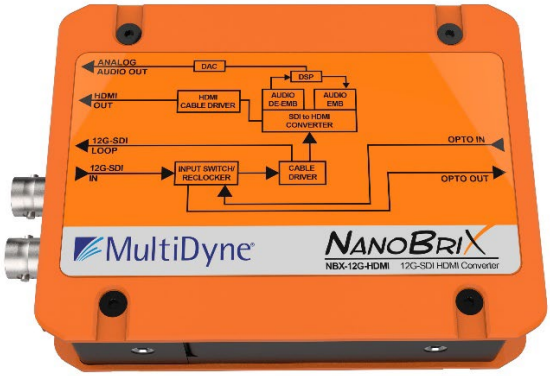
MultiDyne®
Video & Fiber Optic Systems

NB2-12G-HDMI

12G/6G/3G/HD/SD-SDI to HDMI 2.0 Converter

USER MANUAL



252 INDIAN HEAD RD, KINGS PARK, NY 11754 USA
(877) 685-8439 / (516) 671-7278 / FAX (516) 671-3362
sales@multidyne.com
www.multidyne.com

Table of Contents

Document Revisions

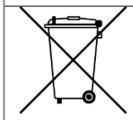
Revision	Description	Date	Author
A	Initial Release	28-August-2024	Khalid Waleed

Declaration of Conformity

Test	Standard	Dates	Initials	Results
Radiated Emissions	EN 55032 / FCC / VCCI	11/22/21, 11/23/21	KHa	Pass
Conducted Emissions	EN 55032	11/22/21, 11/23/21	KHa	Pass
ESD Immunity	EN 61000-4-2	12/6/21	KH	Pass
Radiated Immunity	EN 61000-4-3	12/3/21	KH	Pass
EFT Immunity	EN 61000-4-4	11/30/21, 12/6/21	KH	Pass
Surge Immunity	EN 61000-4-5	12/1/21	KH	Pass
Conducted Immunity	EN 61000-4-6	12/2/21	KH	Pass
Voltage Dips and Drops	EN 61000-4-11	11/30/21, 12/6/21	KH	Pass
Voltage Harmonics	EN 61000-3-2	11/24/21	MM	Pass
Voltage Flicker	EN 61000-3-3	11/24/21	MM	Pass
Other				

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®.

	**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.

- 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 perform 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.

Laser Safety Information

This unit is classified as a CLASS 1 LASER PRODUCT according to EN60825-1 (EU) and FDA 21CFR 1040.10 (USA). Class 1 laser products are considered safe and do not result in biological hazard if used according to these instructions.

	Warning – Use of controls, adjustments, or performance of procedures other than those specified herein may result in hazardous radiation exposure.
	Warning – Never look directly into the end of the optical fiber while either end of the system is operating.
	Warning – Never clean an optical fiber connector on equipment or cable that is carrying light.
	Warning – Always use dust caps on fiber optic connectors when cables are not connected. This will protect the connector from damage and accidental exposure of a human eye to an operating laser.

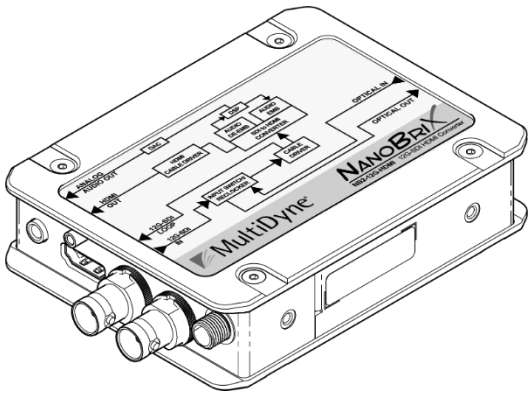
1. Overview

1.1 Overview of the Product Family and Variants

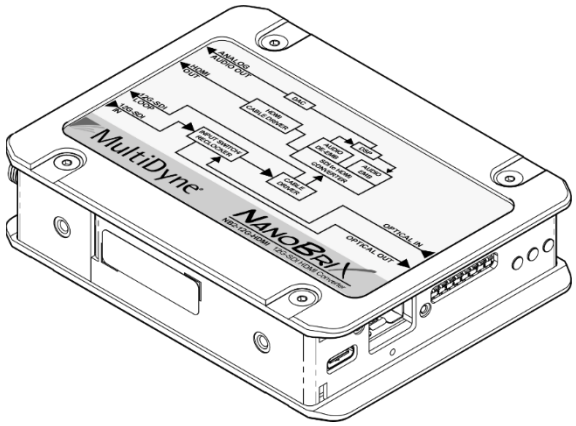
The NB2-12G-HDMI by MultiDyne represents a cutting-edge solution for professionals in the broadcast and video production industries. Designed to meet the diverse needs of signal conversion, the NB2-12G-HDMI offers reliable and high-quality performance. MultiDyne's NANOBRIX series, which includes the NB2-12G-HDMI, is renowned for its compact and rugged design, making it ideal for various applications, including live broadcasts, stadiums, shared control rooms, and campus facilities.

Product Variants

- **NB2-12G-HDMI:** Standard model converting 12G-SDI to HDMI.
- **NB2-12G-HDMI-OE-LC:** NANOBRIX 12G SDI (BNC + SFP RX with LC connector) to HDMI Converter for extended distance signal transmission.
- **NB2-12G-HDMI-OE-ST:** NANOBRIX 12G SDI (BNC + SFP RX with ST connector) to HDMI Converter for extended distance signal transmission.
- **NB2-12G-HDMI-OEEO-LC:** NANOBRIX 12G SDI (BNC + SFP TRX with LC connectors) to HDMI Converter + fiber 12G SDI regeneration for bidirectional signal transmission and regeneration.



Power Side



Fiber Side

1.2 Purpose and Applications

The primary purpose of the NB2-12G-HDMI is to facilitate the conversion of 12G-SDI signals to HDMI 2.0, enabling the integration of professional-grade 12G-SDI signals into consumer and professional HDMI displays. This functionality is crucial for scenarios where high-definition video needs to be displayed on standard HDMI monitors or projectors. The NB2-12G-HDMI also supports audio conversion, allowing embedded SDI audio to be output through HDMI or external analog audio outputs.

Applications

- **Live Broadcast:** Ensures high-quality video conversion in live production environments, making it ideal for broadcast studios and outdoor broadcasts.
- **Arenas and Stadiums:** Facilitates the display of broadcast signals on large screens and monitors in large venues.
- **Shared Control Rooms:** Provides reliable signal conversion for collaborative broadcasting setups, enabling seamless integration of various signal types.

1.3 Key Features

High-Quality Signal Conversion

- **12G-SDI to HDMI 2.0:** Converts professional-grade 12G-SDI signals to HDMI 2.0, ensuring compatibility with a wide range of HDMI displays, from consumer-grade monitors to professional-grade projectors.
- **Wide SDI Bit Rate Support:** Supports SDI bit rates from 270 Mbps to 12 Gbps, making it versatile for various applications and signal standards.

Audio Capabilities

- **External Audio Outputs:** Features analog audio outputs for connecting to external powered speakers. Audio outputs can be configured via DIP switches to provide either a stereo pair or a Lt/Rt multichannel downmix.
- **Embedded Audio Support:** Supports embedded audio pass-through, allowing audio to be transmitted alongside video signals seamlessly.

Fiber Optic Integration

- **Optional SFP Modules:** Includes optional fiber SFP modules for receiving and transmitting SDI signals over fiber. Available in models with LC and ST connectors, these modules extend the operational range of the device and ensure flexibility in different setups.
- **Fiber Signal Regeneration:** Certain models (e.g., NB2-12G-HDMI-OEEO-LC) support bidirectional signal transmission and regeneration over fiber, enhancing signal integrity over long distances.

2. FEATURE DESCRIPTIONS

Robust Design and Durability

- **Compact and Rugged Enclosure:** Designed with a compact and rugged steel enclosure, the NB2-12G-HDMI series is built to withstand the demands of professional broadcast environments.
- **Reclocked SDI Output:** Features a reclocked SDI loop output that maintains signal integrity, ensuring reliable signal pass-through to downstream equipment.

Power and Connectivity

- **USB-C Port:** Equipped with a USB-C port for backup power and firmware updates, providing convenience and ensuring the device can be updated with the latest features and improvements.
- **Secure Power Connection:** Includes a locking DC connector for the AC adapter, ensuring a secure power connection during operation.

User-Friendly Configuration

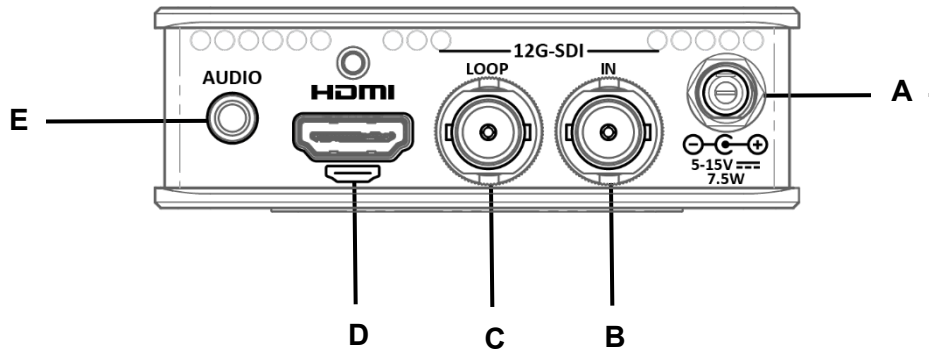
- **DIP Switch Control:** Utilizes DIP switches for configuring various settings, such as audio output options and other operational parameters. This straightforward control method allows for quick and easy adjustments.
- **LED Status Indicators:** Features LED indicators to display the status of the device, including power, signal presence, and active input, providing users with clear and immediate feedback.

Input Failover Functionality

- BNC/SFP Input Failover: Automatically switches between BNC and SFP inputs to ensure continuous operation in case the primary input fails.

2. Feature Descriptions

2.1 Power Side



The power side of the NB2-12G-HDMI series includes several key components that facilitate its primary functions. Here's a detailed description of each component and its functionality.

A. Locking DC Connector for AC Adapter (DC Input)

This is the main power input for the device using a locking DC connector to ensure a secure and reliable connection. Provides the necessary power to operate the device. The locking mechanism ensures that the power connection remains secure during operation, preventing accidental disconnection. The device operates within a power range as follows.

- 5-15 VDC for Barrel Connector
- 5V for USB-C Connector
- 7.5W max

B. SDI Input (BNC Connector)

This is the primary SDI input port for the device. It accepts a single link SDI input, ranging from SD up to 12G-SDI, and uses a standard 75Ω BNC connector.

C. SDI Loop Output (BNC Connector)

This is the SDI loop-through output port, allowing the SDI input signal to be passed through to downstream equipment for monitoring or further processing. The SDI signal on this loop connector is reclocked, ensuring a clean signal for further distribution. This feature is useful for applications where the SDI signal needs to be monitored or processed further without interruption, enabling the same signal to be sent to multiple devices simultaneously.

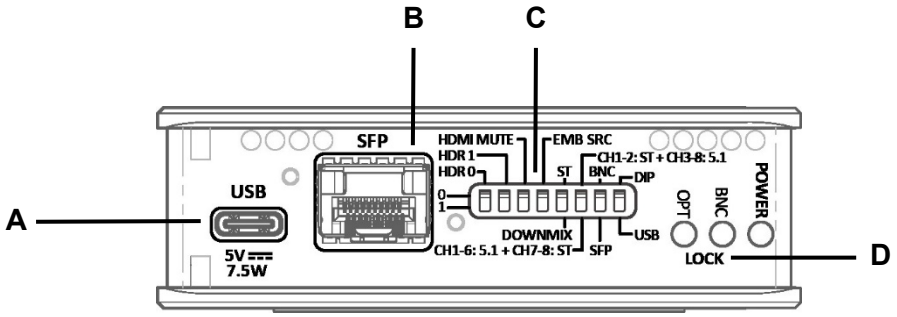
D. HDMI Output (HDMI Type A Connector)

This HDMI output port allows the high-definition SDI signal, already converted to HDMI 2.0, to be displayed on standard HDMI monitors or projectors. This ensures that the video quality is maintained, providing clear and high-resolution output on HDMI-compatible displays.

E. Analog Audio Output (3.5mm Jack Connector)

This analog audio output provides stereo audio connection, which can be routed to powered speakers or headphones. The output is selectable via DIP switches for either stereo pair or Lt/Rt multichannel downmix, allowing flexibility in audio monitoring and output configurations. It allows the audio embedded in the SDI signal to be output separately through an analog connection, offering versatility for various audio devices.

2.2 Fiber Side



Features Description

A. USB-C (USB)

Universal Serial Bus Type-C connector for backup power and firmware updates. This port provides an alternative power input source (5V at 7.5W) and enables firmware updates by connecting the device to a computer via a USB-C cable. Refer to Section 2.2.1.

B. SFP Slot (SFP)

Slot for Small Form-factor Pluggable modules. Supports optional SFP modules for fiber optic connections, allowing for the reception and transmission of SDI signals over extended distances. This enhances the device's flexibility and range. For NB2-12G-HDMI-OE-ST, the SFP module is fitted with a special adapter allowing ST connectivity.

C. DIP Switch

Refer to Section 2.2.3

D. Status Indicators

Refer to Section 2.2.4

2.2.1 USB Configuration Access

1. **Connect Device**
   - Connect the device to your computer using a USB-C cable.
   - A new COM port should be discovered.
2. **Configure COM Port**
   - Baud rate: 115200

- Stop bits: 1
- Parity: None
- Flow Control: None

3. **Open Terminal Application**
   - Launch a terminal application with serial COM port communication capabilities.
   - Open the configured COM port.
   - If the menu is not displayed correctly, ensure options like "new line mode" or "Implicit CR in every LF" are enabled.
4. **Navigate Menu**
   - The current firmware version and a menu with multiple options should appear.
   - Navigate the menu by typing and sending numbers corresponding to the menu options.

Note: While USB-C is primarily used for power and firmware updates, it also facilitates configuration access as described above. This additional functionality allows for convenient device setup and configuration through a single USB-C connection.

2.2.2 Firmware Update

Select Firmware Update

- Choose the "Update firmware" option in the USB configuration menu.
- The COM port connection will close, and a new portable drive will be discovered.

Copy Firmware File

- Copy a single firmware file with a .uf2 extension to the discovered portable drive.
- Ensure the file is extracted and the extension is ".uf2".

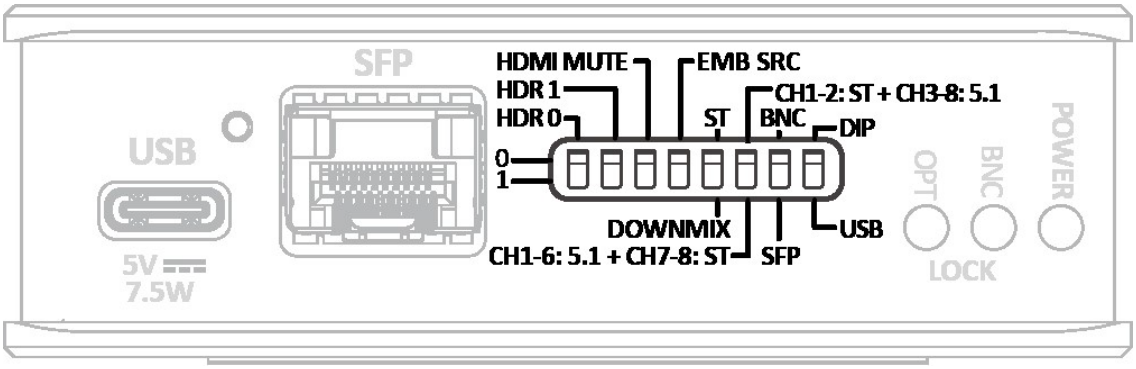
Restart Device

- After a few seconds, the device will restart, the portable drive will disappear, and the COM port will reappear.

Verify Update

- (Optional) Access the menu through the COM port again and verify that the new firmware version is displayed.

2.2.3 DIP Switch Settings



On the fiber side, there are 8 DIP switches used to configure different parameters. Each DIP switch has 2 positions i.e. Top (position '0') and bottom (position '1'). Descriptions of each parameter is provided below.

1. HDR Switch 0 and HDR Switch 1

Select the HDR mode and corresponding EOTF (Electro-Optical Transfer Function) metadata for the HDMI output.

- **Settings**
  - 0/0: Traditional gamma – SDR Luminance Range.
  - 0/1: Traditional gamma – HDR Luminance Range.
  - 1/0: SMPTE ST 2084.
  - 1/1: Hybrid Log-Gamma (HLG) based on ITU-R BT.2100-0.

2. HDMI MUTE

Enable or disable audio embedding in the HDMI signal.

- **Settings:**
  - 0: No sound embedded in HDMI output.
  - 1: Sound embedded in HDMI output.

3. EMB SRC (Audio Embedding Source)

Select whether unprocessed audio channels or downmixed audio is embedded into the HDMI output.

- **Settings**
  - 0: 8 unprocessed audio channels from the SDI stream are embedded into the HDMI stream.

- 1: Stereo/LtRt downmix (based on Downmix mode setting) is embedded into the HDMI stream.

4. Downmix Mode (0 - Stereo, 1 - Downmix)

Select between stereo and LtRt (Left total/Right total) downmix for the analog audio output.

- **Settings**
  - 0: Stereo channels to audio jack.
  - 1: LtRt downmix to audio jack.

5. Stereo Channels (0 - ch1/2, 1 - ch7/8)

Configure which channel pair contains the stereo audio received from the SDI signal. There are two scenarios:

- The first scenario is ch1/2 is stereo, and ch3/4, 5/6, 7/8 are discrete 5.1 channels.
- The second scenario is ch1/2, 3/4, 5/6 are discrete 5.1 channels, and ch7/8 is stereo.

- **Settings**
  - 0: ch1/2 (Channel 1 and Channel 2 are used for stereo).
  - 1: ch7/8 (Channel 7 and Channel 8 are used for stereo).

6. Failover Input Priority (0 - BNC, 1 - SFP)

Select which input has higher priority for the input failover system.

- **Settings:**
  - 0: BNC (If the BNC input fails, the device will switch to the SFP input).
  - 1: SFP (If the SFP input fails, the device will switch to the BNC input).

7. Settings Priority (0 - DIP Switch, 1 - USB)

Allow users to choose whether the device settings should be controlled primarily by the DIP switches or by a connected USB interface.

- **Settings:**
  - 0: DIP Switch (Settings configured by DIP switches take priority).
  - 1: USB (Settings configured via the USB interface take priority).

2.2.4 Status Indicators

1. **Power Indicator**

   Color: Green

   Status

   - **Always On:** Indicates that the device is powered on and operational.

2. **Optical Input Indicator**

   Color: Blue

   Status

   - **Blinking:** Optical SDI input is being used.
   - **Constant:** Valid optical SDI signal is present but not being used.
   - **Off:** No valid optical SDI signal is detected.

3. **BNC Input Indicator**

   Color: Blue

   Status

   - **Blinking:** Electrical BNC input is being used.
   - **Constant:** Valid electrical BNC signal is present but not being used.
   - **Off:** No valid electrical BNC signal is detected.

3. Applications

The NB2-12G-HDMI series is versatile and suitable for various professional broadcast and video production environments. Here are some application examples:

1. Live Broadcast

Description: The NB2-12G-HDMI series is ideal for live broadcast environments where high-quality video conversion and signal integrity are crucial. It can be used to convert 12G-SDI signals to HDMI for monitoring purposes, ensuring that broadcast operators have real-time access to high-definition video feeds.

Example: In a live sports broadcast, the NB2-12G-HDMI can be used to convert 12G-SDI signals from cameras located around the stadium to HDMI for display on large screens and monitors. This ensures that both the production team and the audience have access to clear and high-quality video.

2. Arenas and Stadiums

Description: Large venues like arenas and stadiums require reliable video signal conversion to display live feeds on big screens. The NB2-12G-HDMI series can handle the high data rates required for 4K and HDR video, making it suitable for such demanding applications.

Example: During a concert in an arena, the NB2-12G-HDMI can convert the 12G-SDI signal from the production camera to HDMI, which is then fed to the large LED screens around the venue. This provides attendees with an enhanced viewing experience, ensuring they can see every detail of the performance.

3. Shared Control Rooms

Description: Shared control rooms often require the integration of various video signals from different sources. The NB2-12G-HDMI series can convert these signals to HDMI, facilitating seamless integration and monitoring within the control room.

Example: In a television studio's control room, multiple 12G-SDI video feeds from different cameras and sources need to be monitored. The NB2-12G-HDMI can convert these feeds to HDMI, allowing the production team to view all inputs on standard HDMI monitors, ensuring smooth operation and coordination during live broadcasts.

4. Campus Facilities

Description: Educational institutions and corporate campuses often use high-quality video for lectures, presentations, and digital signage. The NB2-12G-HDMI series can convert professional video signals for use with consumer-grade HDMI displays.

Example: At a university, the NB2-12G-HDMI can be used to convert the 12G-SDI signal from a lecture capture system to HDMI, enabling the video to be displayed on HDMI projectors and monitors in lecture halls and classrooms. This ensures that students have access to high-quality video content during lectures and presentations.

5. Post-Production Studios

Description: Post-production studios require precise video signal conversion to ensure the highest quality of video editing and grading. The NB2-12G-HDMI series can be used to convert SDI signals to HDMI for accurate monitoring on professional HDMI displays.

Example: In a film editing studio, the NB2-12G-HDMI can convert 12G-SDI output from the editing suite to HDMI, allowing editors to view the content on high-resolution HDMI monitors. This ensures that the color grading and editing work is accurate and consistent with the final output.

4. Accessories & Replacement Parts

Wall Mount Bracket:

- **Part Number:** NB2-WMB
- **Description:** Wall Mount Bracket for 2nd Generation NanoBrix.
- **Purpose:** Used to securely mount the NB2-12G-HDMI device on a wall, providing stability and accessibility.

Power Supply:

- **Part Number:** 80-0112-01
- **Description:** POWER SUPPLY, NBX, 5V-15V, 7.5W, 2.5mm LOCKING BARREL.
- **Purpose:** Provides the necessary power to operate the NB2-12G-HDMI device. This power supply ensures a secure connection with a locking barrel connector.

SFP Modules:

- **Part Number:** MDOPT02978
    - **Description:** SFP, 12G SMPTE Single Rx, with CDR and Pathological Support, Non-MSA pin-out
    - **Purpose**: Replacement SFP Module for NB2-12G-HDMI-OE-LC and NB2-12G-HDMI-OE-ST
- **Part Number:** MDOPT02974
    - **Description**: SFP 12G TRX 1310 non-CWDM MSA CDR
    - **Purpose:** Replacement SFP Module for NB2-12G-HDMI-OEEO-LC

5. Troubleshooting

The following table consists of common symptom, probable cause, and test/corrective actions. The probable cause column lists the most common faults that can occur with its corresponding symptom. The test/corrective action column provides a reference to test procedures or specific repairs.

Symptom	Probable Cause	Test/Corrective Action
No power to system	Circuit breaker tripped	Verify that circuit breaker at power source is on. Reset if necessary.
No video	Dirty cable connection	Remove cable and clean both ends, as described below
	Defective video card	Contact MultiDyne
No audio, sync, or data functions	Dirty cable connection	Remove cable and clean both ends, as described below
	Defective circuit card	Contact MultiDyne

Cable Cleaning Procedure

CAUTION!

NEVER use isopropyl alcohol on any fiber connection. If not thoroughly cleaned and dry, isopropyl alcohol can leave residual material on the fiber core, which can interrupt signal flow.

Use only MultiDyne-recommended cleaning products designed for fiber optic cable connections. MultiDyne recommends Sticklers Fiber Optic Connector Cleaner and Benchtop Clean Wipes. For in-depth cleaning, MultiDyne recommends Bulkhead Ferrule Cleaner tool.

Do not scrub the fiber against the wipe. This can cause scratches to the fiber connection. In addition, do not reuse wipes as residual dirt can be transmitted to other cable connections.

Use a fiberscope to inspect the LC connectors for dirt or damage.

- If cable connection is **damaged**, check the connection at both the camera unit and the base unit
- If cable connection is **dirty**:
    - Fold a lint-free Sticklers Benchtop Clean Wipe into a square.
    - Moisten one section of the wipe with a small amount of Sticklers Connector Cleaner. o Lightly wipe the connector end.
    - Dry using the other end of the wipe.
    - Repeat this procedure using a fresh wipe for the other cables that need to be cleaned. Re-inspect the LC connectors using a fiberscope to be sure connection has been cleaned.

For more in-depth cleaning, use the Bulkhead Ferrule Cleaner device.

- Make sure to use the correct size for the connector being cleaned.
- Prime the cleaner and place on the cable end to thoroughly clean the connection.
- Repeat this step for the other cables, as needed.

6. Specifications

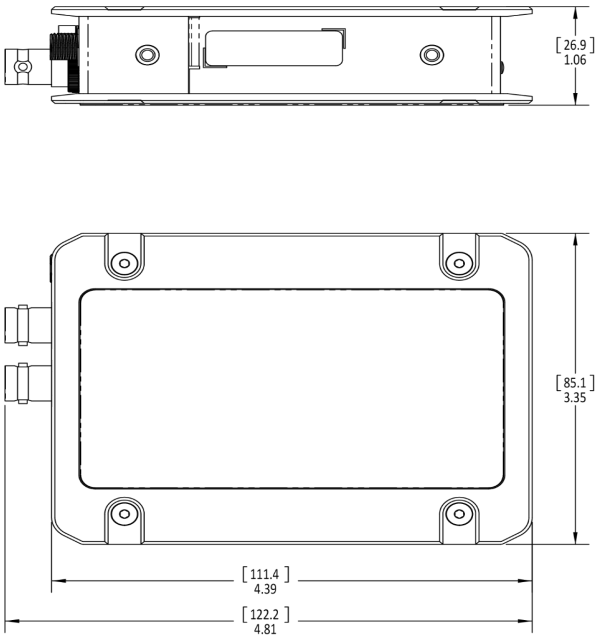
Coaxial Serial Data Input/Output

Connector	75-ohm BNC
Bit Rate	270 Mbps – 12 Gbps
Cable Auto Equalization	60m - Belden 1694A @ 12 Gbps 80m - Belden 1694A @ 3 Gbps 120m - Belden 1694A @ 1.5 Gbps 200m - Belden 1694A @ 270 Mbps
Standards	SMPTE 424M, 292M, 259M-C, 2082-1 DVB-ASI
Return Loss	< 15dB @ 5 MHz – 1.5 GHz < 10dB @ 1.5 GHz – 3.0 GHz
Level	800 mVp-p nominal
Alignment Jitter	< 0.3 UI

Mechanical, Electrical, Environmental

Length/Width/Height	4” x 2.625” x 0.825”
Approx. Weight	11oz
Voltage	5-15 VDC for Barrel Connector 5V for USB-C Connector
Power	7.5W max
Operating temperature	-20 to +45°C (-4 to +113°F)
Storage temperature	-40 to +70°C (-40 to +158°F)
Operation Humidity	Max. 90% (noncondensing)

6.1 Unit Dimensions



7. Contact Support

Contact support@multidyne.com

8. Copyrights

MultiDyne
252 Indian Head Rd,
Kings Park, NY 11754
+1-516-671-7278
sales@multidyne.com