors the operational temperature of the SFP module, ensuring it stays within safe operational limits to avoid overheating issues.
- **TX Power and RX Power:** Measures the transmit and receive power levels, important for diagnosing transmission strength and quality. The TX Power is noted at 0.41 dBm, while the RX Power shows as '-inf dBm', indicating a reception issue that might need further investigation.

4.1.2 Right Panel Overview

The right panel of the openGear DashBoard™ facilitates detailed control over the MDoG-6060 series operations through seven specialized tabs:

- **Network:** Configures network parameters for connectivity.
- **NMOS:** Manages settings for NMOS device discovery and registration.
- **PTP:** Sets up Precision Time Protocol for network synchronization.
- **Video:** Adjusts video settings for format, frame rate, and resolution.
- **Audio:** Configures audio channel setups and encoding parameters.
- **Ancillary:** Manages settings for ancillary data streams.
- **Reference:** Adjusts reference signals for system synchronization.

4. CONFIGURATION

A) Network

The screenshot displays the configuration page for two Ethernet interfaces, ETH1 and ETH2. Each interface has a set of controls for its status and configuration.

ETH1 Configuration:

- Link Status: Up (indicated by a green dot)
- Mode: DHCP (selected with a radio button)
- IP address: 10.161.231.190
- Subnet Mask: 255.0.0.0
- Gateway: 10.160.1.2
- MAC Address: 40:a3:6b:a1:e7:be
- Speed: 25G

ETH2 Configuration:

- Link Status: Down (indicated by a red dot)
- Mode: DHCP (selected with a radio button)
- IP address: 172.161.231.190
- Subnet Mask: 255.0.0.0
- Gateway: 172.160.1.2
- MAC Address: 40:a3:6b:a1:e7:bf
- Speed: 25G

Below the configuration fields for each interface, there are instructions: "Click **Apply** to save the user settings and for them to take effect." and "Click **Cancel** to revert to the previous settings." Each interface also has "Apply" and "Cancel" buttons.

The "Network" tab in the openGear DashBoard™ is crucial for configuring the network settings of the MDoG-6060 series cards. This tab facilitates the management of IP addressing and networking parameters for the device's Ethernet interfaces:

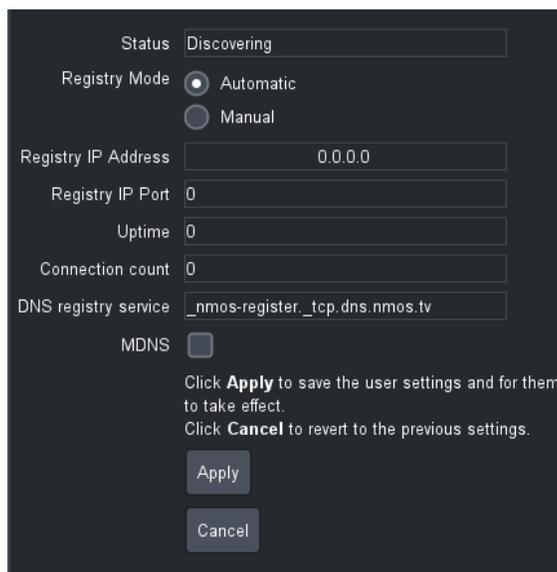
- **Link Status Indicators:** Shows whether each Ethernet interface (ETH1 and ETH2) is active ('Up') or inactive ('Down'), allowing quick diagnostics of network connectivity.
- **Mode Selection:** Users can toggle between 'Static' and 'DHCP' modes for IP addressing. Static mode allows for manual entry of IP addresses, subnet masks, and gateways, ensuring fixed network addresses. DHCP mode enables automatic IP configuration from a network server, simplifying setups in dynamic network environments.

4. CONFIGURATION

- **IP Parameters:** For static IP configuration, set the IP address, subnet mask, and gateway for each interface, providing precise control over network traffic routing. When using DHCP, these parameters are displayed as read-only, reflecting the automatically assigned network settings.
- **MAC Address:** Displays the MAC address for each interface, useful for network administration and security settings.
- **Network Speed:** Indicates the speed capability of the Ethernet connection, with options like 25G reflecting the high-speed potential of modern network infrastructures.
- **Apply and Cancel Buttons:** Changes can be applied with the 'Apply' button, which saves the settings and may reboot the card, taking approximately 30 seconds for changes to take effect. The 'Cancel' button allows users to revert to previous settings if needed.

Note: On 25G, the interface has RS-FEC enabled, and 10G not. It's crucial to make it work in network.

B) NMOS Tab



The screenshot shows a configuration panel for the NMOS tab. It includes the following elements:

- Status:** A dropdown menu currently set to "Discovering".
- Registry Mode:** Two radio buttons, "Automatic" (selected) and "Manual".
- Registry IP Address:** A text input field containing "0.0.0.0".
- Registry IP Port:** A text input field containing "0".
- Uptime:** A text input field containing "0".
- Connection count:** A text input field containing "0".
- DNS registry service:** A text input field containing "_nmos-register._tcp.dns.nmos.tv".
- MDNS:** A checkbox that is currently unchecked.
- Instructions:** Text below the MDNS checkbox: "Click **Apply** to save the user settings and for them to take effect. Click **Cancel** to revert to the previous settings."
- Buttons:** Two buttons, "Apply" and "Cancel", located at the bottom of the panel.

The "NMOS" tab on the openGear DashBoard™ is essential for configuring and monitoring the Networked Media Open Specifications (NMOS) settings of the MDoG-6060 series cards. This tab enables seamless integration and communication within IP-based broadcast environments:

- **Registry Mode:** Users can select between 'Automatic' and 'Manual' modes. Automatic mode allows the device to dynamically discover and register with an NMOS registry, simplifying setup in complex networks. Manual mode requires specific registry IP addresses and port details to be entered if automatic discovery is not suitable.
- **Registry IP Address and Port:** In manual mode, specify the IP address and port number for the NMOS registry to which the device should connect, allowing for precise network targeting.
- **Status Display:** Displays the current status of the NMOS connection, cycling through 'Discovering', 'Connecting', and 'Connected' as it progresses. 'Discovering' indicates the

4. CONFIGURATION

initial search for an NMOS registry, 'Connecting' is the phase where the device attempts to establish a link with the discovered registry, and 'Connected' confirms a successful connection. Each status provides insight into the current state of the NMOS interaction, aiding in diagnostics and monitoring of network activities.

- **Uptime:** Displays the total uptime since the last successful connection to an NMOS registry, providing insight into system reliability.
- **Connection Count:** Records the number of connections made to the NMOS registry, useful for diagnostic and monitoring purposes.
- **DNS Registry Service:** For networks utilizing DNS-based service discovery, this field shows the DNS SRV record for locating NMOS services.
- **MDNS:** Enables or disables Multicast DNS (MDNS) for local network discovery and service advertisement, enhancing network configuration ease.
- **Apply and Cancel Buttons:** Make changes effective by clicking 'Apply', which saves the settings and potentially reboots the device to implement them. Use 'Cancel' to revert to previously saved settings if modifications are not desired.

C) PTP Tab

The screenshot displays the PTP configuration interface with the following settings:

- Clock selection:** Automatic, Manual
- Source selection:** Source 1, Source 2
- PTP Mode:** Multicast (dropdown menu)
- Source 1:**
 - Present: (green indicator)
 - Clock ID: 90-a-84-ff-fe-49-8f-c8
 - Grand Master ID: 90-a-84-ff-fe-49-8f-c8
 - Domain number: 1
 - VLAN ID: 0
 - DSCP: 46
- Source 2:**
 - Present: (red indicator)
 - Clock ID: 0-0-0-0-0-0-0-0
 - Grand Master ID: 0-0-0-0-0-0-0-0
 - Domain number: 1
 - VLAN ID: 0
 - DSCP: 46

Buttons: Apply, Cancel

4. CONFIGURATION

The "PTP" (Precision Time Protocol) tab on the openGear DashBoard™ is crucial for configuring timing settings that ensure precise synchronization across all networked broadcast devices. Here's what you can manage within this tab:

- **Clock Selection:** Choose between 'Automatic' or 'Manual' for clock source selection. Automatic allows the device to select the best available clock source, while Manual lets you specify preferred sources.
- **Source Selection:** Toggle between available sources (e.g., Source 1 and Source 2) to determine which is used for timing and synchronization.
- **PTP Mode:** Set the protocol mode for the PTP, with selectable options including 'Multicast', 'Unicast', and 'Hybrid'. 'Multicast' is used for network-wide time synchronization, while 'Unicast' targets specific devices, and 'Hybrid' combines elements of both to optimize network performance and accuracy.
- **Source Information:**
 - For each source, indicators such as 'Present' (green for active, red for inactive) show whether the source is currently viable.
 - **Clock ID** and **Grand Master ID** display the unique identifiers for the source clock and the grand master clock, respectively, ensuring that the correct time source is being utilized.
- **Domain Number:** Defines the PTP domain within which this device operates, allowing for segmentation of timing networks.
- **VLAN ID:** Specifies the Virtual Local Area Network ID, used to manage domain traffic and enhance network security and efficiency.
- **DSCP:** The Differentiated Services Code Point is configured to prioritize PTP traffic on the network, enhancing the reliability of timing synchronization.
- **Apply and Cancel Buttons:** The 'Apply' button saves and implements the settings, updating the configuration without rebooting the device. The 'Cancel' button discards any changes, reverting to the previous settings.

D) Video Tab

The "Video" tab in the openGear DashBoard™ is a critical tool for managing the SMPTE ST 2110-20 video flow settings of the MDoG-6060 series. It offers comprehensive options for customizing video stream parameters to fit specific broadcast requirements:

- **Bit Rate:** Allows selection between 'Integer' and 'Fractional' bit rates, which can significantly impact the quality and bandwidth requirements of the video stream. It is important to note that the bitrate setting is a global adjustment, affecting all available channels on the device.
- **Channel Selector:** Users can select from available channels (e.g., 2, 6, 8, depending on the configuration) to view and adjust settings for each. The 'Flow Type' displayed for each channel indicates its fixed functionality, either as an 'Encapsulator' or 'Decapsulator'. This selector is key for managing specific channels within the device's setup, allowing users to fine-tune individual components according to their operational needs.

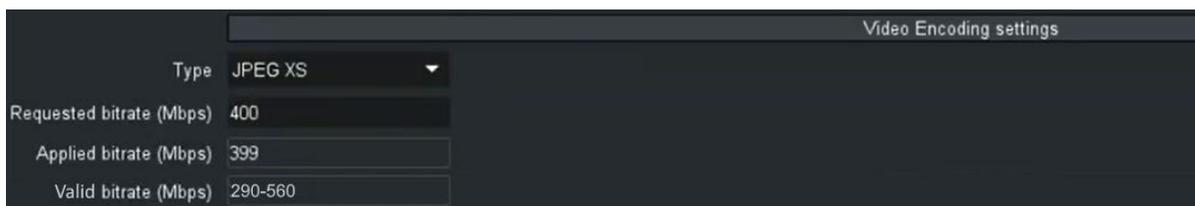
4. CONFIGURATION

- **Video Settings:**

- **Format:** Set the video resolution and standard, such as SMPTE ST 274 for 1920x1080.
- **Frame Rate:** Configurable to match the source material or broadcasting standards, up to 60 frames per second in this case.
- **Sampling Format:** Choose from formats like 4:2:2 YCbCr, 4:4:4 YCbCr or 4:4:4 RGB for high fidelity video processing.
- **Bit Depth:** Options such as 10-bit or 12-bit depth allow for enhanced video quality by capturing more data per pixel.
- **Mode:** Supports various scanning formats including 'Progressive', 'Interlaced', and 'PsF' (Progressive segmented Frame). Each mode caters to different broadcast requirements—'Progressive' ensures smoother and clearer movement in video playback, 'Interlaced' is suited for standard broadcast formats, and 'PsF' combines the benefits of both for enhanced quality on specific platforms.
- **SDI Presence:** Indicates whether the SDI signal is present or not, with a status indicator.

Consult available options in [Chapter 5: Supported Video Formats](#).

- **SDI Output Behavior** (Decapsulators only): Adjust how the device behaves when there's no input signal, with options including displaying a blue screen, black screen, freezing the last frame, or turning the output off.
- **Network Settings:**
 - **Source and Destination IP & Port:** Define IP addresses and ports of data flow for managing data traffic effectively.
 - **VLAN Tag:** Helps in segregating and managing network traffic, using a 12-bit value. Users can specify any VLAN ID from 1 to 4094, allowing for precise control over data flow within complex network environments.
 - **Packet Counter:** Monitors traffic on the selected channel and interface to ensure data is flowing correctly.
 - **Enable Flow:** Toggle to activate or deactivate the video stream, allowing for immediate changes to take effect without needing to navigate away from the tab.



The "**Video Encoding Settings**" in the MDoG-6061 cards facilitate JPEG-XS encoding and decoding, optimizing video quality and bandwidth use:

- **Type:** Can be set to JPEG XS for efficient compression or Uncompressed for use as a regular 2110 gateway.

4. CONFIGURATION

- **Requested Bitrate (Mbps):** User-defined target for video encoding, shown here as 400 Mbps.
- **Applied Bitrate (Mbps):** The actual bitrate achieved, displayed (e.g., 399 Mbps). The requested bitrate is automatically rounded to the nearest supported value.
- **Valid Bitrate Range (Mbps):** Specifies the operational bitrate range based on the signal connected to SDI. Users can set a value within this range to ensure compatibility and optimal encoding performance.

E) Audio Tab

Network settings		
	Primary	Secondary
Source IP	192.168.0.1	192.168.0.1
Source Port	10000	10000
Destination IP	239.0.1.4	239.0.1.5
Destination Port	20000	20000
VLAN Tag	0	0
Packet Counter	0	0
Enable flow	<input type="checkbox"/>	<input type="checkbox"/>

The "Audio" tab on the openGear DashBoard™ allows precise configuration of audio settings for the MDoG-6060 series, catering to diverse broadcasting needs:

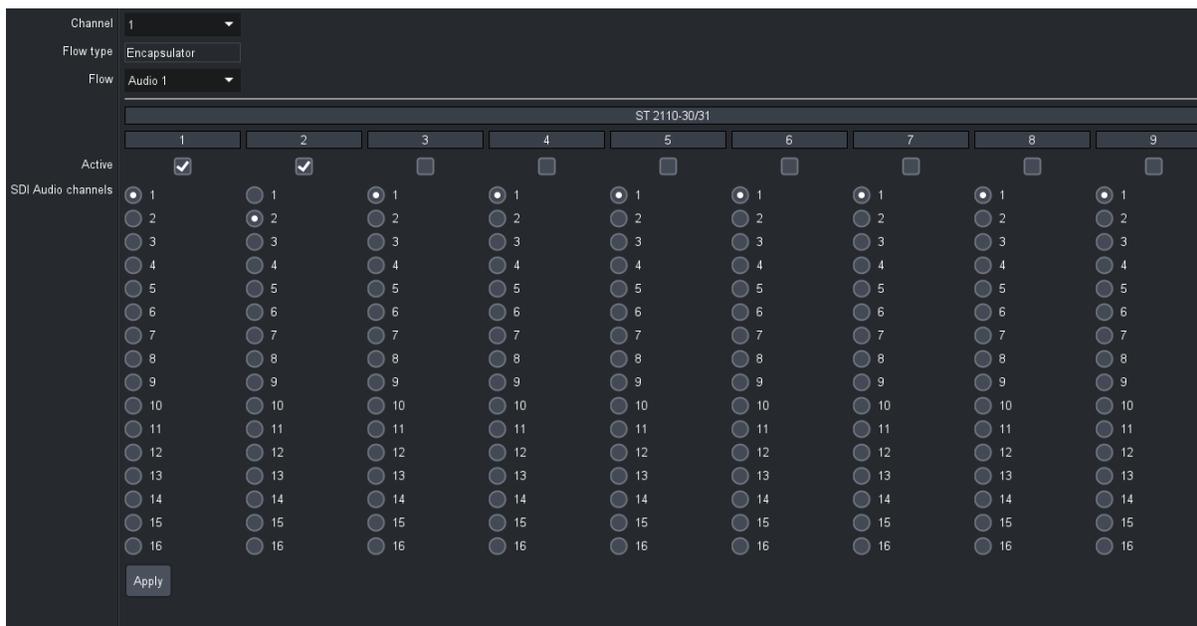
- **Channel and Flow Type:** Users can select the channel number, and the corresponding flow type is displayed automatically, similar to the video settings.
- **Number of Audio Channels:** Configurable up to 4 audio flows per channel, supporting a maximum of 16 audio channels per flow, enabling extensive audio management.
- **Audio Format:** Choose between compressed (e.g., SMPTE ST 2110-31) or uncompressed (SMPTE ST 2110-30) formats for flexible audio processing.
- **Audio Packet Time:** Options range from 1 ms to 125 μ s, allowing customization of packet timing to suit network and audio requirements.

Network Settings:

- **IP Configuration:** Set source and destination IPs and ports for primary and secondary networks, facilitating targeted audio stream routing.
- **VLAN Tagging:** Essential for network traffic management, ensuring audio data is correctly segmented within the network infrastructure.

4. CONFIGURATION

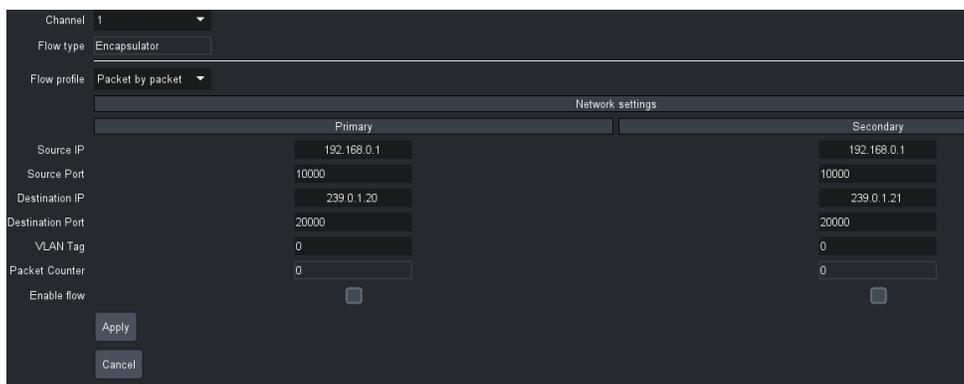
- **Enable Flow:** Toggle to activate or deactivate the audio stream, providing control over the audio data transmission.



The "Audio Mapping" feature within the Audio tab allows precise control over the routing of audio signals between SDI and ST 2110 formats:

- **Channel Configuration:** Users can view the channel and flow type for managing audio flows. This setting is read-only.
- **Mapping Flexibility:** For each of the 16 SDI audio channels, users can assign specific ST 2110 audio flows. This mapping capability ensures that audio signals are accurately routed and synchronized with corresponding video and ancillary data streams.
- **Encapsulation and Decapsulation:** In encapsulation mode, specify which ST 2110 flow each SDI channel outputs to. Conversely, in decapsulation mode, select which ST 2110 flow to decapsulate for each SDI channel, optimizing audio integration and distribution across networked media environments.

F) Ancillary tab



4. CONFIGURATION

The "Ancillary" tab in the openGear DashBoard™ is designed for configuring ST 2110-40 ancillary data flows, essential for integrating non-audio/video data (such as subtitles and metadata) into the broadcast stream:

- **Flow Type:** Displays the flow type (e.g., 'Encapsulator') used to manage how ancillary data is embedded into network streams. This setting is read-only.
- **Network Settings:** Configure primary and secondary network settings similar to video and audio tabs:
 - **Source IP/Port:** Set the IP address and port from which the ancillary data originates.
 - **Destination IP/Port:** Specify the IP address and port to which the data should be sent.
 - **VLAN Tag:** Optional setting for network traffic management.
- **Flow Profile:** Select the flow profile that best suits the operational requirements, options include:
 - "End of field event"
 - "1ms from decoding"
 - "Packet by packet"
- **Packet Counter:** Monitors the number of packets sent, aiding in diagnostics and system checks.
- **Enable Flow:** Toggle to activate or deactivate the flow of ancillary data, allowing for dynamic management during live operations.

G) Reference Tab



The "Reference" tab within the openGear DashBoard™ is crucial for precisely synchronizing audio and video streams by setting offsets and enabling synchronization features:

- **Flow Type:** Displays the direction of the data flow (e.g., 'Encapsulator' or 'Decapsulator').

4. CONFIGURATION

- **Frame Sync:** Toggle 'Enabled' to synchronize video frames with an external or internal reference signal, ensuring alignment with other broadcast elements.
- **Offset Mode:** Choose between 'MicroSeconds units' and 'Video Lines' for defining the offset, allowing for fine-tuned synchronization adjustments:
 - **Microseconds Offset:** Set a specific time offset in microseconds to delay the video signal, helping align it with audio or other video sources.
 - **Video Lines:** Specify the number of video lines by which the video signal is delayed, useful in multi-format environments.
 - **Video Pixels:** Adjust the delay in terms of pixels for precise alignment within a video line.
- **Audio Delay Compensation:** Adjust the audio delay in milliseconds to synchronize audio perfectly with the video, especially vital in live broadcasts to maintain lip-sync accuracy.
- **SDI Input Genlock:** Users can select the genlock source, either Free Running Source or Genlocked Source. The Free Running Source option allows the video signal to operate independently, while the Genlocked Source synchronizes the signal with an external reference for consistent timing across multiple sources.

5. SUPPORTED VIDEO FORMATS

5. Supported Video formats

Format	Rate Gb/s	10-bit	12-bit	4:2:2 YCbCr	4:4:4 RGB or YCbCr	Colorimetry
1280 × 720p23.98	1.5	•		•	•	BT.709
1280 × 720p24	1.5	•		•	•	BT.709
1280 × 720p25	1.5	•		•	•	BT.709
1280 × 720p29.97	1.5	•		•	•	BT.709
1280 × 720p30	1.5	•		•	•	BT.709
1280 × 720p50	1.5	•		•	•	BT.709
1280 × 720p59.94	1.5	•		•	•	BT.709
1280 × 720p60	1.5	•		•	•	BT.709
1920 × 1080p23.98	1.5	•	•	•	•	BT.709 or BT.2020
1920 × 1080p24	1.5	•	•	•	•	BT.709 or BT.2020
1920 × 1080p25	1.5	•	•	•	•	BT.709 or BT.2020
1920 × 1080p29.97	1.5	•	•	•	•	BT.709 or BT.2020
1920 × 1080p30	1.5	•	•	•	•	BT.709 or BT.2020
1920 × 1080p50	3	•		•		BT.709 or BT.2020
1920 × 1080p59.94	3	•		•		BT.709 or BT.2020
1920 × 1080p60	3	•		•		BT.709 or BT.2020
1920 × 1080psf23.98	1.5	•	•	•	•	BT.709 or BT.2020
1920 × 1080psf24	1.5	•	•	•	•	BT.709 or BT.2020
1920 × 1080psf25	1.5	•	•	•	•	BT.709 or BT.2020
1920 × 1080psf29.97	1.5	•	•	•	•	BT.709 or BT.2020
1920 × 1080psf30	1.5	•	•	•	•	BT.709 or BT.2020
1920 × 1080i47.95	1.5	•		•		BT.709 or BT.2020
1920 × 1080i48	1.5	•		•		BT.709 or BT.2020
1920 × 1080i50	1.5	•	•	•	•	BT.709 or BT.2020
1920 × 1080i59.94	1.5	•	•	•	•	BT.709 or BT.2020
1920 × 1080i60	1.5	•	•	•	•	BT.709 or BT.2020
2048 × 1080p23.98	1.5	•	•	•	•	BT.709 or BT.2020
2048 × 1080p24	1.5	•	•	•	•	BT.709 or BT.2020
2048 × 1080p25	1.5	•	•	•	•	BT.709 or BT.2020
2048 × 1080p29.97	1.5	•	•	•	•	BT.709 or BT.2020
2048 × 1080p30	1.5	•	•	•	•	BT.709 or BT.2020
2048 × 1080p47.95	3	•		•		BT.709 or BT.2020
2048 × 1080p48	3	•		•		BT.709 or BT.2020
2048 × 1080p50	3	•		•		BT.709 or BT.2020
2048 × 1080p59.94	3	•		•		BT.709 or BT.2020

5. SUPPORTED VIDEO FORMATS

2048 × 1080p60	3	•		•		BT.709 or BT.2020
3840 × 2160p23.98	6	•	•	•	•	BT.709 or BT.2020
3840 × 2160p24	6	•	•	•	•	BT.709 or BT.2020
3840 × 2160p25	6	•	•	•	•	BT.709 or BT.2020
3840 × 2160p29.97	6	•	•	•	•	BT.709 or BT.2020
3840 × 2160p30	6	•	•	•	•	BT.709 or BT.2020
3840 × 2160p50	12	•		•		BT.709 or BT.2020
3840 × 2160p59.94	12	•		•		BT.709 or BT.2020
3840 × 2160p60	12	•		•		BT.709 or BT.2020
4096 × 2160p23.98	6	•	•	•	•	BT.709 or BT.2020
4096 × 2160p24	6	•	•	•	•	BT.709 or BT.2020
4096 × 2160p25	6	•	•	•	•	BT.709 or BT.2020
4096 × 2160p29.97	6	•	•*		•*	BT.709 or BT.2020
4096 × 2160p30	6	•	•*	•	•*	BT.709 or BT.2020
4096 × 2160p47.95	12	•		•		BT.709 or BT.2020
4096 × 2160p48	12	•		•		BT.709 or BT.2020
4096 × 2160p50	12	•		•		BT.709 or BT.2020
4096 × 2160p59.94*	12	•		•		BT.709 or BT.2020
4096 × 2160p60*	12	•		•		BT.709 or BT.2020

* When using the following resolutions, a single channel only can be used on either the Encapsulator or the De-encapsulator.

6. LIMITATIONS

6. Limitations

6.1 UHD Signal Handling

Feature	Maximum Support
UHD Encapsulation	2 UHD Encapsulation
UHD De-encapsulation	2 UHD Encapsulation
Combination	1 UHD Encapsulation + 1 UHD De-encapsulation
Note	When two 12G-UHD signals are in use, no additional signals can be processed.

6.2 4K DCI Resolution Restrictions

Resolution	Bit Depth	Chroma Subsampling	Colour Space	Notes
4096 × 2160p @ 29.97Hz	12-bit	4:02:02	YCbCr	Single channel only
4096 × 2160p @ 30Hz	12-bit	4:02:02	YCbCr	Single channel only
4096 × 2160p @ 59.94Hz	10-bit	4:02:02	YCbCr	Single channel only
4096 × 2160p @ 60Hz	10-bit	4:02:02	YCbCr	Single channel only
4096 × 2160p @ 29.97Hz	10/12-bit	4:04:04	RGB/YCbCr	Single channel only
4096 × 2160p @ 30Hz	10/12-bit	4:04:04	RGB/YCbCr	Single channel only

6.3 Bitrate Considerations

Pixel Data Structure	Color Space	Bitrate Requirement Compared to 4:2:2 YCbCr (10-bit)
4:04:04	RGB/YCbCr	Double
4:02:02	YCbCr (12-bit)	Double

6. LIMITATIONS

6.4 SMPTE ST 2022-7 Hitless Redundancy Limitations

Constraint	Details
Redundant Receiver Streams	Configuring two redundant receiver streams with the same Destination IP address and multicast port value is not supported.
Redundant Sender Streams	Configuring two redundant sender streams with the same Destination IP address is not supported, irrespective of the destination port values.
Primary/Secondary Stream Inversion	<p>Inversion of primary and secondary streams is not supported. Network filters are paired: one for the primary stream and one for the secondary stream. The video reconstruction engine selects one as the "good" stream and flips to the other in case of failure. This design limits certain configurations.</p> <p>For example, if Receiver 1, Video 1 uses Stream Configuration X for the primary stream and Y for the secondary stream, Receiver 2, Video 1 cannot use the reverse configuration (Y as primary and X as secondary). Disabling the secondary stream on Video 1 prevents Receiver 2 from receiving the primary stream, even if it remains enabled.</p>
Stream Configuration Differences	The configurations for the primary and secondary streams must be distinct. Since the SMPTE ST 2022-7 reconstruction engine merges two network filters into a single essence stream, these filters cannot be identical.
Primary Network Stream	The primary network stream acts as the principal stream in an SMPTE ST 2022-7 pair. If the primary stream is disabled, the secondary stream is also deactivated. To ensure uninterrupted redundancy, keep both streams active, especially during maintenance or when one lane is taken offline.

7. TROUBLESHOOTING

7. Troubleshooting

Symptom	Probable Cause	Test/Corrective action
<i>No power to system</i>	Card not placed correctly	Make sure the card has been fully inserted into the frame, after insertion the card should make a snapping sound on the connectors
<i>Card is not showing in DashBoard™</i>	Defective card	Please contact MultiDyne
<i>Card is present in DashBoard™, but settings are wrong i.e. Device name is MDoG-6060-255-255-4K-25G</i>	Module defective	Please contact MultiDyne
<i>No ethernet link</i>	Dirty cable connection	Remove cable and clean both ends, as described below; Make sure SFP reports signal power on RX side
	Ethernet connection is set wrong	Your PC must be on the same network as the device.
		It is essential to ensure that the switch configuration permits access to the device port via the management port (VLAN configuration).
		When utilizing the L3 configuration, it is essential to ensure that the gateway is correctly configured.
		Please verify that the IP addresses used for duplicate management are not shared between two or more devices.
		Please verify that the DHCP settings are correct and that the server is operational.
SFP not placed correctly	Make sure SFP is visible in DashBoard™	
<i>Ethernet link is up, but device is unreachable</i>	Wrong ethernet speed	Configure the switch port speed to 10GE or 25GE according to the product requirements.
	Wrong RS-FEC configuration	Default RS-FEC is enabled on 25G and disabled on 10G. Set accordingly on switch.
	Card defective	Please contact MultiDyne
<i>Device is not discovered by its NMOS registry</i>	NMOS discovery in Peer-to-peer (P2P) mode.	MDoG Cards only support static or auto mode. An NMOS registry server is required to support these modes. No MDoG cards support P2P mode.
<i>No video input detected</i>	Dirty cable connection	Remove cable and clean both ends, as described below
	Standard is not supported	Make sure that signal is listed in “Supported signals” chapter.

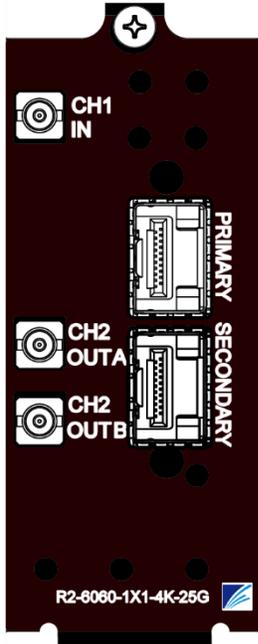
7. TROUBLESHOOTING

<i>No video output</i>	Signal is not reaching the De encapsulator (no packet count).	Validate that IGMP snooping and IGMP querier are correctly configured in the switch. Both v2 and v3 are supported
		Please verify that the configuration of the flow on the Encapsulator is aligned with that of the De-encapsulator.
		Please verify that the source IP is correctly configured in the flow, if applicable.
	PTP is not locked or not present.	Ensure PTP is configured correctly on the switch, ensure PTP is in the same domain and VLAN.
	PTP is not locked but it is present	The device has not received an adequate number of PTP messages to enable it to lock. Please configure the PTP settings on the switch to send 8 pps.
	PTP lock is unstable.	It is important to ensure that your network switches are PTP aware and that this feature is enabled. A PTP aware switch is able to compensate for buffering delays created within the switch, which is just one of a number of important PTP related features.
Please verify that the PTP sync interval is configured to a minimum of -3 or 8 messages per second.		
SDI source not locked to PTP.	Make sure the source is referenced to PTP.	
	Enable the frame sync (paid optional license) on the Encapsulator.	
<i>Audio does not contain all channels.</i>	SDI mapping is not configured correctly.	Configure the SDI mapping according to the receiving flows.

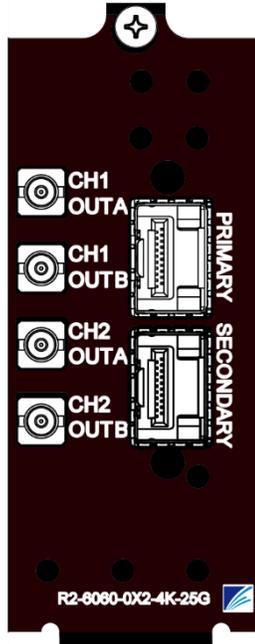
8. REAR PANEL LAYOUTS

8. Rear Panel Layouts

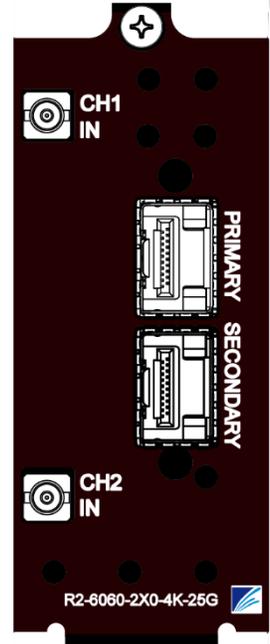
8.1 MDoG-6060



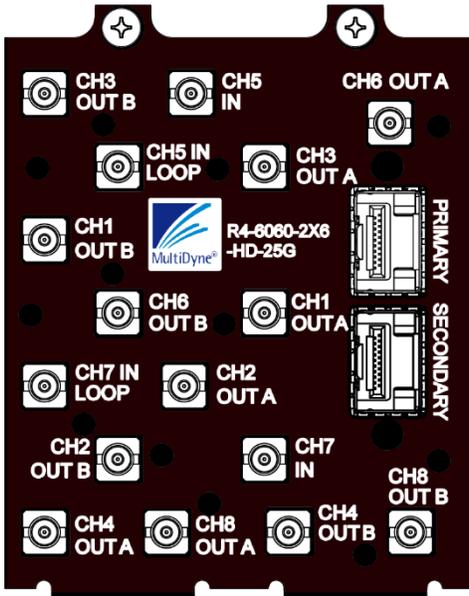
R2-6060-1X1-4K-25G



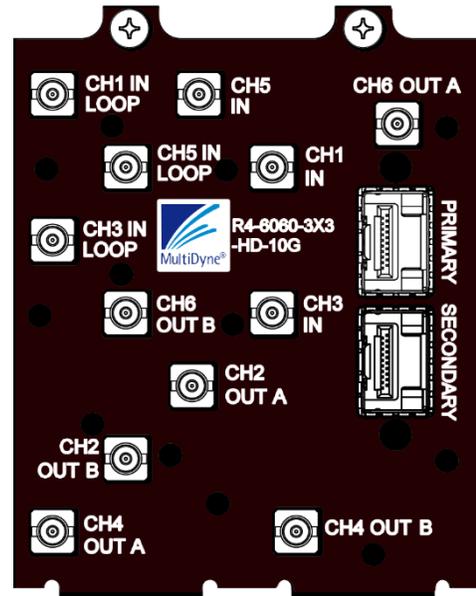
R2-6060-0X2-4K-25G



R2-6060-2X0-4K-25G

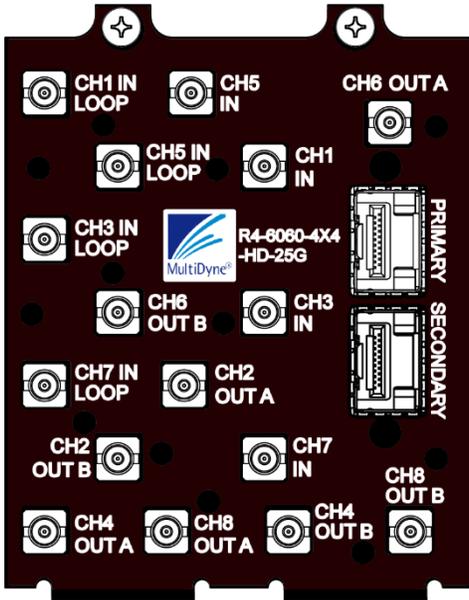


R4-6060-2X6-HD-25G

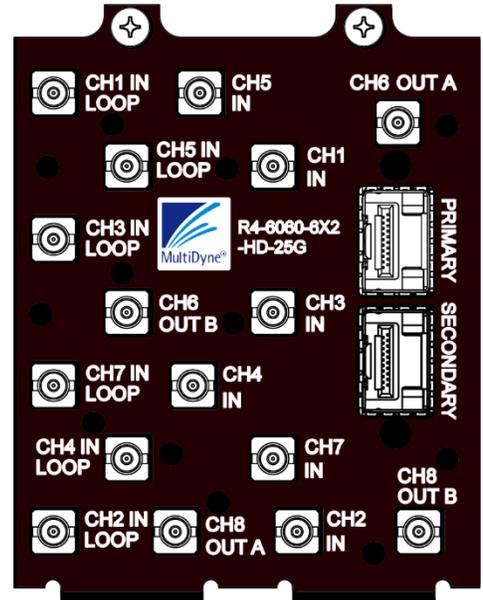


R4-6060-3X3-HD-10G

8. REAR PANEL LAYOUTS

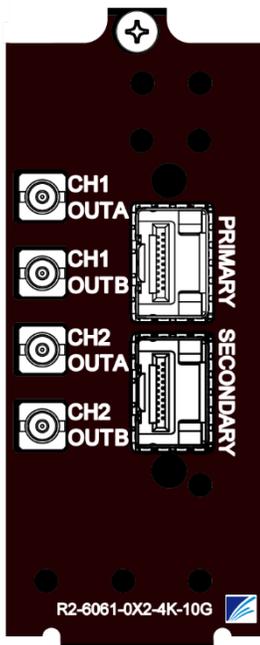


R4-6060-4X4-HD-25G

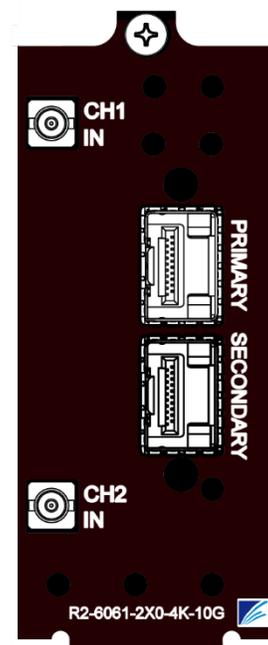


R4-6060-6X2-HD-25G

8.2 MDoG-6061



R2-6061-0X2-4K-10G



R4-6060-2X0-HD-25G

8. REAR PANEL LAYOUTS

8.3 Supported SFP Modules

SFPs for 10G

OPT-00121	SFP, 10G ETHERNET TRX, MSA, 10km, 1310
OPT-00122	SFP, 10G ETHERNET TRX, MSA, WDM, 10km, 1270/1330
OPT-00123	SFP, 10G ETHERNET TRX, MSA, WDM, 10km, 1330/1270
OPT-00075 to OPT-00092	A series of 10G SFP TRX CWDM modules, covering wavelengths from 1271nm to 1611nm, each offering a 10Km range.

SFPs for 25G

OPT-00114	SFP, 25G ETHERNET TRX, MSA, SM, 10km, 1310
OPT-00115	SFP, 25G ETHERNET TRX, MSA, MM, 100m, 850
OPT-00116	SFP, 25G ETHERNET TRX, MSA, WDM, 10km, 1270/1330
OPT-00117	SFP, 25G ETHERNET TRX, MSA, WDM, 10km, 1330/1270
OPT-00019	SFP, 25GBASE, CWDM, TR, 10km, SFP28, 0-70C, 1271
OPT-00020	SFP, 25GBASE, CWDM, TR, 10km, SFP28, 0-70C, 1291
OPT-00063	SFP, 25GBASE, CWDM, TR, 10km, SFP28, 0-70C, 1311
OPT-00021	SFP, 25GBASE, CWDM, TR, 10km, SFP28, 0-70C, 1331
OPT-00022	SFP, 25GBASE, CWDM, TR, 10km, SFP28, 0-70C, 1351
OPT-00023	SFP, 25GBASE, CWDM, TR, 10km, SFP28, 0-70C, 1371

9. Specifications

Specification	Details
SDI Input and Output	
Number of Inputs	1 to 6 input options available
Number of Outputs	1 to 6 output options available
Interface	SMPTE, ST292, ST424, DVB-ASI, ST2081, ST2082
Data Rate	1.5Gbps, 3Gbps, 6Gbps, 12Gbps
Input/Output Level	800mVp-p
Input/Output Impedance	75 Ohms
Return Loss	>15 dB up to 3 GHz
Jitter	< 0.2UI
Rise/Falls Times	< 130ps (HD)
Bit-error Rate	1.00E-11
Physical, Power	
openGear® Form Factor	3.025H" x 12.75L" x 2 slots for R2 panels 3.025H" x 12.75L" x 4 slots for R4 panels
Power Consumption	15 Watts
Environmental	
Operating Temperature Range	-20C to +45C, 0 to 95% RH, non-condensing

Notes

- Some Inputs / Outputs are a function of rear I/O Module used.
- Specifications are subject to change without notice.

10. Contact Support

Contact support@MultiDyne.com

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