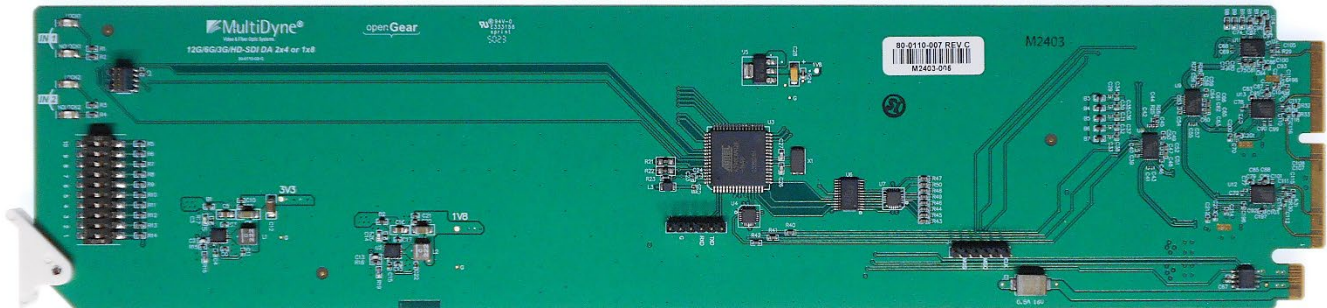




openGear MDoG-6002 12G-SDI Reclocking Distribution Amplifier

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

1.1 Overview of the Product Family and Variants

The MDoG 6002 is part of the MDoG 60X series, a family of high-performance 12G-SDI distribution amplifiers designed for reliable signal transport in broadcast environments. This series supports a range of configurations to cater to various needs in signal distribution, including dual 1x4 or single 1x8 modes. The MDoG 6002 offers seamless integration into the openGear platform, ensuring compatibility and flexibility for both current and future broadcast setups.

1.2 Purpose and Applications

The MDoG 6002 is specifically designed to address the increasing demand for high-bandwidth video formats such as 4K (Ultra HD) and beyond, making it ideal for studios, outside broadcast vans, and production control rooms. It simplifies video distribution through single-cable 12G-SDI transport, reducing complexity while maintaining high signal integrity. The module's applications include live broadcasting, post-production, and critical signal distribution for professional video content.

1.3 Key Features

- Dual 1x4 or single 1x8 SDI distribution configurations.
- Supports 12G-SDI, 6G-SDI, and 3G-SDI standards.
- Adaptive equalization and reclocking for signal integrity.
- DashBoard™ and SNMP monitoring and control for remote and local management.
- Failover input protection to ensure uninterrupted operation.
- Hot-swappable, compatible with openGear frames for easy maintenance.

2. SDI Signal Handling

2.1 SDI Transport

The MDoG 6002 is a 12G-SDI Reclocking Distribution Amplifier, designed to support high-definition video distribution over long cable runs. The module can operate in either 1x8 mode (one input, eight outputs) or 2x4 mode (two inputs, four outputs each), making it suitable for a wide range of broadcast environments.

Supported SMPTE Standards:

- **SMPTE ST2082-1:** 12G-SDI (4K/Ultra HD video).
- **SMPTE ST2081-1:** 6G-SDI.
- **SMPTE ST424:** 3G-SDI.
- **SMPTE ST292:** HD-SDI.
- **SMPTE ST259:** SD-SDI.

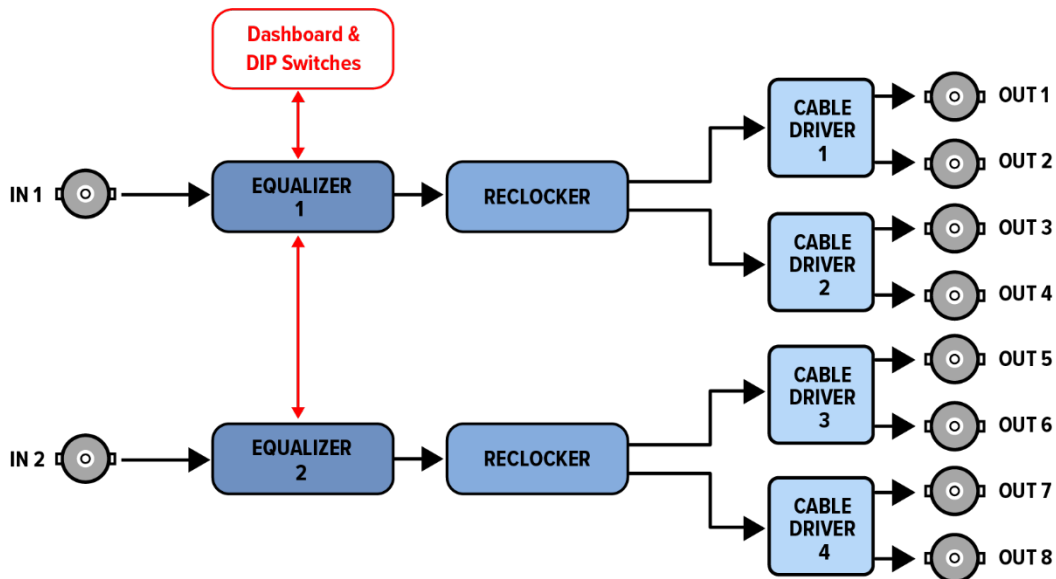
The MDoG 6002 features adaptive cable equalization, allowing it to compensate for signal degradation over long distances. Cable lengths of up to:

- **50 meters** at 12G-SDI,
- **100 meters** at 6G-SDI,
- **180 meters** at 3G-SDI,
- **450 meters** at SD-SDI (270 Mbps) are supported with Belden 1694A cable.

All SDI outputs are non-inverted, and the conversion process ensures full transparency to any embedded audio or ancillary data within the SDI stream.

2. SDI SIGNAL HANDLING

2.1.1 Block Diagram of the MDoG-6002



The **MDoG-6002 Block Diagram** provides a visual overview of the internal signal flow and key components that process the SDI signals within the distribution amplifier.

1. Inputs (IN 1 and IN 2):

- The diagram shows two separate inputs, IN 1 and IN 2, which are the SDI signal inputs to the module. These inputs represent the two potential video sources that can be processed and distributed.
- In 1x8 mode, either IN 1 or IN 2 is distributed across all 8 outputs (OUT 1 to OUT 8). Although not directly shown, IN 2 is connected to IN 1, and vice-versa, allowing either input to be routed through all outputs in this mode.

2. Equalizers (Equalizer 1 and Equalizer 2):

- Both inputs are first passed through the Equalizers. The role of the Equalizer is to perform adaptive cable equalization. This ensures that any degradation in the signal due to long cable runs is corrected, recovering the original signal quality.
- This is critical in high-bandwidth signals such as 12G-SDI, which can suffer attenuation over long distances.

3. Reclockers:

- After passing through the Equalizers, the signals are processed by the Reclockers. The reclocking function stabilizes the timing of the signal by reducing jitter (signal distortion), restoring the signal integrity to the proper specification.
- The reclocking process ensures that the SDI signals are ready for high-quality distribution without errors.

2. SDI SIGNAL HANDLING

4. Cable Drivers (1 to 5):

- Once the signals are equalized and reclocked, they are sent to the Cable Drivers (Driver 1 through Driver 4). These drivers amplify and condition the signal for distribution across multiple outputs, ensuring that the signal strength remains consistent across the outputs.

5. DashBoard™ and DIP Switches:

- The entire signal processing chain can be controlled via DashBoard™ software or DIP switches. These allow the user to configure the signal paths parameters either locally (using DIP switches) or remotely (using DashBoard™).
- This remote monitoring and control feature provides flexibility in adjusting the module's operation without needing direct physical access to the hardware.

6. Outputs (OUT 1 to OUT 8):

- The processed signals are distributed to eight outputs. In 1x8 mode, IN 1 is distributed across all eight outputs (OUT 1 to OUT 8). Alternatively, in 2x4 mode, OUT 1 to OUT 4 correspond to IN 1, and OUT 5 to OUT 8 correspond to IN 2.
- This allows for flexible distribution of the input signals, where a single input can be broadcast to multiple destinations or devices.

2.2 Signal Re-clocking and Bypass

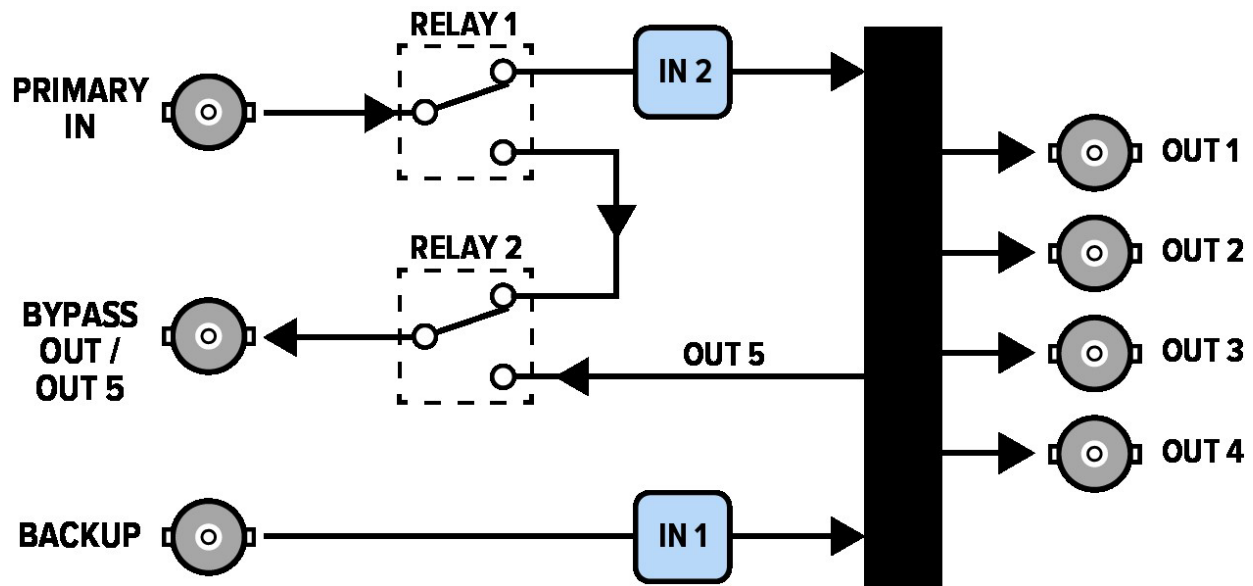
The MDoG 6002 automatically performs reclocking at supported data rates (1.5 Gbps, 3 Gbps, 6 Gbps, and 12 Gbps), stabilizing the signal by removing jitter and maintaining the correct timing for broadcast-quality video output.

Reclocking ensures compliance with the following standards:

- JitterA UHD: <0.2 UI.
- JitterT UHD: <2 UI.
- Rise/fall time of less than 45 ps.

2. SDI SIGNAL HANDLING

2.3 R2-6002-DA-1X4-12G-B with Bypass Relay



The R2-6002-DA-1X4-12G-B with Bypass Relay diagram illustrates how the bypass relay system functions within the distribution amplifier. This system provides redundancy and automatic signal switching to ensure uninterrupted video distribution in case of power failure.

1. Primary Input (IN 1)

- The Primary In (IN 1) is the main SDI signal input that gets processed through the Equalizer, reclocker, and distributed across the 1x4 outputs (OUT 1 to OUT 4). Under normal conditions, the signal from the Primary In is sent to the output without interruption.

2. Relay 1 and Relay 2

- In the event of signal loss at the Primary Input, the system automatically switches to the BACKUP signal input.
- In the event of a Power Failure or Removal of the Maincard, the system automatically engages Relay 1 and Relay 2. Relay 1 switches the input source to BYPASS OUT.
- Relay 2 directs the signal from the Backup Input or Out 5 to the output, maintaining signal flow.

3. Backup Input

- The Backup Input (IN 1) is designed to provide a secondary signal source. In case the Primary Input is lost, the module automatically switches to the Backup Input, ensuring that the signal continues to be delivered to the outputs.

2. SDI SIGNAL HANDLING

4. Outputs

- The processed signal (either from the Primary Input or the Backup Input) is then distributed across the four main outputs (OUT 1 to OUT 4). The Out 5 connection serves either as an additional output or as part of the bypass relay system, depending on the configuration.

This bypass relay system offers flexibility in managing critical broadcast signals, ensuring that signal loss does not disrupt video distribution. The automatic switch-over provides seamless continuity without requiring manual intervention.

2.4 Signal Presence and Status Monitoring

The MDoG 6002 allows users to monitor signal status and performance in real time via the **DashBoard™** control software. Information on **signal presence**, **data rate**, and **reclocking lock status** is available for each SDI channel, offering operators precise control over signal quality and distribution. Additionally, the MDoG 6002 supports **hot-swappable** functionality, allowing for easy maintenance without interrupting broadcast operations.

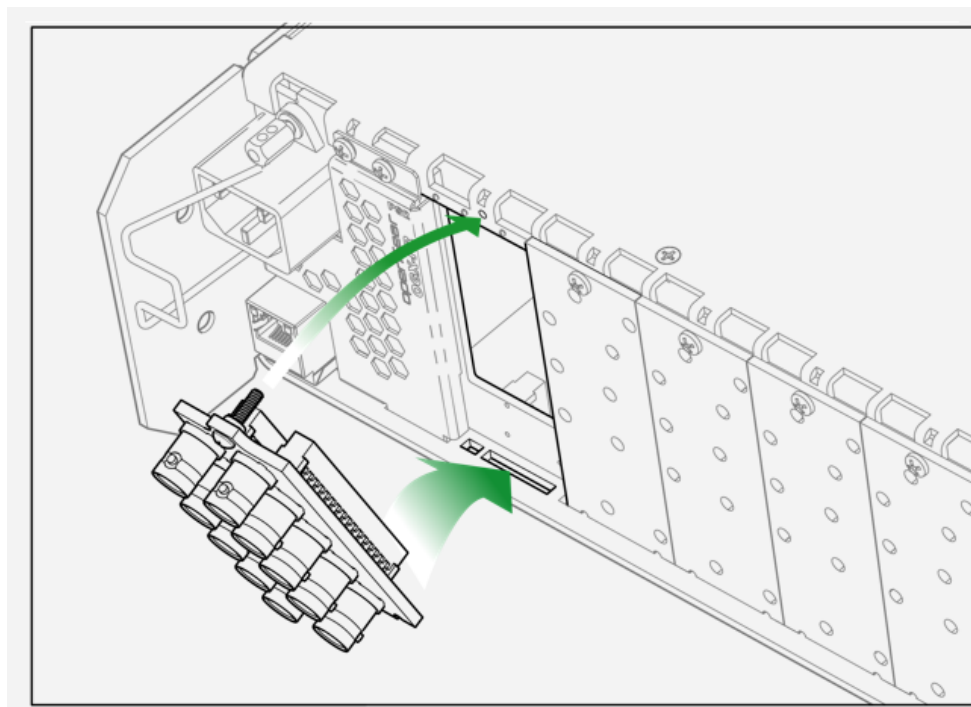
3. INSTALLATION INSTRUCTIONS

3. Installation Instructions

Proper installation of the MDoG 6002 module is critical to ensure its optimal performance. Follow the steps below to install the rear module and the MDoG 6002 into the openGear frame.

3.1 Installing a Rear Module

Before installing the MDoG 6002, ensure that the correct rear module is selected and properly installed in the openGear frame.



To install the rear module, follow these steps:

1. **Unpacking:**

- Unpack the rear module and inspect for any damage.

2. **Slot Selection:**

- Select an open slot in the openGear frame and remove the blanking plate.

3. **Module Alignment:**

- Hold the rear module as shown in the diagram above and align it with the seating slot in the backplane.

4. **Securing the Module:**

- Insert the rear module into the frame and secure it with the provided screws.

3. INSTALLATION INSTRUCTIONS

3.2 Installing the MDoG 6002 in an openGear Frame

Once the rear module has been installed, the next step is to insert the MDoG 6002 module into the frame.

1. Preparation:

- Ensure the frame is powered off before installing the module to prevent damage from static electricity or accidental electrical surges.
- Ground yourself to avoid electrostatic discharge (ESD) that could damage the module's circuitry.

2. Inserting the MDoG 6002 Module:

- Align the edges of the MDoG 6002 card with the guide rails in the chosen slot of the openGear frame.
- Carefully slide the module into the slot, ensuring that the card-edge connectors on the MDoG 6002 engage with the rear module.

3. Seating the Module:

- Push the MDoG 6002 card firmly into the slot until it is fully seated.
- Verify that the module is properly seated by checking the connection at the rear of the frame.

4. Powering On:

- Once the module is securely in place, power on the openGear frame.
- The module's LED indicators should light up, confirming that it is receiving power and functioning correctly.

5. Hot Swappable Installation (if applicable):

- The MDoG 6002 is designed to be hot-swappable, meaning it can be inserted or removed from the frame without powering down the entire system. This feature is useful for maintenance or system upgrades in live production environments.

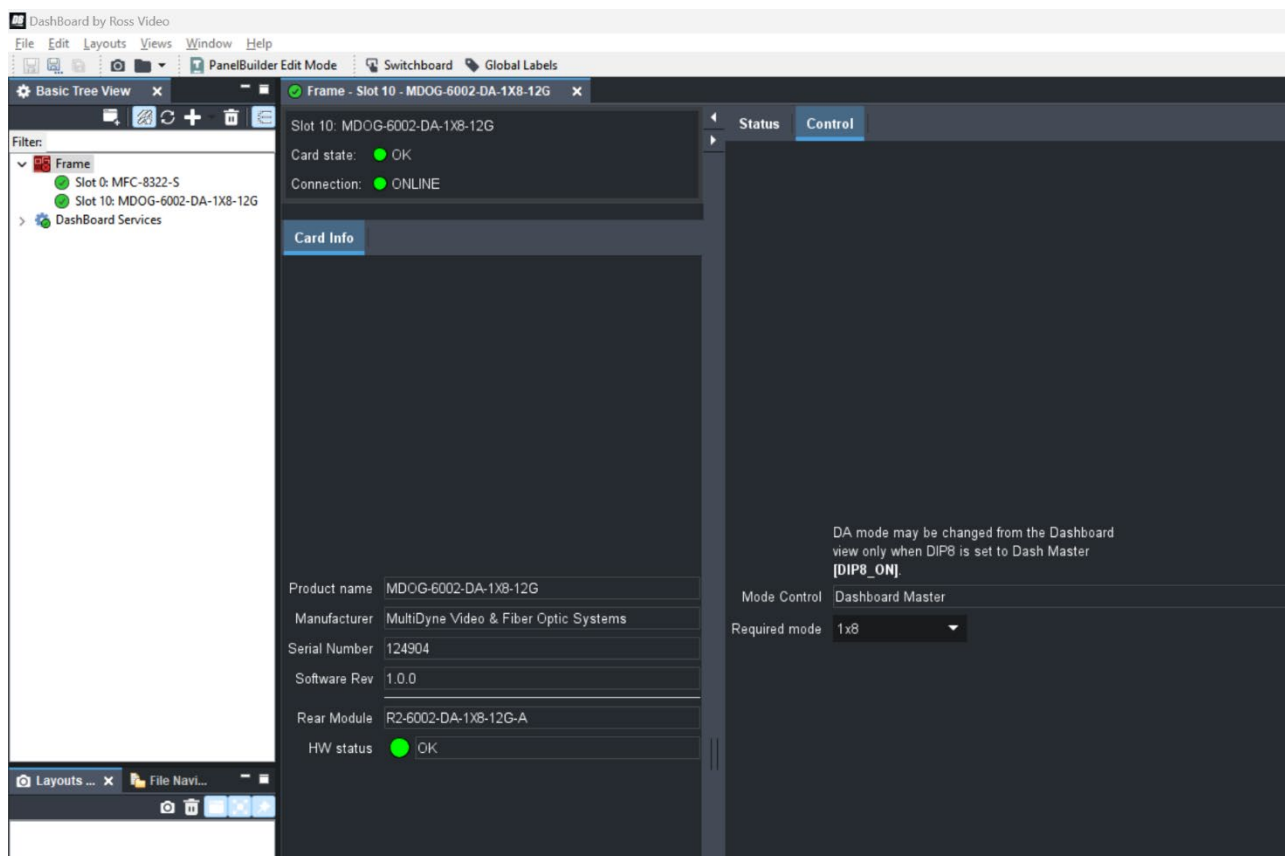
4. CONFIGURATION

4. Configuration

The MDoG-6002 module can be configured and monitored remotely using **DashBoard™** software, or manually through DIP switches. This chapter covers the steps for configuring key operational modes, monitoring the module's status, and adjusting settings via DashBoard.

4.1 DashBoard Control Overview

DashBoard™ software provides real-time monitoring and control of the MDoG-6002 module. Upon opening DashBoard, the module appears in the Basic Tree View under the corresponding slot, allowing users to select it for further configuration.



In the **Card Info** tab, users can change the mode and view the product information, such as serial number, software version, and hardware status. The module mode may only be changed from the DashBoard view when DIP8 is set to Dash Master (DIP8_ON).

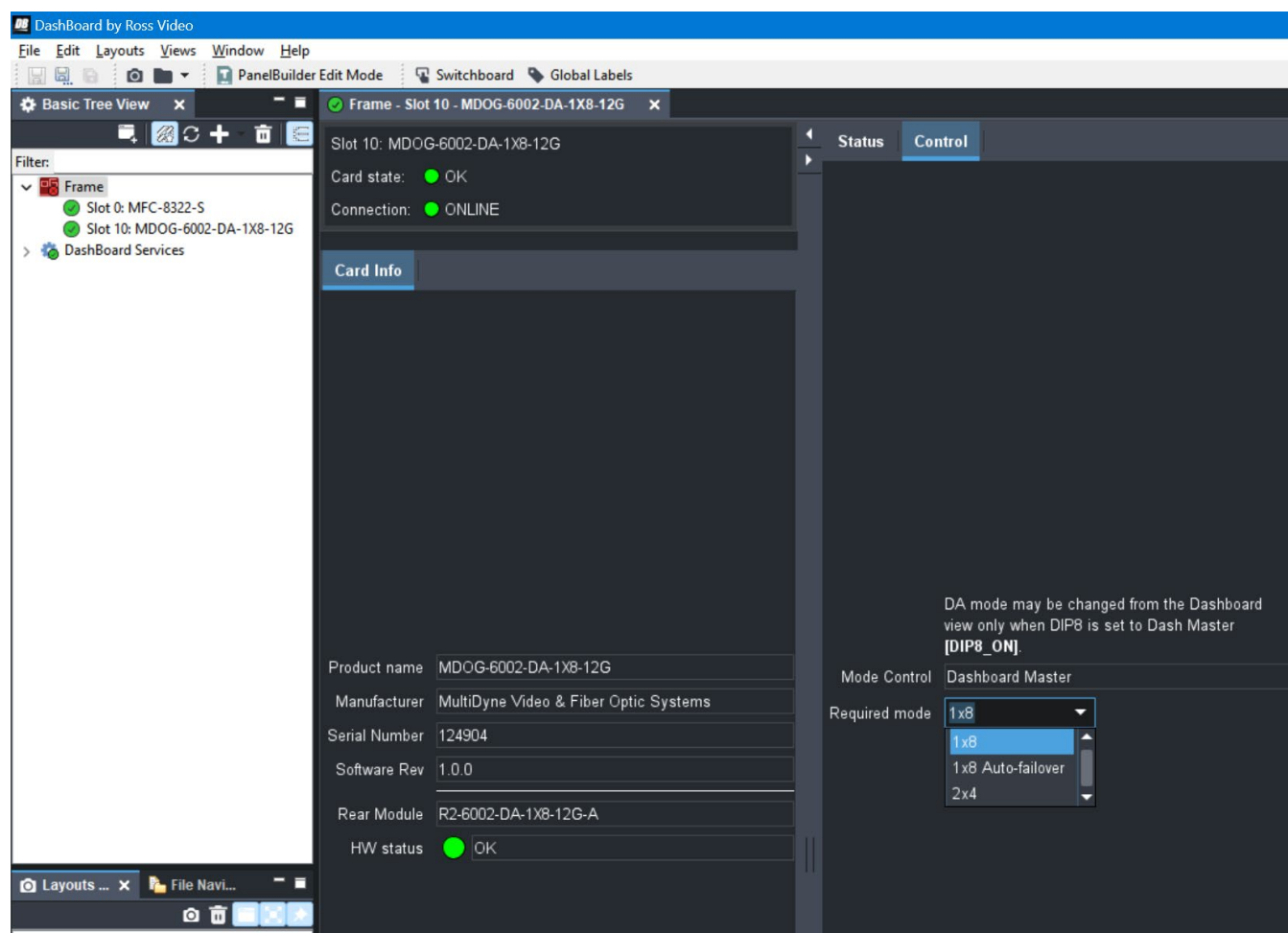
4. CONFIGURATION

4.2 Mode Control Configuration

The Mode Control of the MDoG-6002 allows users to select the appropriate operational mode based on their broadcast requirements. This can be configured through DashBoard under the Control tab or manually adjusted via DIP switches for local control.

The Mode Control dropdown provides the following options:

- 1x8 Mode: Distributes a single input across all 8 outputs.
- 1x8 Auto-failover Mode: Automatically switches to the backup input in the event of signal loss, distributing the backup signal across all 8 outputs.
- 2x4 Mode: Distributes IN 1 to outputs OUT 1 to OUT 4, and IN 2 to outputs OUT 5 to OUT 8, effectively splitting the module into two separate 1x4 distribution amplifiers.



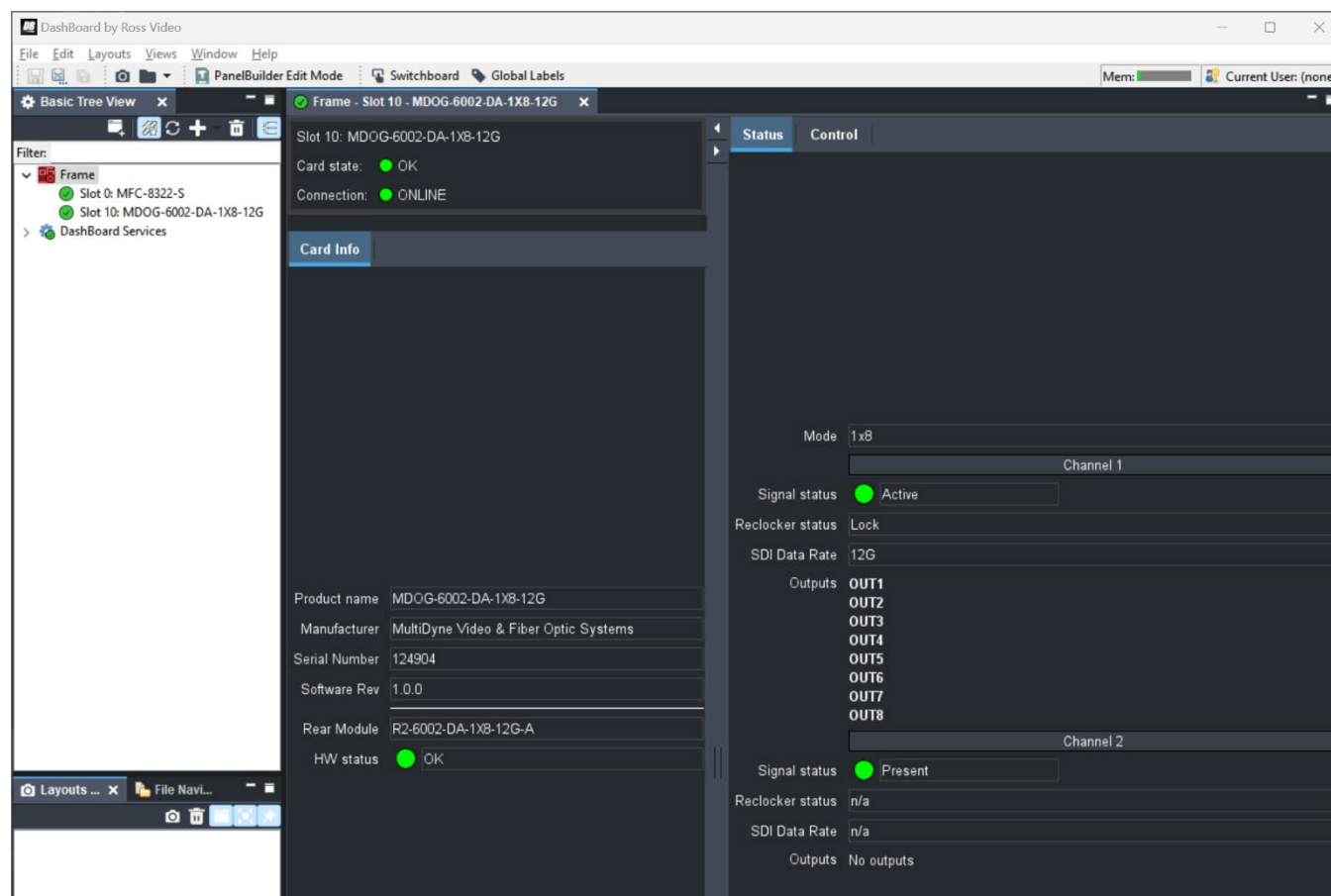
This configuration flexibility allows the MDoG-6002 to adapt to different signal distribution needs, making it suitable for a wide range of broadcast applications.

4. CONFIGURATION

4.3 Monitoring Signal Status via DashBoard

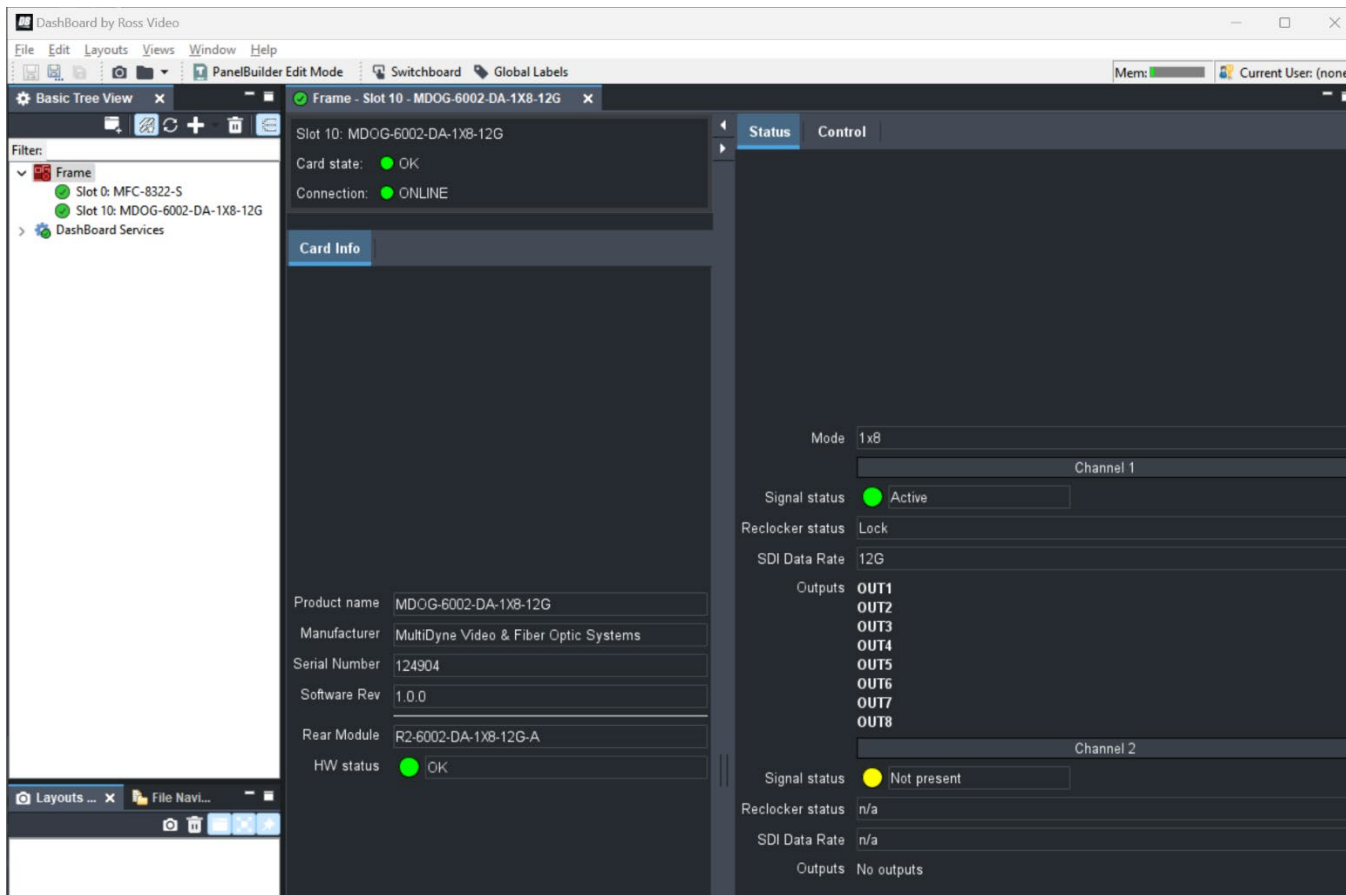
The Status tab in DashBoard allows real-time monitoring of the signal status and reclocker performance. Users can check whether the signal is Active, the SDI data rate, and whether the reclocker is Locked or in bypass mode.

For example, in 1x8 Auto-failover mode, both channels 1 and 2 may be active, ensuring redundancy in case of signal failure.



Alternatively, when operating in 1x8 mode, Channel 1 is active, and the module distributes the signal across all outputs.

4. CONFIGURATION



The Signal Status and Reclocker Status fields provide valuable information for diagnosing signal issues or verifying the reclocker is maintaining proper signal timing.

4.4 Mode Selection and Hardware Status

The Mode Control allows the module to operate in three primary modes. The HW Status icon will only be green when the corresponding signal conditions for each mode are met. If the conditions are not met, the icon will turn yellow, indicating a warning.

Mode	IN1	IN2	HW Status
1x8		n/a	Signal must be present on IN1
1x8 auto-failover			Signal must be present on both inputs
2x4			Signal must be present on both inputs

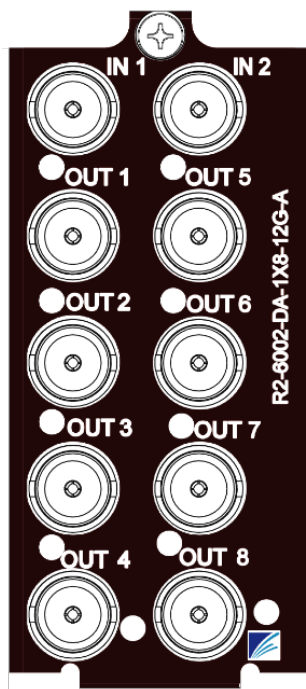
For the -B and -C rear panels, there is no manual mode selection. The system automatically detects the rear panel, and the proper mode is set based on the configuration.

5. REAR PANEL LAYOUTS

5. Rear Panel Layouts

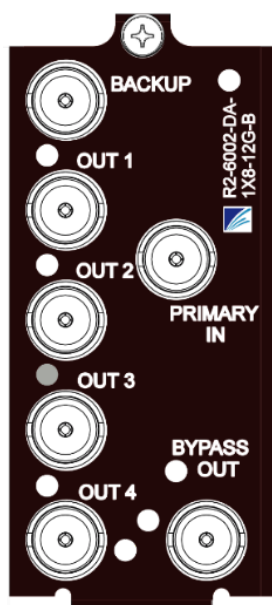
5.1 R2-6002-DA-1X8-12G-A

Standard-Width Rear Module for MDoG-6002-DA-1x8-12G Distribution Amplifiers with Full Size BNCs.



5.2 R2-6002-DA-1X4-12G-B

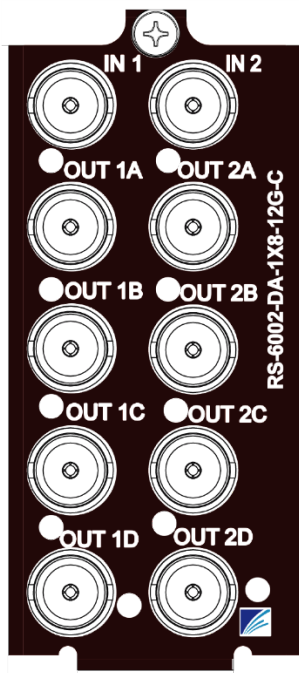
Standard-Width Rear Module for MDoG-6002-DA-1x8-12G Distribution Amplifiers with Full Size BNCs and Passive Bypass Relay Protection.



5. REAR PANEL LAYOUTS

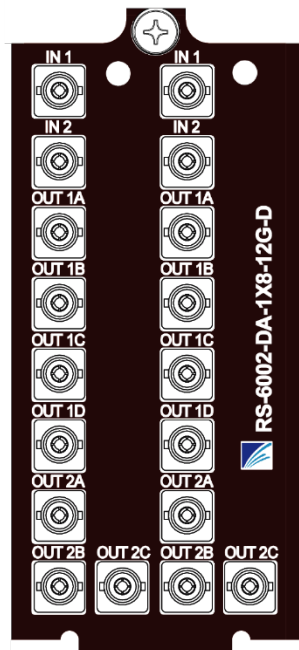
5.3 RS-6002-DA-1X8-12G-C

2-Slot Split Rear Module for MDoG-6002-DA-1x8-12G Distribution Amplifiers with Full Size BNCs.



5.4 RS-6002-DA-1X8-12G-D

2-Slot Split Rear Module for MDoG-6002-DA-1x8-12G Distribution Amplifiers with HD-BNCs.



6. SPECIFICATIONS

6. Specifications

Electrical	
Power	6W
Temperature	0-60° C

SD/HD/3G/6G/12G-SDI Input	
Bit Rates	1Mbps to 12Gbps
Impedance	75 Ohms
SMPTE Standards	ST259, ST292, ST297, ST424, ST2081-1, ST2082-1
Return Loss	<-15dB 5MHz - 1.485GHz
	<-10dB 1.485GHz - 3GHz
	<-7dB 3GHz - 6GHz
	<-4dB 6GHz - 12GHz
Inputs	1 or 2 BNC
Cable EQ Length (1694A)	50m@12G
	100m@6G
	180m@3G
	450m@270M

SD/HD/3G/6G/12G-SDI Output	
Output	1x8 or 2x4 modes
Impedance	75 Ohms
Signal Level	800mV \hat{A} ±10%
Return Loss	<-15dB 5MHz - 1.485GHz
	<-10dB 1.485GHz - 3GHz
	<-7dB 3GHz - 6GHz
	<-4dB 6GHz - 12GHz
JitterA	UHD <0.2UI
JitterT	UHD <2UI
Rise/Fall Time	<45ps

7. Contact Support

Contact support@multidyne.com

8. Copyrights

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