USER MANUAL

MCXG2 SERIES

MCX G2 ENCODERS AND DECODERS

24/7 TECHNICAL SUPPORT AT 1.877.877.2269 OR VISIT BLACKBOX.COM

BLACK BOX®

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SAFETY

SAFETY PRECAUTIONS

Please read all instructions before attempting to unpack, install or operate this equipment and before connecting the power supply. Please keep the following in mind as you unpack and install this equipment:

- Always follow basic safety precautions to reduce the risk of fire, electrical shock and injury to persons.
- To prevent fire or shock hazard, do not expose the unit to rain, moisture or install this product near water.
- Never spill liquid of any kind on or into this product.
- Never push an object of any kind into this product through any openings or empty slots in the unit, as you may damage parts inside the unit.
- Do not attach the power supply cabling to building surfaces.
- Use only the supplied power supply unit (PSU). Do not use the PSU if it is damaged.
- Do not allow anything to rest on the power cabling or allow any weight to be placed upon it or any person walk on it.
- To protect the unit from overheating, do not block any vents or openings in the unit housing that provide ventilation and allow for sufficient space for air to circulate around the unit.
- The mounting holes are intended for desktop mounting and can't be used for wall mounting.
- The power cord must be connected to a socket outlet with Earth Ground.

CHAPTER 1: ENCODERS

1.1 INTRODUCTION

This Encoder is designed for high-quality, IP routable, AV extension with virtually zero latency. The unit is capable of transmitting AV and other data for long extension, enhancing the flexibility of any installation. By using a sophisticated ultra-light compression scheme (lossless for most content) it is a great solution for extending 4K audio/video streams (HDMI or Type C) and data. Advanced HDMI content, such as HDR (High Dynamic Range), 10-bit color and multi-channel HD Bitstream audio, can be transmitted in pass-through mode.

For the copper encoder, the use of high-quality, 10-Gbps Ethernet ports and Cat.6A or better cable allows for point-to-point transmission of the video signal up to 100m.

For the fiber encoder, the use of interchangeable, field replaceable, SFP+ modules allows for transmission distances of up to 30km. (Maximum transmission distance depends on the SFP+ modules used.)

Multiple control and data signals may also be transmitted along with the audio and video, including IR, RS-232, and Ethernet.

When combined with the optional MCX Gen2 Controller,or control software, the functionality of the Encoder expands exponentially. Multiple encoders/decoders may be combined with one or more 10-Gigabit fiber Ethernet switches. The units can be used together to form a distributed video matrix, a multi-viewer system, or a video wall system. This AV network capability provides flexibility in large event installations.

The integrated USB hub of each decoder can be configured to be in USB Host or Device Mode. It can function as a simple point-to-point KVM extension, freely routed between any two endpoints, or it can be configured into a special “Simultaneous” mode, allowing up to 7 Host Mode units to extend their USB ports to a single Device Mode unit. This type of USB KVM routing flexibility enables a wide range of multi-user, control room, or on-demand installation scenarios.

The built-in EDID and HDCP management functionality enables the unit to fit into every video distribution situation. Basic configuration of the unit can be achieved via front panel buttons with an OSD (On-Screen Display). Advanced control requires the optional MCX Gen2 controller, or control software, and a LAN connection.

1.2 APPLICATIONS

- Video, Audio, LAN, IR, and USB over copper cable or fiber extension
- Long distance data and video transmission immune to RF interference
- Point-to-point secure video conferencing
- Hotel or convention center display
- Multi-monitor broadcast
- Distributed video matrix system
- Distributed video wall system
- Remote KVM system control

1.3 PACKAGE CONTENTS

- (1) UHD+ copper or fiber transmitter
- (1) 12V/3A DC power adapter
- (1) Power cord
- (1) IR emitter
- (1) 3-pin terminal block

1.4 SYSTEM REQUIREMENTS

- HDMI or Type-C video source equipment, such as a media player, video game console, PC, or set-top box
- HDMI receiving equipment, such as an HDTV, monitor, or audio amplifier
- Analog audio receiving equipment, such as headphones, an audio amplifier, or powered speakers
- A 10-Gbps Ethernet network switch with jumbo frame and IGMP snooping support is required for distributed video systems. (Optional, required for multi-encoder/decoder copper systems)
- A 10-Gbps fiber Ethernet network switch with jumbo frame and IGMP snooping support is required for distributed video systems. (Optional, required for multi-encoder/decoder fiber systems)
- IEEE 802.3ae compatible SFP+ fiber module supporting a dual-optical fiber connection style, such as LC, or a pre-terminated crossover dual-optical fiber cable (required for fiber encoder)
- Note: Single-mode and multi-mode support is dependent on the SFP+ modules used
- MCX Gen2 Controller or control software to configure distributed matrix, video wall or multi-view systems (Optional)

1.5 FEATURES

- Provides AV, IR, RS-232, USB 2.0, and ethernet extension
- HDMI 2.0 and DVI 1.0 compatible
- HDCP 2.2 and HDCP 1.4 compliant
- (1) HDMI, (1) HDMI Loop-Through, (1) USB Type C; and (1) 3.5mm phone jack input
- IP switchable with virtually zero latency (requires optional MCX Gen2 controller or control software)
- Optional lossless compression to allow video transfer within limited bandwidth
- Extends up to 100m in point-to-point mode (with CAT.6A cable for copper encoder)
- Extends up to 30km over fiber (maximum distance depends on the SFP+ module and type of fiber used for fiber encoder)
- Supports independent breakaway A/V matrix switching with minimum latency, video wall generation, and multi-view compositing (requires optional MCX Gen2 controller/control software)
- Facilitates pass-through of 10/12-bit HDR sources (point-to-point and Genlock modes only)
- Enables pass-through of audio formats including LPCM (up to eight channels), Bitstream and HD Bitstream from HDMI or DP sources
- Unit can be powered directly by PoE when connected to a 10 Gigabit Ethernet (10GbE) switch that provides PoE (802.3at) (for copper encoder)
- Signal transmission interfaces with 10-Gigabit Ethernet switches via XFI (IEEE 802.3ae) compatible SFP+ fiber modules (for fiber encoder)
- Basic configuration via front panel buttons with an OSD
- Supports the use of an external control center (MCX Gen2 Controller) or control software to provide expanded functionality (Contact Black Box for more information.)

1.6 OPERATION CONTROLS AND FUNCTIONS

1.6.1FRONT PANEL

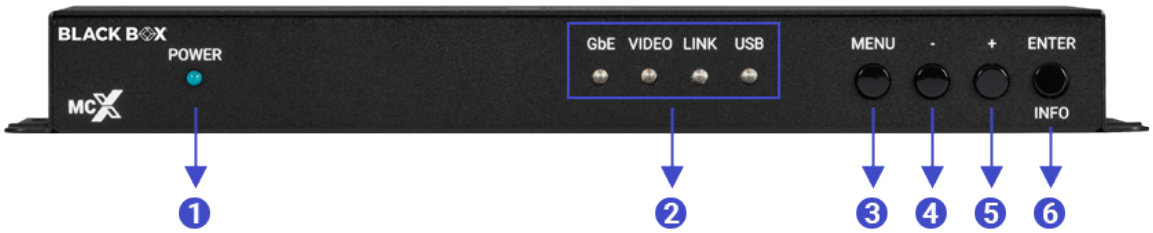

FIGURE 1-1: FRONT PANEL

TABLE 1-1. FRONT-PANEL COMPONENTS

NUMBER IN FIGURE 1-1	COMPONENT	DESCRIPTION
1	(1) Power LED indicator	Lights ON or OFF for Power
2	(1) Status LED block	**GbE LED:** This LED will illuminate and blink to indicate a live and active connection on the local gigabit Ethernet port. **VIDEO LED:** This LED will illuminate Green when a video signal is live on the optical fiber streaming port or illuminate Amber when streaming a detected input stream. When no video is active, the LED will remain off, even if the streaming connection is valid. **LINK LED:** These LEDs will illuminate and blink to indicate data transmission and reception activity across the optical fiber streaming connection. **USB LED:** This LED will illuminate when the unit's USB ports have successfully paired with the USB ports on another unit. This LED will blink if the unit's USB ports are not currently paired and are in stand-by mode.
3	(1) Menu button	Press to enter the OSD menu or to back out from menu items.
4	(1) Menu button: - Minus button	Press to move up or adjust selections within OSD menus. When not in a menu, press to manually switch between encoder source inputs.
5	(1) Menu button: + button	Press to move up or adjust selections within OSD menus. When not in a menu, press to manually switch between decoder source inputs.
6	(1) Enter/Info button	When inside an OSD menu, press to confirm a selection or to go deeper into a menu item. When not in a menu, press to activate the Information OSD.

1.6.2 REAR PANEL

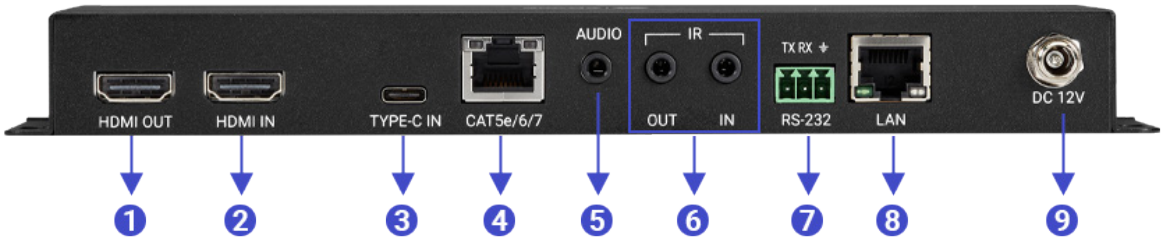

FIGURE 1-2: REAR PANEL (COPPER)

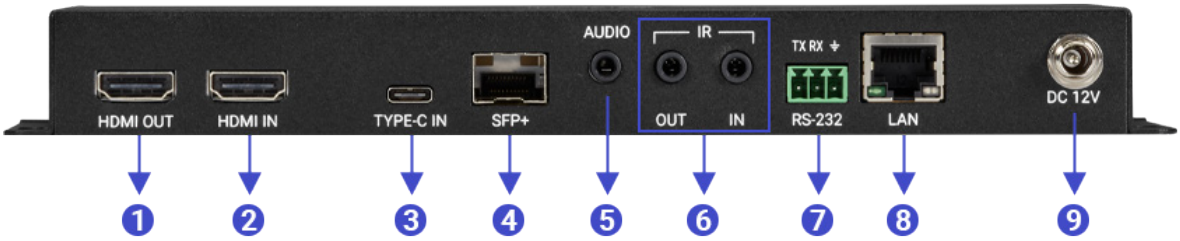

FIGURE 1-3: REAR PANEL (FIBER)

TABLE 1-2. REAR-PANEL COMPONENTS

NUMBER IN FIGURE 1-2/1-3	COMPONENT	DESCRIPTION
1	(1) HDMI Out Port	Connect to an HDMI TV, monitor, or amplifier for digital video and audio output.
2	(1) HDMI In Port	Connect to HDMI source equipment, such as a media player, game console, or set-top box.
3	(1) Type C In Port	Connect to Type C or USB Type A to Type C source equipment, such as a PC or laptop.
4	(1) Cat5E/6/7 port OR (1) SFP+ port	Connect directly to a compatible encoder/decoder for point-to-point extension, or to a 10 Gigabit Ethernet switch for distributed matrixing (requires MCX Gen2 Controller or control software) with a single Cat.5e/6/7 cable for extension of all data signals (for copper encoder). **NOTE: If the connected network switch supports the IEEE 802.3at-2009 PoE (Power over Ethernet) standard, this unit can optionally be powered directly via this Ethernet port.** Insert a standard SFP+ module and connect the appropriate optical cable to allow data transmission to a compatible decoder or to a 10-gigabit optical fiber network switch (for fiber encoder). **NOTE: The SFP+ module must support a dual-optical fiber connection style, such as LC, or be pre-terminated dual-optical fiber cables. Single-mode and multi-mode support is dependent on the SFP+ modules used.**
5	(1) Audio port	**As OUT:** Connect to powered speakers or an amplifier for stereo analog audio output. **As IN:** Connect to the stereo analog output of a device, such as a CD player or PC. **NOTE: When the encoder and decoder are connected directly in a point-to-point configuration, audio is routed directly to the opposite end's Ports. Free routing can only be configured by use of the optional MCX Gen2 Master Controller or control software.**
6	(2) IR ports	**OUT Port:** Connect to an IR Blaster to broadcast IR signals from a connected encoder to devices within direct line-of sight of the IR Blaster. **IN Port:** Connect to an IR Extender to receive IR control signals and extend them to devices connected to a connected encoder. Ensure that the remote being used is within direct line-of-sight of the IR Extender. **NOTE: Currently, only 38KHz IR signal extension is supported.**
7	(1) RS-232 Terminal Block	Connect directly to a PC, laptop or serial controllable device with a 3-pin adapter cable to extend the RS-232 signal between encoder and decoder.
8	LAN Port	Connection for device configuration only
9	DC 12V Port	Plug the 12V DC power adapter into this port and connect it to an AC wall outlet for power.

1.6.3 IR CABLE PINOUTS

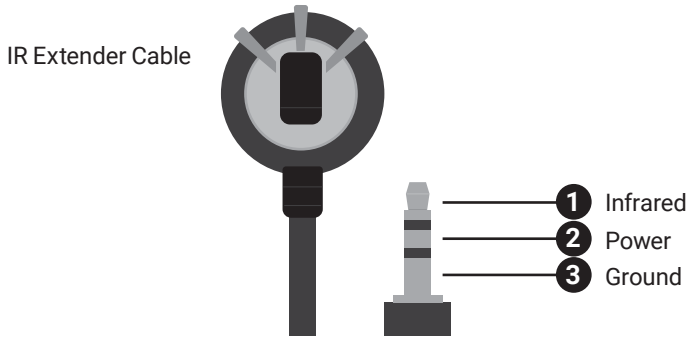

FIGURE 1-4: IR EXTENDER CABLE PINOUTS

1.6.4 RS-232 PINOUT AND DEFAULTS

SERIAL PORT DEFAULT SETTINGS	
BAUD RATE	57600
DATA BITS	8
PARITY BITS	NONE
STOP BITS	1
FLOW CONTROL	NONE

FIGURE 1-5: SERIAL PORT DEFAULT SETTINGS

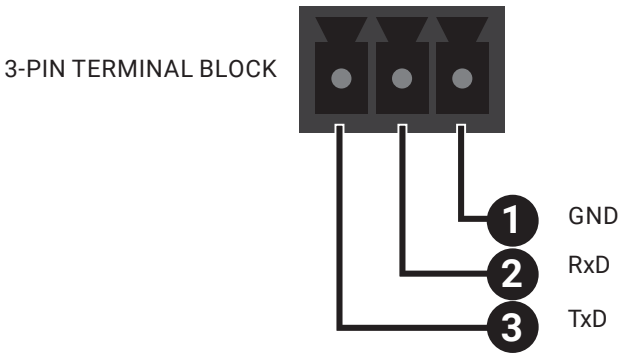

FIGURE 1-6: 3-PIN TERMINAL BLOCK

NOTE: The default Serial Port baud rate can only be changed by use of the optional MCX Gen2 Controller or control software.

1.6.5 OSD MENU

All functions of this unit can be controlled by using the OSD (On Screen Display) which is activated by pressing the [**MENU**] button on the front of the unit. Use the [**+**] (PLUS), [**–**] (MINUS), and [**ENTER**] buttons to navigate the OSD menu. Press the [**MENU**] button to back out from any menu item and then press it again to close the menu.

MAIN MENU
OSD
EDID
HDCP
DEVICE SETTING
INFORMATION
USB INFORMATION
FACTORY SETTING

FIGURE 1-7: MAIN MENU

The individual functions of the OSD will be introduced in the following section. Items marked in **BOLD** are the factory default settings.

OSD	
2ND LEVEL	**3RD LEVEL**
DISPLAY INFORMATION	**ON**
	OFF
INFORMATION TIMEOUT	OFF
	10~40 SEC **[10 SEC]**
MENU TIMEOUT	OFF
	10~40 SEC **[10 SEC]**
MENU H POSITION	0~100 **[10]**
MENU V POSITION	0~100 **[90]**

FIGURE 1-8: OSD MENU

TABLE 1-3. OSD

SECOND LEVEL IN FIGURE 1-8	SELECTION	DESCRIPTION
Display Information	On/Off	Enable or disable the Information OSD.
Information Timeout	Multiple	Set the display timeout for the Information OSD.
Menu Timeout	Multiple	Set the display timeout for the OSD Menu.
Menu H position	Multiple	Set the horizontal position of the OSD Menu.
Menu V Position	Multiple	Set the horizontal position of the OSD Menu.

EDID	
2ND LEVEL	**3RD LEVEL**
HDMI EDID	**INTERNAL 1 (FHD 2CH)**
	INTERNAL 2 (FHD MCH)
	INTERNAL 3 (UHD 2CH)
	INTERNAL 4 (UHD MCH)
	INTERNAL 5 (UHD+ 2CH)
	INTERNAL 6 (UHD+ MCH)
	EXTERNAL A [HDMI OUTPUT]
	EXTERNAL B [VOIP OUTPUT]
	USER 1
	USER 2
TYPE-C EDID	**INTERNAL 1 (FHD 2CH)**
	INTERNAL 2 (FHD MCH)
	INTERNAL 3 (UHD 2CH)
	INTERNAL 4 (UHD MCH)
	INTERNAL 5 (UHD+ 2CH)
	INTERNAL 6 (UHD+ MCH)
	EXTERNAL A [HDMI OUT]
	EXTERNAL B [VOIP OUT]
	USER 1
	USER 2

FIGURE 1-9: EDID MENU

TABLE 1-4. EDID

SECOND LEVEL IN FIGURE 1-9	SELECTION	DESCRIPTION
HDMI EDID	Multiple	Select the EDID to send to the unit's HDMI input.
Type-C EDID	Multiple	Select the EDID to send to the unit's DisplayPort™ input.

This unit provides the following six default EDIDs:

UNIT'S DEFAULT EDIDS	
FHD 2CH	1920×1080P@60HZ (4.95GBPS), 8-BIT COLOR, LPCM 2.0
FHD MCH	1920×1080P@60HZ (4.95GBPS), 8-BIT COLOR, LPCM 7.1 & BITSTREAM
UHD 2CH	3840×2160P@30HZ (10.2GBPS), 12-BIT DEEP COLOR, LPCM 2.0
UHD MCH	3840×2160P@30HZ (10.2GBPS), 12-BIT DEEP COLOR, LPCM 7.1 & BITSTREAM
UHD+ 2CH	3840×2160P@60HZ (18GBPS), 12-BIT DEEP COLOR, LPCM 2.0
UHD+ MCH	3840×2160P@60HZ (18GBPS), 12-BIT DEEP COLOR, LPCM 7.1 & BITSTREAM

FIGURE 1-10: DEFAULT EDIDS

NOTE: In some rare cases it is possible for custom or external EDIDs to cause compatibility issues with certain sources. If this happens, it is recommended to switch to one of the six default EDIDs for maximum compatibility.

HDCP	
2ND LEVEL	3RD LEVEL
HDMI HDCP	DISABLE
	FOLLOW OUT
	FOLLOW IN
	FOLLOW API
TYPE-C HDCP	DISABLE
	FOLLOW OUT
	FOLLOW IN
	FOLLOW API

FIGURE 1-11: HDCP MENU

TABLE 1-5. HDCP

SECOND LEVEL IN FIGURE 1-11	SELECTION	DESCRIPTION
HDMI HDCP	Multiple	Selects the HDCP logic to use with the HDMI input. **Follow In:** The input supports up to the HDCP version required by the connected source. **Follow Out:** The input supports up to the HDCP version supported by the connected display. **Disable:** HDCP support is completely disabled. **Follow API:** Uses the HDCP setting defined by the MCX Gen2 Controller or control software. **NOTE: In a point-to-point configuration, "Follow API" will behave the same as "Follow Out", if the API hasn't been manually redefined.**
Type-C HDCP	Multiple	Selects the HDCP logic to use with the DisplayPort input. **Follow In:** The input supports up to the HDCP version required by the connected source. **Follow Out:** The input supports up to the HDCP version supported by the connected display. **Disable:** HDCP support is completely disabled. **Follow API:** Uses the HDCP setting defined by the MCX Gen2 Controller or control software. **NOTE: In a point-to-point configuration, "Follow API" will behave the same as "Follow Out", if the API hasn't been manually redefined.**

DEVICE SETTING	
2ND LEVEL	**3RD LEVEL**
USB VIRTUAL HUB	**OFF**
	ON
HDMI OUT SOURCE	**INPUT 1 (HDMI)**
	INPUT 2 (YPE-C)
VOIP OUT SOURCE	**INPUT 1 (HDMI)**
	INPUT 2 (YPE-C)
HDMI OUT AUTO MODE	OFF
	AUTO SWITCH
VOIP OUT AUTO MODE	OFF
	AUTO SWITCH

FIGURE 1-12: DEVICE SETTING MENU

TABLE 1-6. DEVICE SETTINGS

SECOND LEVEL IN FIGURE 1-12	SELECTION	DESCRIPTION
USB Virtual hub	Off/On	Enables or disables the "simultaneous connection" USB mode which allows the PC/Laptop connected to this unit to be paired with the USB devices on up to seven decoders.
HDMI Out Source	HDMI/TYPE-C	Select the input source to display on the HDMI output.
VOIP Out Source	HDMI/TYPE-C	Select the input source to transmit as an AV over IP stream.
HDMI Out Auto Mode	Off/Auto Switch	Enable or disable the HDMI output's automatic source selection mode. When enabled, the unit will automatically switch the input routed to the local HDMI output whenever a new source is detected or if the current source is lost.
VOIP Out Auto Mode	Off/Auto Switch	Enable or disable the AVoIP streaming output's automatic source selection mode. When enabled, the unit will switch the input routed to the AVoIP output whenever a new source is detected or if the current source is lost.

INFORMATION	
2ND LEVEL	3RD LEVEL
RESOLUTION	[CURRENT SOURCE RESOLUTION]
STATUS	ENCODER
FW VERSION	[CURRENT FIRMWARE VERSION]
IP	[CURRENT IP ADDRESS]
MAC	[UNIT'S MAC ADDRESS]
SN	[UNIT'S SERIAL NUMBER]

FIGURE 1-13: INFORMATION MENU

TABLE 1-7. INFORMATION

SECOND LEVEL IN FIGURE 1-13	SELECTION	DESCRIPTION
Resolution	Default	Displays the unit's detected source resolution
Status	Default	Always show ENCODER
FW Version	Default	Displays the unit's firmware version
IP	Default	Displays the unit's IP address
MAC	Default	Displays the unit's MAC address
SN	Default	Displays the unit's serial number

USB INFORMATION	
2ND LEVEL	3RD LEVEL
IP MODE	[UNIT'S USB IP MODE]
IP	[UNIT'S USB IP ADDRESS]
MAC	[UNIT'S USB MAC ADDRESS]
PAIRED MAC 1	[USB MAC ADDRESSES OF CONNECTED USB SOURCES]
PAIRED MAC 2	
PAIRED MAC 3	
PAIRED MAC 4	
PAIRED MAC 5	
PAIRED MAC 6	
PAIRED MAC 7	

FIGURE 1-14: USB INFORMATION MENU

TABLE 1-8. USB INFORMATION

SECOND LEVEL IN FIGURE 1-14	SELECTION	DESCRIPTION
IP Mode	Default	Displays the unit's USB IP mode
IP	Default	Displays the unit's USB IP address
MAC	Default	Displays the unit's USB MAC address
PAIRED MAC 1-7	Default	Displays the unit's USB addresses of connected USB sources

FACTORY SETTING	
2ND LEVEL	3RD LEVEL
ARE YOU SURE?	**NO**
	YES

FIGURE 1-15: FACTORY SETTING MENU

TABLE 1-9. FACTORY INFORMATION

SECOND LEVEL IN FIGURE 1-15	SELECTION	DESCRIPTION
Are you sure?	No/Yes	Selecting [**Yes**] will reset the unit's settings back to their factory defaults. Selecting [**No**] will keep the current settings.

1.6.6 BASIC AV EXTENSION

1.6.6.1 POINT-TO-POINT (ONE WAY)

The most basic extension configuration available is a point-to-point system with a single transmitter unit acting as an encoder connected directly to a single receiver unit acting as a decoder. In this configuration the HDMI/DP input on the encoder side is transmitted to the connected decoder side without modification to the audio or video format. The analog stereo audio input on the encoder transfers audio directly to the analog stereo audio output on the decoder. The LAN, RS-232 and IR ports form direct connections between the encoder and decoder as well. This configuration is ideal for basic video extension as well as remote KVM applications.

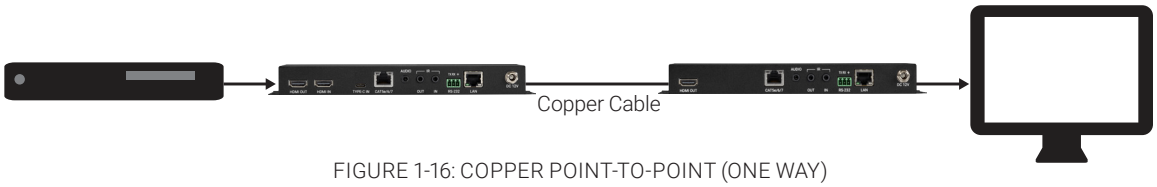

FIGURE 1-16: COPPER POINT-TO-POINT (ONE WAY)

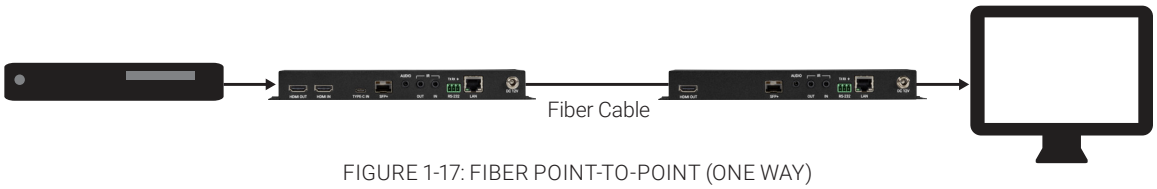

FIGURE 1-17: FIBER POINT-TO-POINT (ONE WAY)

NOTE: These configurations do not use or require an external control center, such as the MCX Gen2 Controller, to function. No audio insertion/extraction is performed in these configurations.

1.6.7 ADVANCED AV EXTENSION

1.6.7.1 MCX GEN2 CONTROLLER

The MCX Gen2 Controller is a hardware solution designed to provide a unified and easy method to access and control all of the encoders and decoders in a system. It provides a user-friendly, and operating system agnostic, web-based interface allowing easy control over all of the most critical functions within a distribution system.

The MCX Gen2 hardware is an optional component and is not included with individual encoder, decoder, or transcoder units. Please contact your authorized dealer for more information.

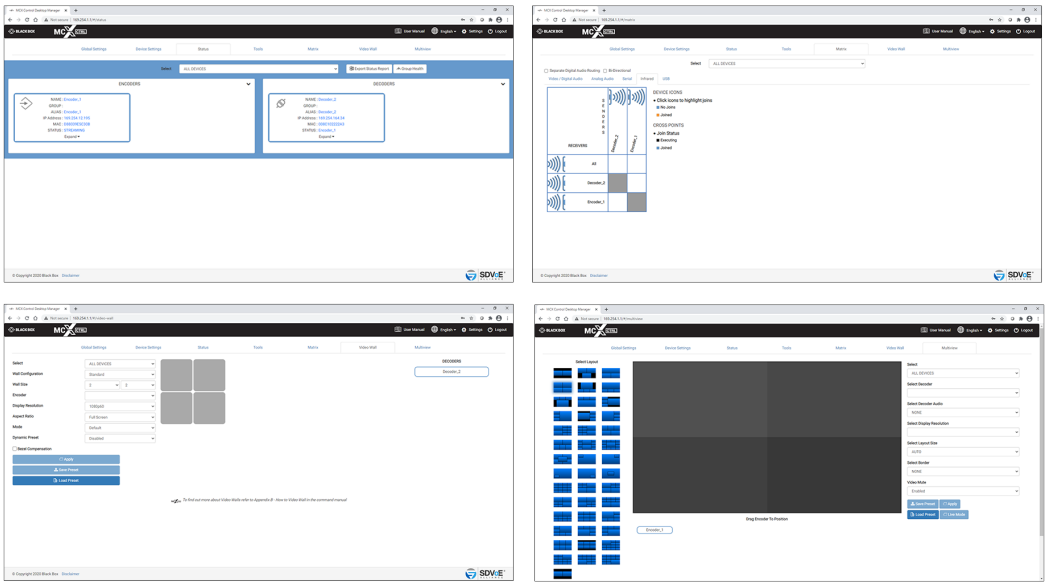

FIGURE 1-18: SAMPLE MCX GEN2 CONTROLLER SCREENSHOTS

NOTE: Interface images are for example only and may differ from the delivered product.

1.6.7.2 CONFIGURATION EXAMPLES

When combined with the MCX Gen2 Controller, and a 10 Gigabit fiber Ethernet switch, this extension system gains a large number of additional configuration options including: multi-in/multi-out matrix switching with breakaway audio, video wall creation, and a multiview output mode. Audio extraction and embedding is fully controllable. Additionally, audio, USB, IR, and RS-232 routing can be fully controlled.

(1) **Matrix Configuration**

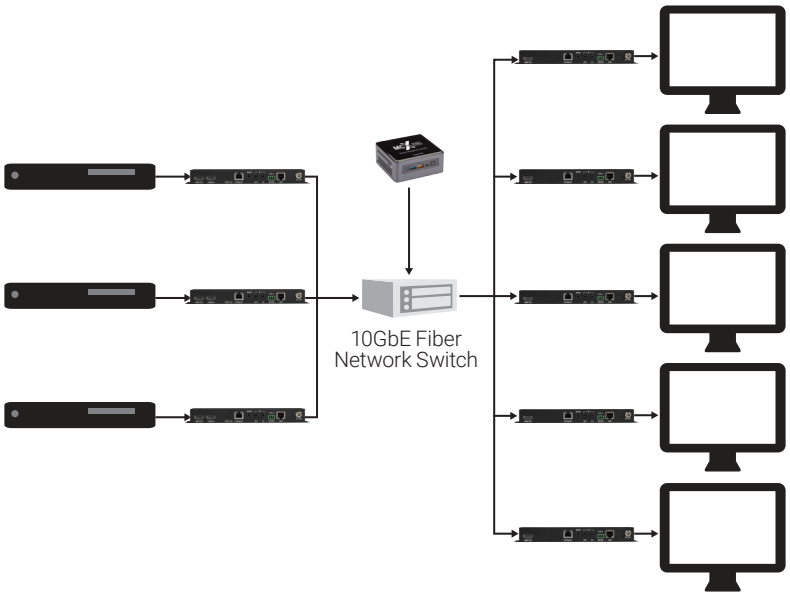

FIGURE 1-19: COPPER MATRIX CONFIGURATION

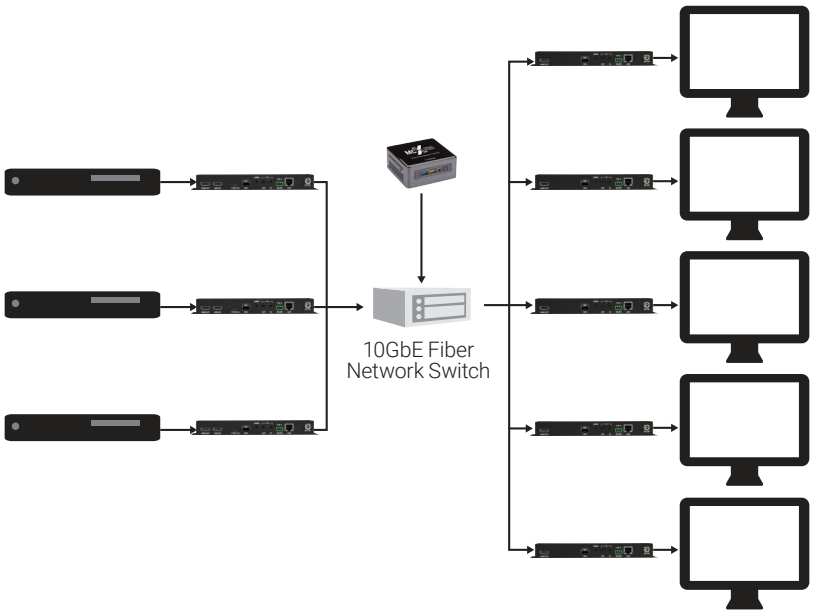

FIGURE 1-20: FIBER MATRIX CONFIGURATION

(2) Video Wall Configuration

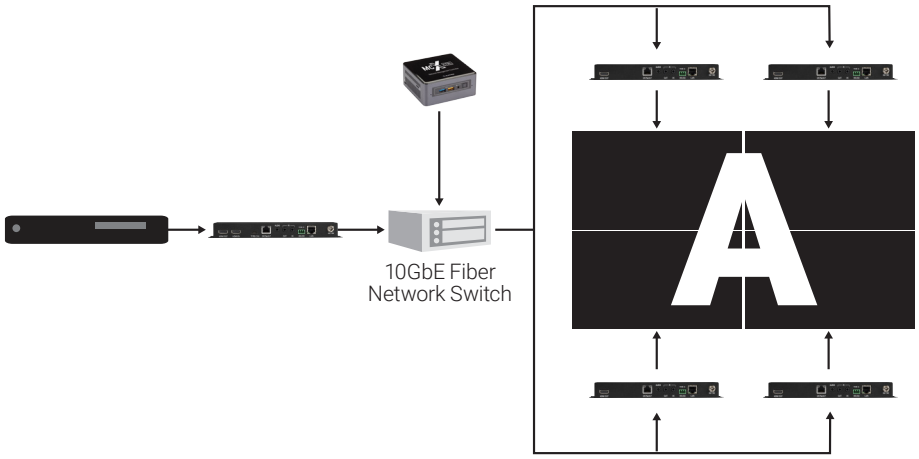

FIGURE 1-21: COPPER VIDEO WALL CONFIGURATION

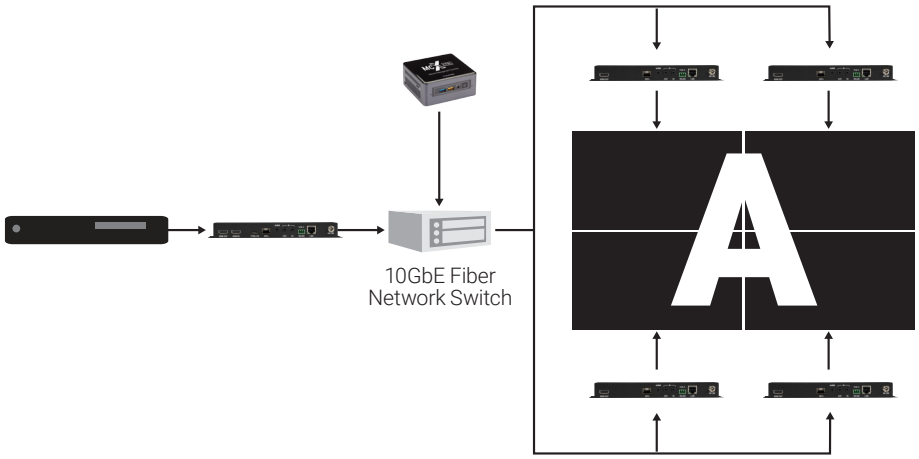

FIGURE 1-22: FIBER VIDEO WALL CONFIGURATION

(3) Multiview (PiP/PoP/Quad/Etc.) Configuration

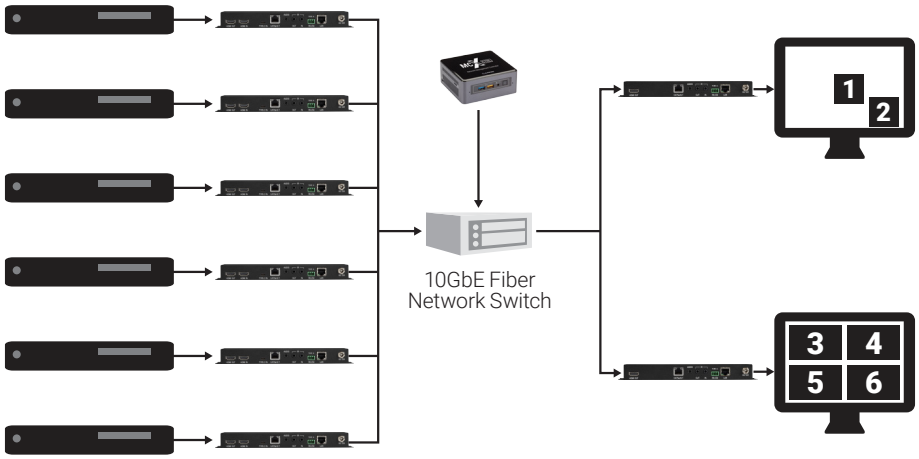

FIGURE 1-23: COPPER MULTIVIEW (PIP/POP/QUAD/ETC.) CONFIGURATION

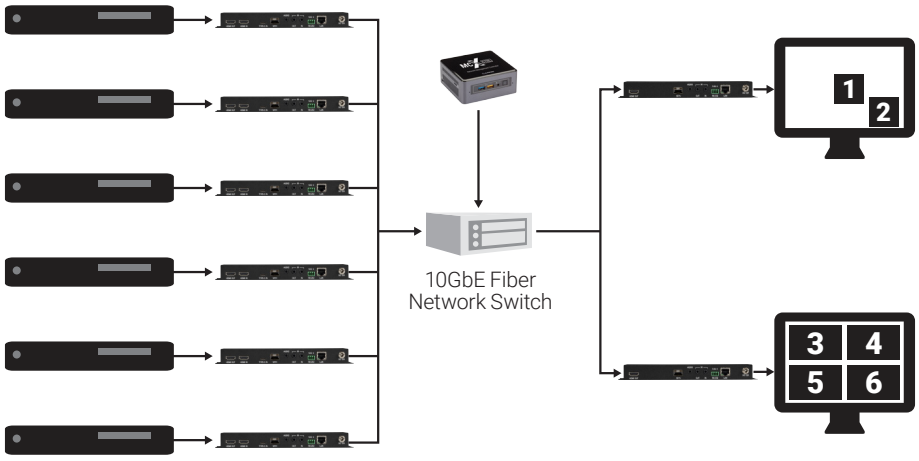

FIGURE 1-24: FIBER MULTIVIEW (PIP/POP/QUAD/ETC.) CONFIGURATION

(4) KVM Switch Configuration

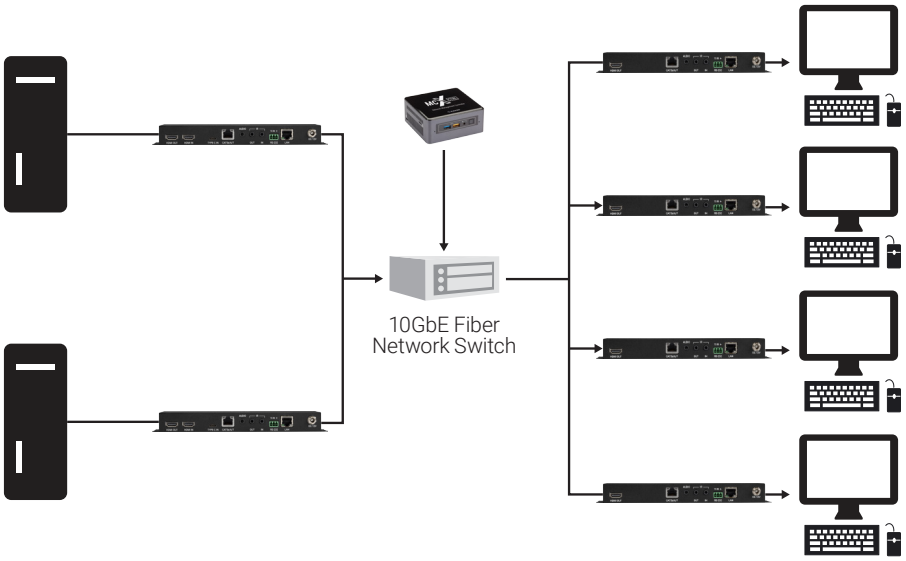

FIGURE 1-25: COPPER KVM SWITCH CONFIGURATION

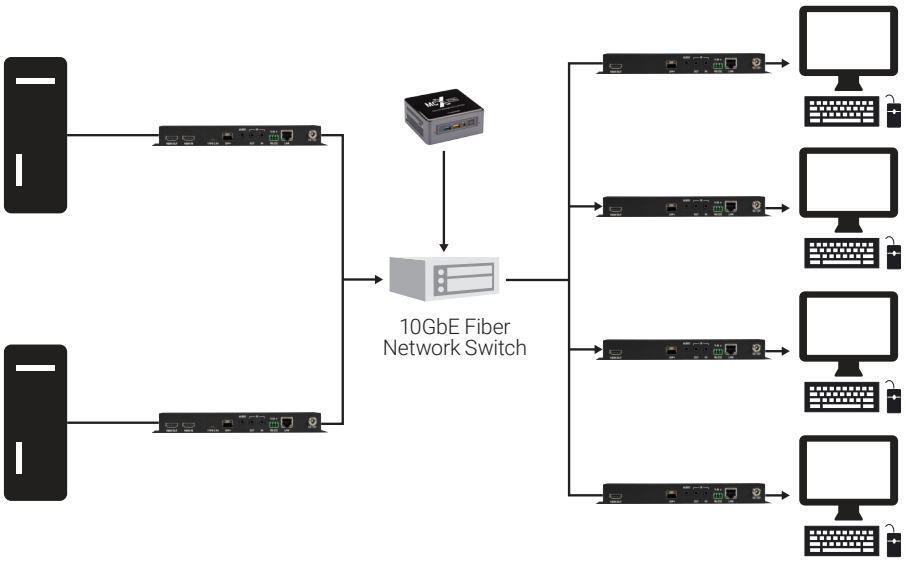

FIGURE 1-26: FIBER KVM SWITCH CONFIGURATION

1.7 CONNECTION DIAGRAMS

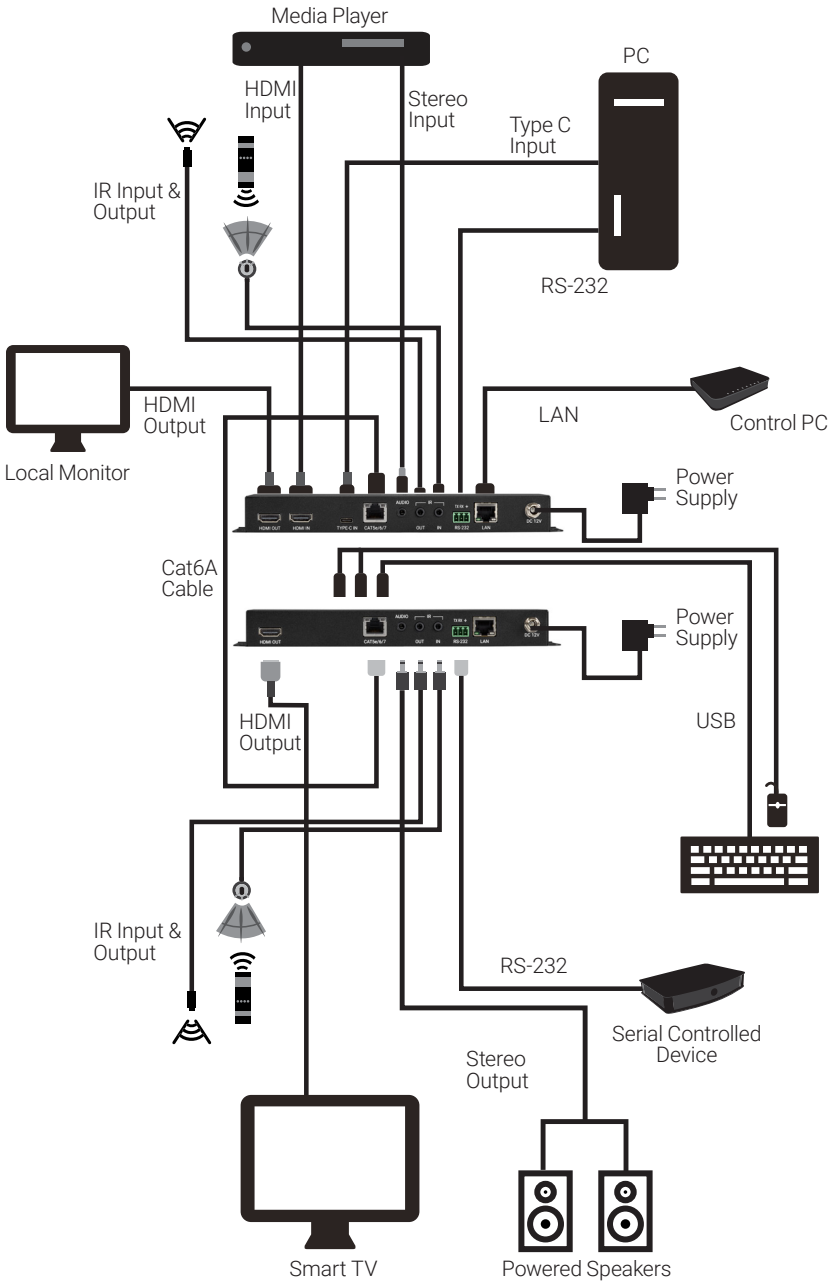

FIGURE 1-27: COPPER CONNECTION DIAGRAM

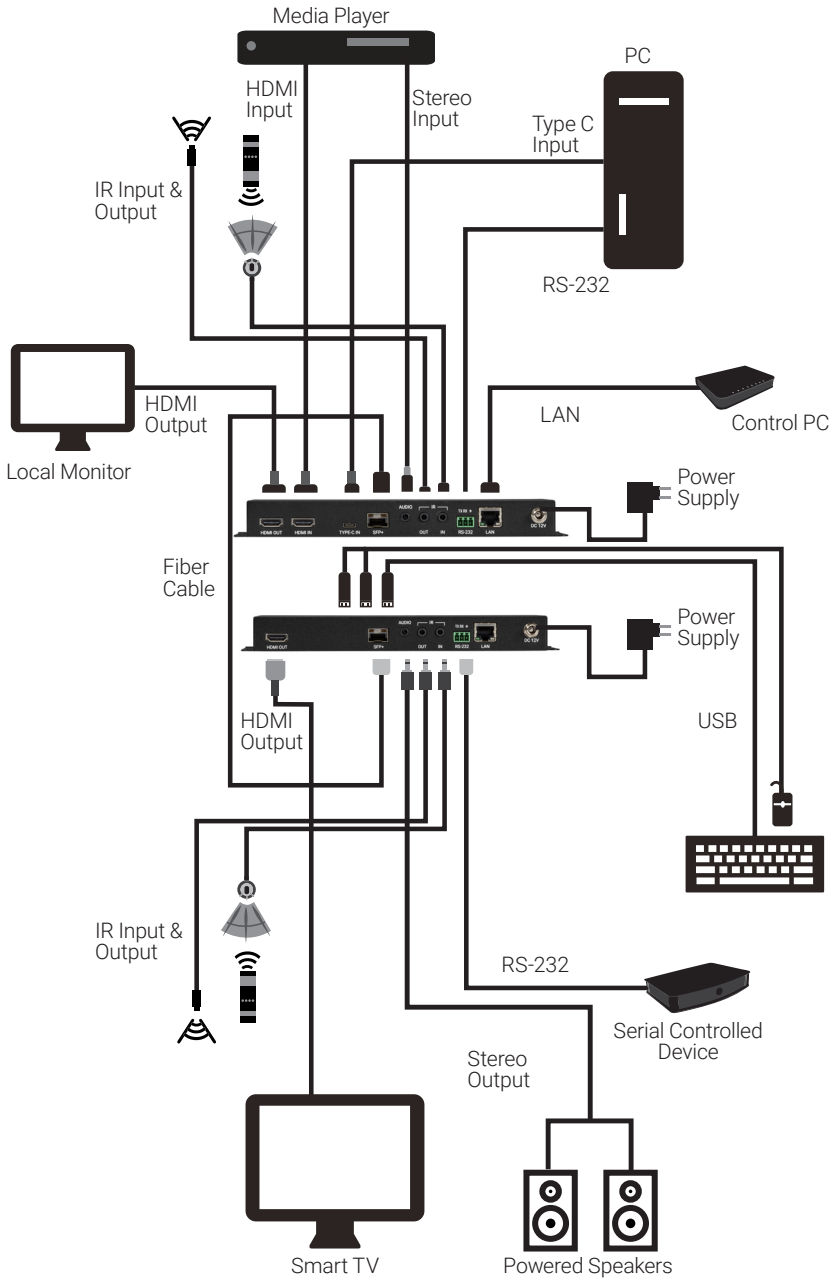

FIGURE 1-28: FIBER CONNECTION DIAGRAM

1.8 SPECIFICATIONS

TABLE 1-10. GENERAL SPECIFICATIONS

SPECIFICATION	DESCRIPTION
HDMI Version	HDMI 2.0b
10GbE Bandwidth	10 Gbps
Input Ports	(1) HDMI (Type A) female; (1) Type C female; (1) Stereo Audio (3.5mm) female
Output Ports	(1) HDMI (Type A) female
Pass-Through Ports	(1) 10GbE LAN (RJ-45 for copper; SFP+ for fiber) female; (2) IR (3.5mm) female; (1) RS-232 (3-pin terminal block) female; (1) LAN (RJ-45) female
IR Frequency	38kHz
Baud Rate	57600 (default), up to 115200 bps
Power Supply	12V/3A DC (US/EU standards, CE/FCC/UL certified)
ESD Protection (HBM)	±8kV (air discharge); ±4kV (contact discharge);
Dimensions	215mm x 25mm x 108mm (case only); 215mm x 25mm x 116.7 mm (all inclusive)
Weight	916g
Chassis Metal	Metal (steel)
Chassis Color	Black
Operating Temperature	0 to 40˚C (32 to 104˚F)
Storage Temperature	-20 to 60˚C (-4 to 140˚F)
Relative Humidity	20 to 90% RH (Non-condensing)
Power Consumption	14.3w (for copper); 18.51w (for fiber)

TABLE 1-11. VIDEO SPECIFICATIONS

	INPUT		OUTPUT	
SUPPORTED RESOLUTIONS (**HZ**)	**HDMI**	TYPE-C	10GBE	HDMI
720×400p@70/85	✓	✓	✓	✓
640×480p@60/72/75/85	✓	✓	✓	✓
720×480i@60	✓	✓	✓	✓
720×480p@60	✓	✓	✓	✓
720×576i@50	✓	✓	✓	✓
720×576p@50	✓	✓	✓	✓
800×600p@56/60/72/75/85	✓	✓	✓	✓
848×480p@60	✓	✓	✓	✓
1024×768p@60/70/75/85	✓	✓	✓	✓
1152×864p@75	✓	✓	✓	✓
1280×720p@50/60	✓	✓	✓	✓
1280×768p@60/75/85	✓	✓	✓	✓
1280×800p@60/75/85	✓	✓	✓	✓
1280×960p@60/85	✓	✓	✓	✓
1280×1024p@60/75/85	✓	✓	✓	✓
1360×768p@60	✓	✓	✓	✓
1366×768p@60	✓	✓	✓	✓
1400×1050p@60	✓	✓	✓	✓
1440×900p@60/75	✓	✓	✓	✓
1600×900p@60RB	✓	✓	✓	✓
1600×1200p@60	✓	✓	✓	✓
1680×1050p@60	✓	✓	✓	✓
1920×1080i@50/60	✓	✓	✓	✓
1920×1080p@24/25/30	✓	✓	✓	✓
1920×1080p@50/60	✓	✓	✓	✓
1920×1200p@60RB	✓	✓	✓	✓
2560×1440p@60RB	✓	✓	✓	✓
2560×1600p@60RB	✓	✓	✓	✓
2048×1080p@24/25/30	✓	✓	✓	✓
2048×1080p@50/60	✓	✓	✓	✓
3840×2160p@24/25/30	✓	✓	✓	✓
3840×2160p@50/60 (4:2:0)	✓	✓	✓	✓
3840×2160p@24, HDR10	✓	✓	✓	✓
3840×2160p@50/60 (4:2:0), HDR10	✓	✓	✓	✓
3840×2160p@50/60	✓	✓	✓	✓
4096×2160p@24/25/30	✓	✓	✓	✓
4096×2160p@50/60 (4:2:0)	✓	✓	✓	✓
4096×2160p@24, HDR10	✓	✓	✓	✓

TABLE 1-11. VIDEO SPECIFICATIONS CONTINUED

	INPUT		OUTPUT	
SUPPORTED RESOLUTIONS (**HZ**)	**HDMI**	TYPE-C	10GBE	HDMI
4096×2160p@50/60 (4:2:0), HDR10	✓	✓	✓	✓
4096×2160p@50/60	✓	✓	✓	✓

TABLE 1-12. DIGITAL AUDIO HDMI INPUT SPECIFICATIONS

SPECIFICATION	DESCRIPTION
LPCM	
Max Channels	8 channels
Sampling Rate (kHz)	32, 44.1, 48
Bitstream	
Supported Formats	Standard and High Definition

TABLE 1-13. CAT5E/6/7 OUTPUT (COPPER)/FIBER OUTPUT (FIBER)

SPECIFICATION	DESCRIPTION
LPCM	
Max Channels	8 channels
Sampling Rate (kHz)	32, 44.1, 48
Bitstream	
Supported Formats	Standard and High Definition

TABLE 1-14. ANALOG AUDIO INPUT SPECIFICATIONS

SPECIFICATION	DESCRIPTION
Max Audio Level	1Vrms
Impedance	10kΩ
Type	Unbalanced

TABLE 1-15. ANALOG AUDIO OUTPUT SPECIFICATIONS

SPECIFICATION	DESCRIPTION
Max Audio Level	1Vrms
THD+N	< −80dB@0dBFS 1kHz (A-wt)
SNR	> 80dB@0dBFS
Frequency Response	< ±1dB@20Hz~20kHz
Crosstalk	< −80dB@10kHz
Impedance	470Ω
Type	Unbalanced

TABLE 1-16. CABLE SPECIFICATIONS

CABLE LENGTH	1080P 8-BIT	1080P 12-BIT	4K30 (4:4:4) 8-BIT	4K60 (4:4:4) 8-BIT
HIGH SPEED HDMI CABLE				
HDMI INPUT	15m	10m	5m	3m
HDMI OUTPUT	15m	10m	5m	3m
CATEGORY CABLE **(COPPER)**				
CAT. 5E/6	100m		70m	
CAT. 6A/7	100m			
FIBER CABLE				
MULTI-MODE FIBER (OM3)	300m			
MULTI-MODE FIBER (OM4)	550m			
SINGLE-MODE FIBER	30km			

Bandwidth Category Examples:

1080p (FHD Video)

- Up to 1080p@60Hz, 12-bit color
- Data rates lower than 5.3Gbps or below 225MHz TMDS clock

4K30 (4K UHD Video)

- 4K@24/25/30Hz & 4K@50/60Hz (4:2:0), 8-bit color
- Data rates higher than 5.3Gbps or above 225MHz TMDS clock but below 10.2Gbps

4K60 (4K UHD+ Video)

- 4K@50/60Hz (4:4:4, 8-bit)
- 4K@50/60Hz (4:2:0, 10-bit HDR)
- Data rates higher than 10.2Gbps

CHAPTER 2: DECODERS

2.1 INTRODUCTION

This Decoder is designed for high-quality, IP routable, AV extension with virtually zero latency. The unit is capable of receiving AV and other data for long extension, enhancing the flexibility of any installation. By using a sophisticated ultra-light compression scheme (lossless for most content) it is a great solution for extending 4K audio/video streams (HDMI or DisplayPort™) and data. Advanced HDMI content, such as HDR (High Dynamic Range), 10-bit color and multi-channel HD Bitstream audio, can be transmitted in pass-through mode.

For the copper decoder, the use of high-quality 10-Gbps Ethernet ports and Cat.6A or better cable allows for point-to-point transmission of the video signal up to 100m.

For the fiber decoder, the use of interchangeable, field replaceable, SFP+ modules allows for transmission distances of up to 30km. (Maximum transmission distance depends on the SFP+ modules used.)

Multiple control and data signals may also be transmitted along with the audio and video, including IR, RS-232, and Ethernet.

When combined with the optional MCX Gen2 Controller, or control software, the functionality of the decoders expands exponentially. Multiple encoders/decoders may be combined with one or more 10-Gigabit fiber Ethernet switches. The units can be used together to form a distributed video matrix, a multi-viewer system, or a video wall system. This AV network capability provides flexibility in large event installations.

The integrated USB hub of each decoder can be configured to be in USB Host or Device Mode. It can function as a simple point-to-point KVM extension, freely routed between any two endpoints, or it can be configured into a special “Simultaneous” mode, allowing up to 7 Host Mode units to extend their USB ports to a single Device Mode unit. This type of USB KVM routing flexibility enables a wide range of multi-user, control room, or on-demand installation scenarios.

The built-in EDID and HDCP management functionality enables the unit to fit into every video distribution situation. Basic configuration of the unit can be achieved via front panel buttons with an OSD (On-Screen Display). Advanced control requires the optional MCX Gen2 controller, or control software, and a LAN connection.

2.2 APPLICATIONS

- Video, Audio, LAN, IR, and USB over Copper Cable or Fiber extension
- Long distance data and video transmission immune to RF interference
- Point-to-Point Secure Video Conferencing
- Hotel or convention center display
- Multi-monitor broadcast
- Distributed video matrix system
- Distributed video wall system
- Remote KVM system control

2.3 PACKAGE CONTENTS

- (1) UHD+ Copper or Fiber Receiver
- (1) 12V/3A DC Power Adapter
- (1) Power Cord
- (1) 3-pin terminal block

2.4 SYSTEM REQUIREMENTS

- Compatible encoders
- HDMI receiving equipment, such as an HDTV, monitor, or audio amplifier
- Analog audio receiving equipment, such as headphones, an audio amplifier, or powered speakers
- A 10-Gbps Ethernet network switch with jumbo frame and IGMP snooping support is required for distributed video systems. (Optional, required for multi-encoder/decoder copper systems)
- A 10-Gbps fiber Ethernet network switch with jumbo frame and IGMP snooping support is required for distributed video systems. (Optional, required for multi-encoder/decoder fiber systems)
- IEEE 802.3ae compatible SFP+ fiber module supporting a dual-optical fiber connection style, such as LC, or a pre-terminated crossover dual-optical fiber cable (required for fiber decoder)

NOTE: Single-mode and multi-mode support is dependent on the SFP+ modules used.

- MCX Gen2 Controller or control software to configure distributed matrix, video wall, or multi-view systems (Optional)

2.5 FEATURES

- Provides AV, IR, RS-232, USB 2.0, and Ethernet extension
- HDMI 2.0 and DVI 1.0 compatible
- HDCP 2.2 and HDCP 1.4 compliant
- (1) HDMI -output, (3) USB TYPE A, (1) Cat5e/6/7 input, (1) 3.5 mm phone jack output; also copper model: (1) 10G RJ-45 input or output, fiber mode: (1) SFP+ input or output
- IP switchable with minimum latency (requires optional MCX Gen2 Controller or control software)
- Optional lossless compression to allow video transfer within limited bandwidth
- Extends up to 100m in point-to-point mode (with Cat.6A cable for copper decoder)
- Extends up to 30km (Maximum distance depends on the SFP+ module and type of fiber used for fiber decoder.)
- Supports independent breakaway A/V matrix switching with minimum latency, video wall generation, and multi-view compositing (requires optional MCX Gen2 Controller/control software)
- Facilitiates pass-through of 10/12-bit HDR sources (Point-to-Point and Genlock modes only)
- Enables pass-through of audio formats including LPCM (up to eight channels), Bitstream and HD Bitstream from HDMI or DP sources
- Unit can be powered directly by PoE when connected to a 10 Gigabit Ethernet (10GbE) switch that provides PoE (802.3at) (for copper decoder)
- Signal transmission interfaces with 10-Gigabit Ethernet switches via XFI (IEEE 802.3ae) compatible SFP+ fiber modules (for fiber decoder)
- Basic configuration via front panel buttons with an OSD
- Supports the use of an external control center (MCX Gen2 Controller) or control software to provide expanded functionality (Contact Black Box for more information.)

2.6 OPERATION CONTROLS AND FUNCTIONS

2.6.1FRONT PANEL

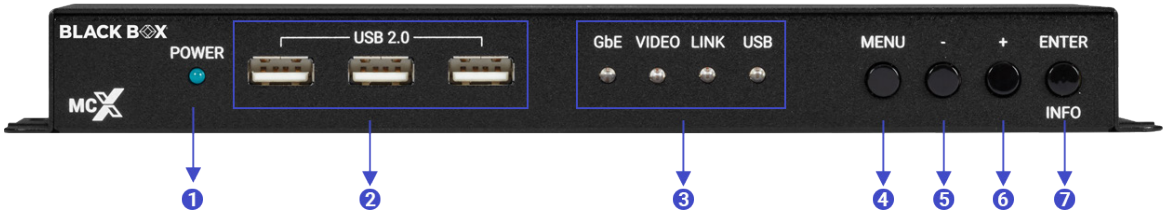

FIGURE 2-1: FRONT PANEL

TABLE 2-1. FRONT-PANEL COMPONENTS

NUMBER IN FIGURE 2-1	COMPONENT	DESCRIPTION
1	(1) Power LED indicator	Lights ON or OFF for Power
2	(3) USB 2.0 (Type A) ports	Connect directly to standard USB devices, such as a mouse, keyboard or flash drive to extend their USB functionality to the currently active/routed encoder.
3	(1) Status LED Block	**GbE LED:** This LED will illuminate and blink to indicate a live and active connection on the local gigabit Ethernet port. **VIDEO LED:** This LED will illuminate Green when a video signal is live on the optical fiber streaming port or illuminate Amber when streaming a detected input stream. When no video is active, the LED will remain off, even if the streaming connection is valid. **LINK LED:** These LEDs will illuminate and blink to indicate data transmission and reception activity across the optical fiber streaming connection. **USB LED:** This LED will illuminate when the unit's USB ports have successfully paired with the USB ports on another unit. This LED will blink if the unit's USB ports are not currently paired and are in stand-by mode.
4	(1) Menu button	Press to enter the OSD menu, or to back out from menu items.
5	(1) Menu button: - Minus button	Press to move up or adjust selections within OSD menus. When not in a menu, press to manually switch between encoder source inputs.
6	(1) Menu button: + button	Press to move up or adjust selections within OSD menus. When not in a menu, press to manually switch between decoder source inputs.
7	(1) Enter/Info button	When inside an OSD menu, press to confirm a selection or to go deeper into a menu item. When not in a menu, press to activate the Information OSD.

2.6.2 REAR PANEL

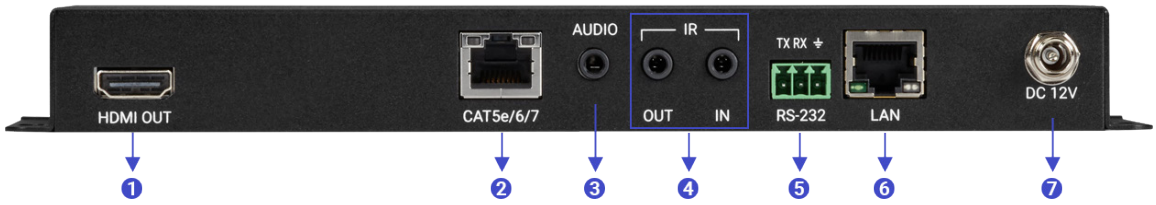

FIGURE 2-2: REAR PANEL (COPPER)

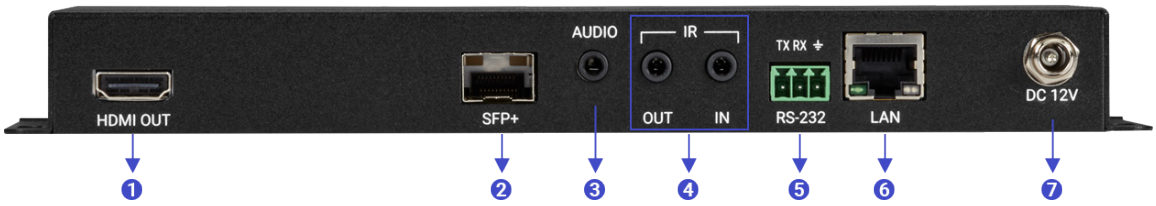

FIGURE 2-3: REAR PANEL (FIBER)

TABLE 2-2. REAR-PANEL COMPONENTS

NUMBER IN FIGURE 2-2/2-3	COMPONENT	DESCRIPTION
1	(1) HDMI Out Port	Connect to an HDMI TV, monitor, or amplifier for digital video and audio output.
2	(1) Cat5E/6/7 port OR (1) SFP+ port	Connect directly to a compatible encoder/decoder for point-to-point extension, or to a 10 Gigabit Ethernet switch for distributed matrixing (requires MCX Gen2 Controller or control software) with a single Cat.5e/6/7 cable for extension of all data signals (for copper decoder). **NOTE: If the connected network switch supports the IEEE 802.3at-2009 PoE (Power over Ethernet) standard, this unit can optionally be powered directly via this Ethernet port.** Insert a standard SFP+ module and connect the appropriate optical cable to allow data transmission to a compatible encoder or to a 10-gigabit optical fiber network switch (for fiber decoder). **NOTE: The SFP+ module must support a dual-optical fiber connection style, such as LC, or be pre-terminated dual-optical fiber cables. Single-mode and multi-mode support is dependent on the SFP+ modules used.**
3	(1) Audio port	**As OUT**: Connect to powered speakers or an amplifier for stereo analog audio output. **As IN**: Connect to the stereo analog output of a device, such as a CD player or PC. **NOTE: When the encoder and decoder are connected directly in a point-to-point configuration, audio is routed directly to the opposite end's Ports. Free routing can only be configured by use of the optional MCX Gen2 Master Controller or control software.**
4	(2) IR ports	**OUT Port:** Connect to an IR Blaster to broadcast IR signals from a connected decoder to devices within direct line-of sight of the IR Blaster. **IN Port:** Connect to an IR Extender to receive IR control signals and extend them to devices connected to a connected decoder. Ensure that the remote being used is within direct line-of-sight of the IR Extender. **NOTE: Currently, only 38KHz IR signal extension is supported.**
5	(1) RS-232 Terminal Block	Connect directly to a PC, laptop or serial controllable device with a 3-pin adapter cable to extend the RS-232 signal between encoder and decoder.
6	LAN Port	Connection for device configuration only
7	DC 12V Port	Plug the 12V DC power adapter into this port and connect it to an AC wall outlet for power.

2.6.3 IR CABLE PINOUTS

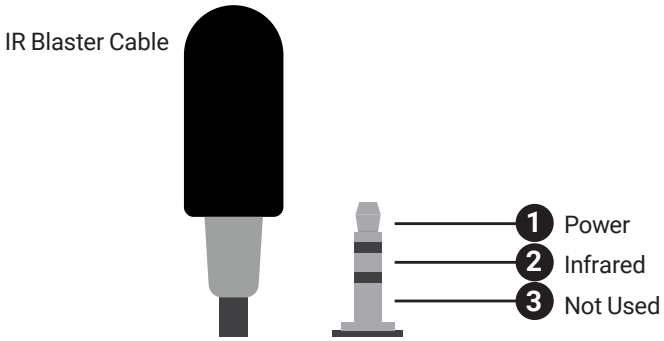

FIGURE 2-4: IR BLASTER CABLE PINOUTS

2.6.4 RS-232 PINOUT AND DEFAULTS

SERIAL PORT DEFAULT SETTINGS	
BAUD RATE	57600
DATA BITS	8
PARITY BITS	NONE
STOP BITS	1
FLOW CONTROL	NONE

FIGURE 2-5: SERIAL PORT DEFAULT SETTINGS

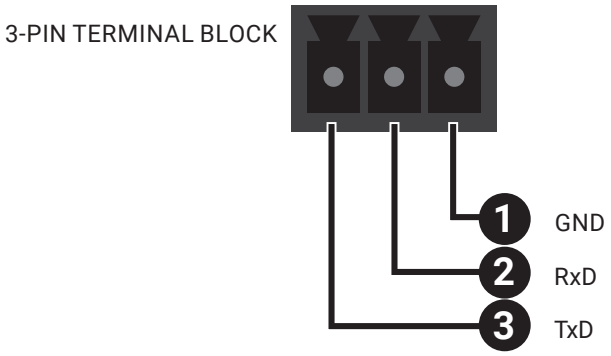

FIGURE 2-6: 3-PIN TERMINAL BLOCK

NOTE: The default Serial Port baud rate can only be changed by use of the optional MCX Gen2 Controller or control software.

2.6.5 OSD MENU

All functions of this unit can be controlled by using the OSD (On Screen Display) which is activated by pressing the **[MENU]** button on the front of the unit. Use the **[+]** (PLUS), **[–]** (MINUS), and **[ENTER]** buttons to navigate the OSD menu. Press the **[MENU]** button to back out from any menu item and then press it again to close the menu.

MAIN MENU
OSD
INFORMATION
USB INFORMATION
FACTORY SETTING

FIGURE 2-7: MAIN MENU

The individual functions of the OSD will be introduced in the following section. Items marked in **BOLD** are the factory default settings.

OSD	
2ND LEVEL	3RD LEVEL
DISPLAY INFORMATION	**ON**
	OFF
INFORMATION TIMEOUT	OFF
	10~40 SEC **[10 SEC]**
MENU TIMEOUT	OFF
	10~40 SEC **[10 SEC]**
MENU H POSITION	0~100 **[90]**
MENU V POSITION	0~100 **[90]**

FIGURE 2-8: OSD MENU

TABLE 2-3. OSD

SECOND LEVEL IN FIGURE 2-8	SELECTION	DESCRIPTION
Display Information	On/Off	Enable or disable the Information OSD.
Information Timeout	Multiple	Set the display timeout for the Information OSD.
Menu Timeout	Multiple	Set the display timeout for the OSD Menu.
Menu H position	Multiple	Set the horizontal position of the OSD Menu.
Menu V Position	Multiple	Set the horizontal position of the OSD Menu.

INFORMATION	
2ND LEVEL	3RD LEVEL
RESOLUTION	[CURRENT SOURCE RESOLUTION]
STATUS	DECODER
FW VERSION	[CURRENT FIRMWARE VERSION]
IP	[CURRENT IP ADDRESS]
MAC	[UNIT'S MAC ADDRESS]
SN	[UNIT'S SERIAL NUMBER]

FIGURE 2-9: INFORMATION MENU

TABLE 2-4. INFORMATION

SECOND LEVEL IN FIGURE 2-9	SELECTION	DESCRIPTION
Resolution	Default	Displays the unit's detected source resolution
Status	Default	Always shows DECODER
FW Version	Default	Displays the unit's firmware version
IP	Default	Displays the unit's IP address
MAC	Default	Displays the unit's MAC address
SN	Default	Displays the unit's serial number

USB INFORMATION	
2ND LEVEL	3RD LEVEL
IP MODE	[UNIT'S USB IP MODE]
IP	[UNIT'S USB IP ADDRESS]
MAC	[UNIT'S USB MAC ADDRESS]
PAIRED MAC	[USB MAC ADDRESSES OF CONNECTED USB SOURCES]

FIGURE 2-10: USB INFORMATION MENU

TABLE 2-5. USB INFORMATION

SECOND LEVEL IN FIGURE 2-10	SELECTION	DESCRIPTION
IP Mode	Default	Displays the unit's USB IP mode
IP	Default	Displays the unit's USB IP address
MAC	Default	Displays the unit's USB MAC address
PAIRED MAC	Default	Displays the unit's USB addresses of connected USB sources

FACTORY SETTING	
2ND LEVEL	3RD LEVEL
ARE YOU SURE?	**NO**
	YES

FIGURE 2-11: FACTORY SETTING MENU

TABLE 2-6. FACTORY INFORMATION

SECOND LEVEL IN FIGURE 2-11	SELECTION	DESCRIPTION
Are you sure?	No/Yes	Selecting [**Yes**] will reset the unit's settings back to their factory defaults. Selecting [**No**] will keep the current settings.

2.6.6 BASIC AV EXTENSION

2.6.6.1 POINT-TO-POINT (ONE WAY)

The most basic extension configuration available is a point-to-point system with a single transmitter unit acting as an encoder connected directly to a single receiver unit acting as a decoder. In this configuration the HDMI/DP input on the encoder side is transmitted to the connected decoder side without modification to the audio or video format. The analog stereo audio input on the encoder transfers audio directly to the analog stereo audio output on the decoder. The LAN, RS-232 and IR ports form direct connections between the encoder and decoder as well. This configuration is ideal for basic video extension as well as remote KVM applications.

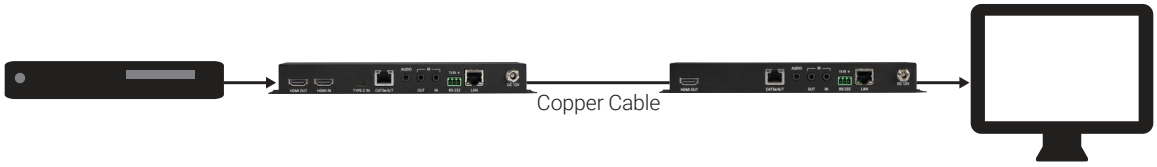

FIGURE 2-12: COPPER POINT-TO-POINT (ONE WAY)

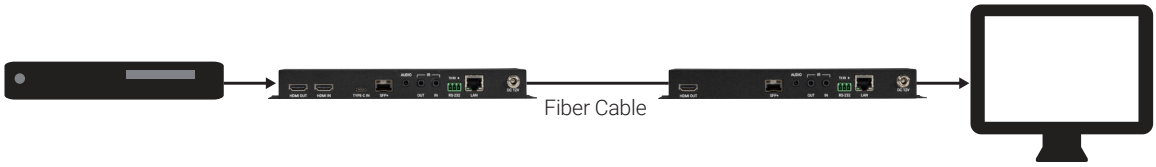

FIGURE 2-13: FIBER POINT-TO-POINT (ONE WAY)

NOTE: These configurations do not use or require an external control center, such as the MCX Gen2 Controller, to function. No audio insertion/extraction is performed in these configurations.

2.6.7 ADVANCED AV EXTENSION

2.6.7.1 MCX GEN2 CONTROLLER

The MCX Gen2 Controller is a hardware solution designed to provide a unified and easy method to access and control all of the encoders and decoders in a system. It provides a user-friendly, and operating system agnostic, web-based interface allowing easy control over all of the most critical functions within a distribution system.

The MCX Gen2 Controller hardware is an optional component and is not included with individual encoder, decoder, or transcoder units. Please contact your authorized dealer for more information.

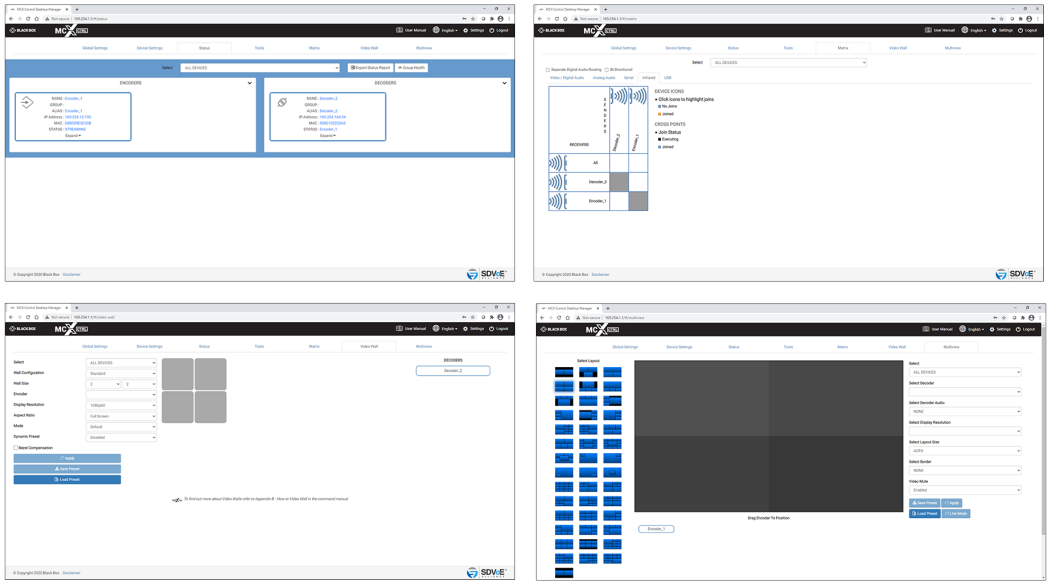

FIGURE 2-14: SAMPLE MCX GEN2 CONTROLLER SCREENSHOTS.

NOTE: Interface images are for example only and may differ from the delivered product.

2.6.7.2 CONFIGURATION EXAMPLES

When combined with the MCX Gen2 Controller, and a 10 Gigabit fiber Ethernet switch, this extension system gains a large number of additional configuration options including: multi-in/multi-out matrix switching with breakaway audio, video wall creation, and a multiview output mode. Audio extraction and embedding is fully controllable. Additionally, audio, USB, IR, and RS-232 routing can be fully controlled.

(1) **Matrix Configuration**

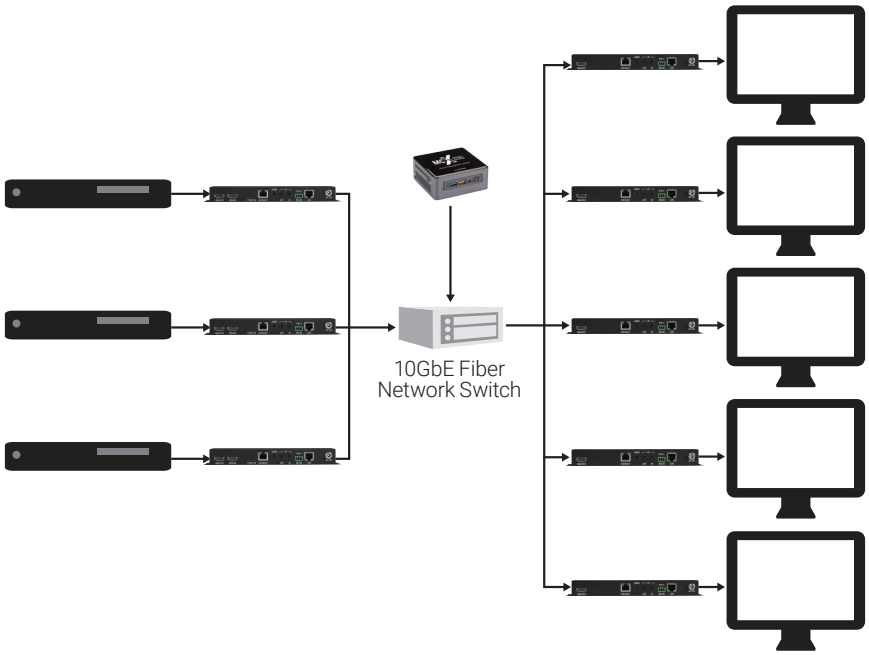

FIGURE 2-15: COPPER MATRIX CONFIGURATION

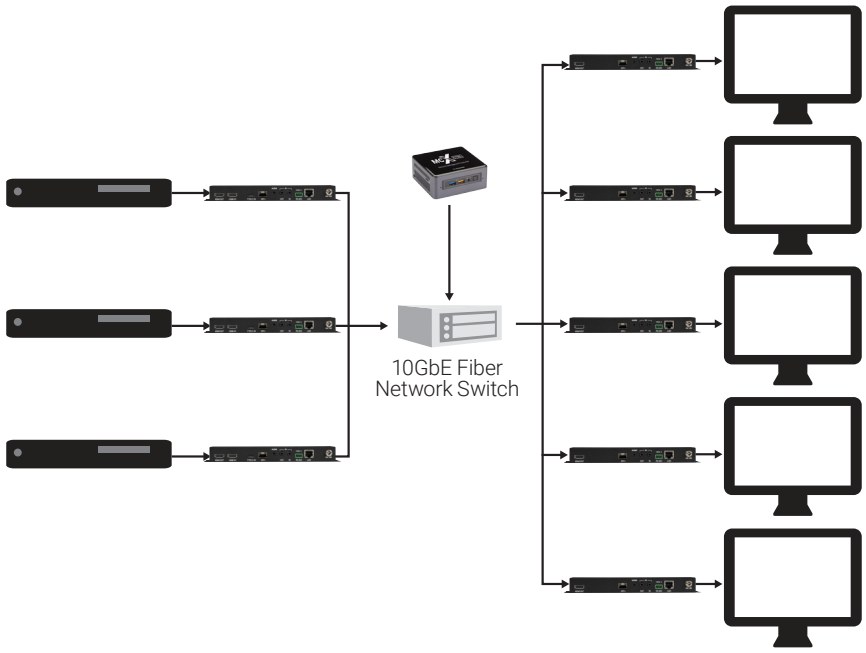

FIGURE 2-16: FIBER MATRIX CONFIGURATION

(2) **Video Wall Configuration**

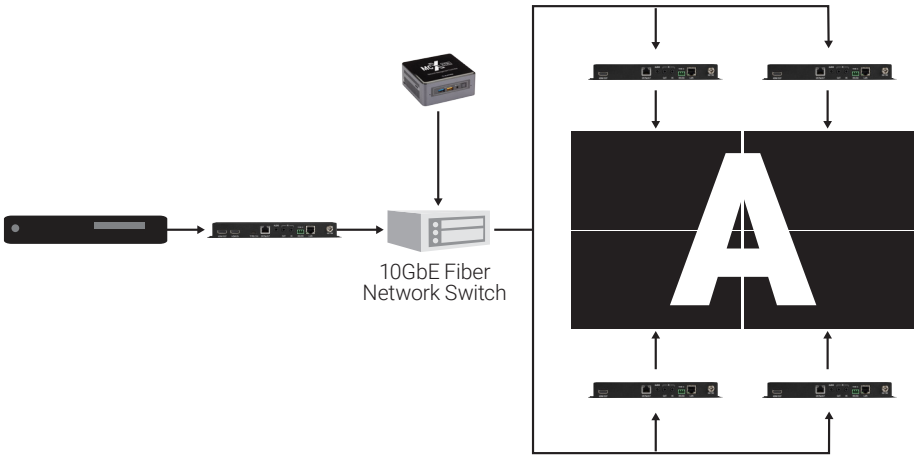

FIGURE 2-17: COPPER VIDEO WALL CONFIGURATION

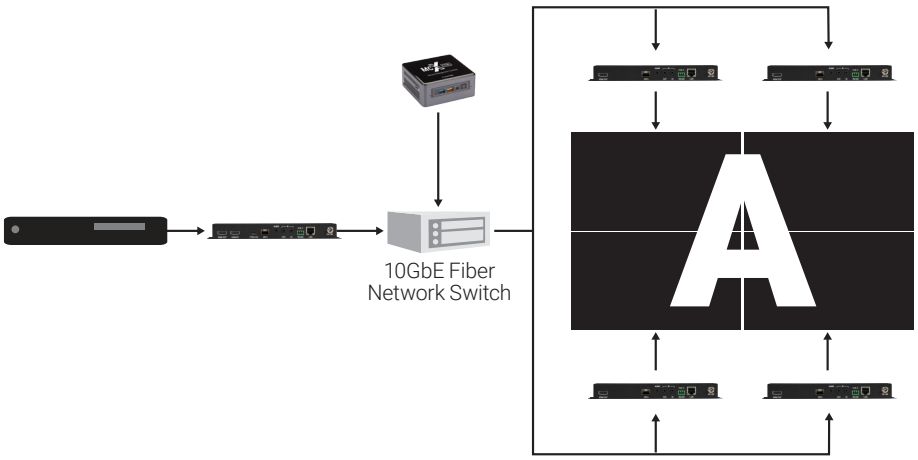

FIGURE 2-18: FIBER VIDEO WALL CONFIGURATION

(3) **Multiview (PiP/PoP/Quad/Etc.) Configuration**

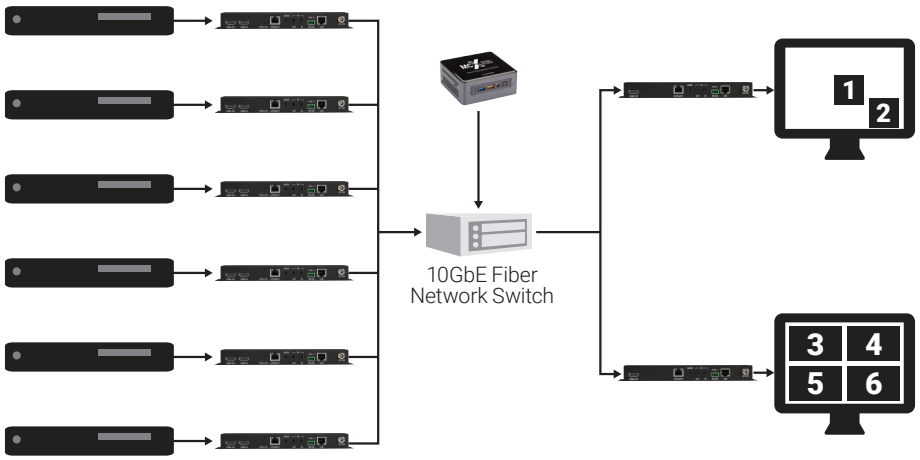

FIGURE 2-19: COPPER MULTIVIEW (PIP/POP/QUAD/ETC.) CONFIGURATION

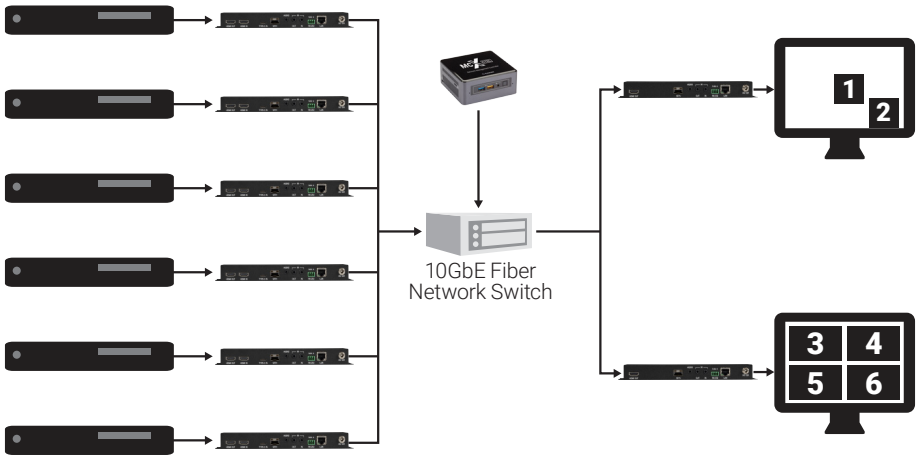

FIGURE 2-20: FIBER MULTIVIEW (PIP/POP/QUAD/ETC.) CONFIGURATION

(4) **KVM Switch Configuration**

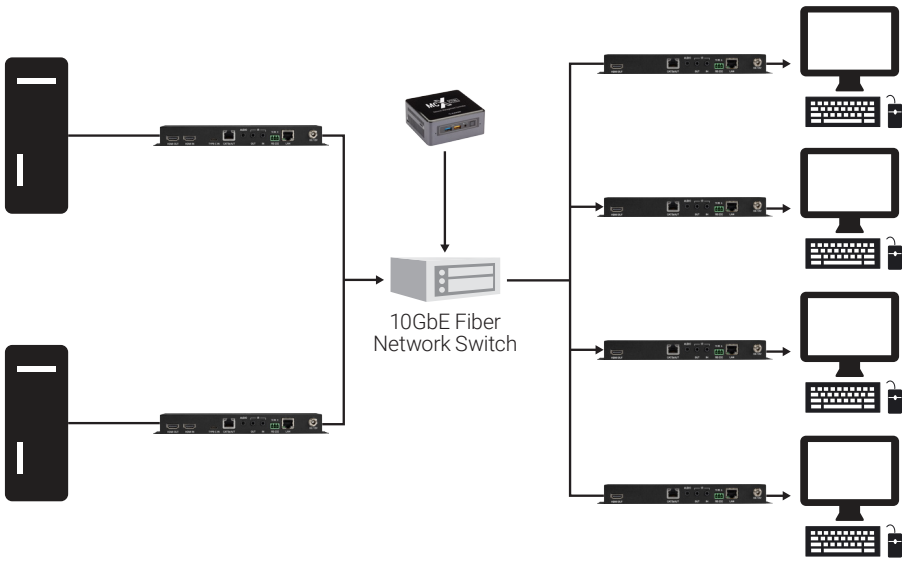

FIGURE 2-21: COPPER KVM SWITCH CONFIGURATION

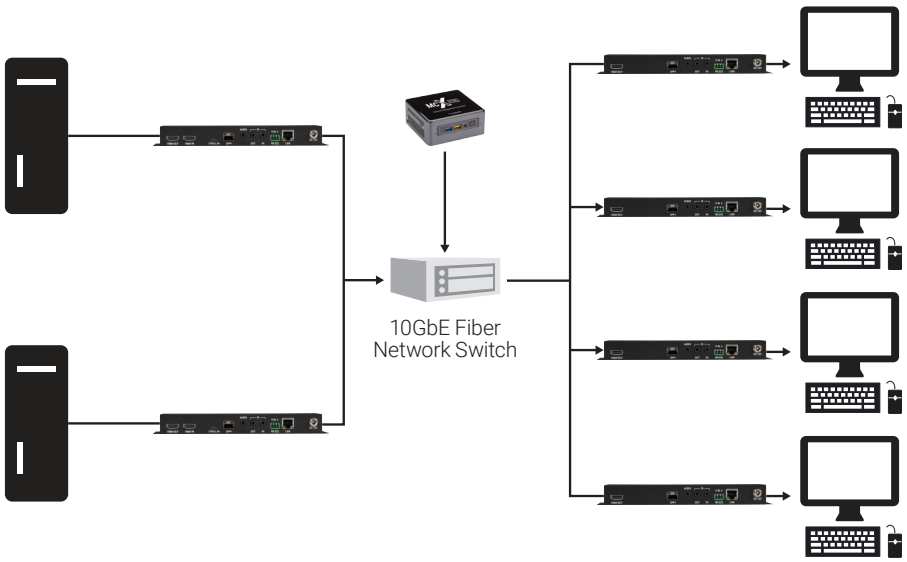

FIGURE 2-22: FIBER KVM SWITCH CONFIGURATION

2.7 CONNECTION DIAGRAMS

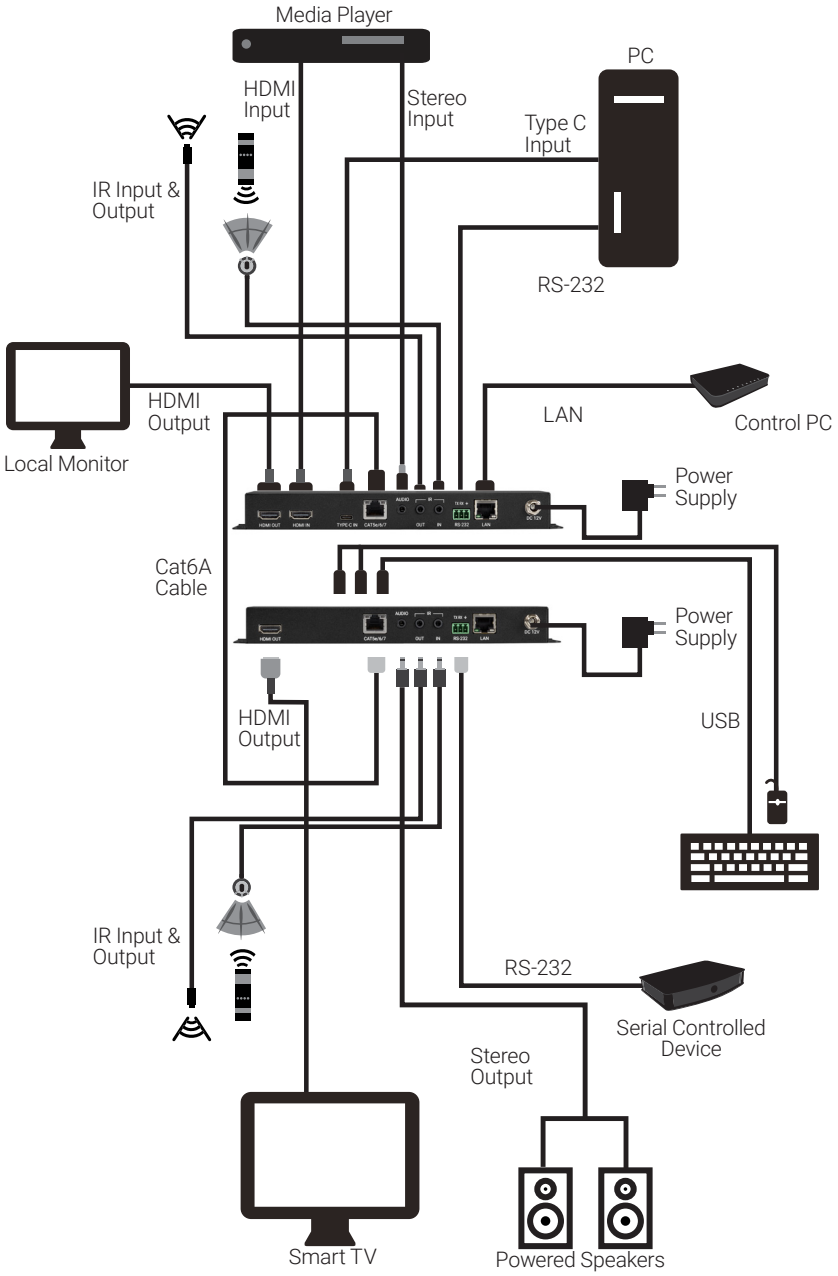

FIGURE 2-23: COPPER CONNECTION DIAGRAM

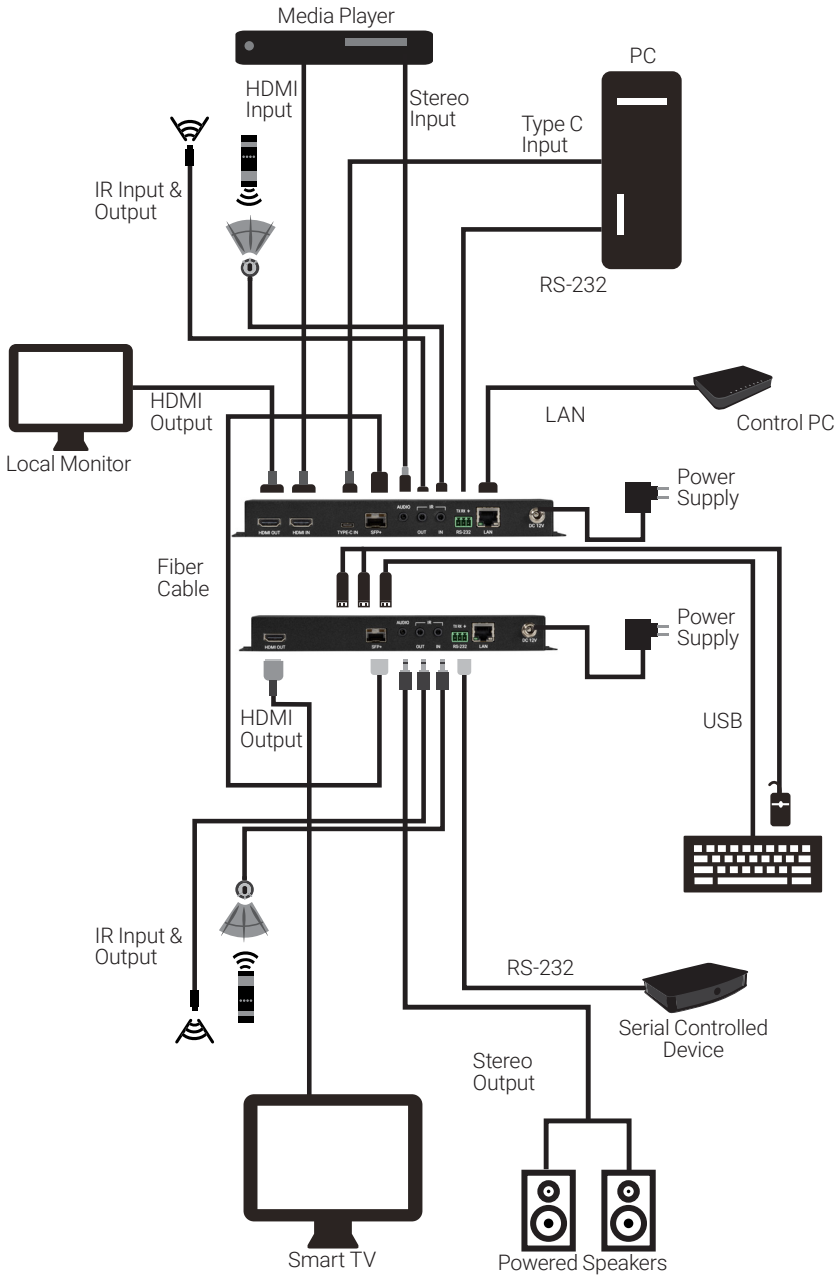

FIGURE 2-24: FIBER CONNECTION DIAGRAM

2.8. SPECIFICATIONS

TABLE 2-7. GENERAL SPECIFICATIONS

SPECIFICATION	DESCRIPTION
HDMI Version	HDMI 2.0b
10GbE Bandwidth	10 Gbps
Input Ports	N/A
Output Ports	(1) HDMI (Type A) female; (1) Stereo Audio (3.5mm) female
Pass-Through Ports	(1) 10GbE LAN (RJ-45 for copper; SFP+ for fiber) female; (2) IR (3.5mm) female; (1) RS-232 (3-pin terminal block) female; (1) LAN (RJ-45) female; (3) USB 2.0 (Type A) female
IR Frequency	38kHz
Baud Rate	57600 (default), up to 115200 bps
Power Supply	12V/3A DC (US/EU standards, CE/FCC/UL certified)
ESD Protection (HBM)	±8kV (air discharge); ±4kV (contact discharge);
Dimensions	215mm x 25mm x 108mm (case only); 215mm x 25mm x 116.7 mm (all inclusive)
Weight	916g
Chassis Metal	Metal (steel)
Chassis Color	Black
Operating Temperature	0 to 40˚C (32 to 104˚F)
Storage Temperature	-20 to 60˚C (-4 to 140˚F)
Relative Humidity	20 to 90% RH (Non-condensing)
Power Consumption	14.3w (for copper); 18.51w (for fiber)

TABLE 2-8. VIDEO SPECIFICATIONS

	INPUT	OUTPUT
SUPPORTED RESOLUTIONS (HZ)	10GBE	HDMI
720×400p@70/85	✓	✓
640×480p@60/72/75/85	✓	✓
720×480i@60	✓	✓
720×480p@60	✓	✓
720×576i@50	✓	✓
720×576p@50	✓	✓
800×600p@56/60/72/75/85	✓	✓
848×480p@60	✓	✓
1024×768p@60/70/75/85	✓	✓
1152×864p@75	✓	✓
1280×720p@50/60	✓	✓
1280×768p@60/75/85	✓	✓
1280×800p@60/75/85	✓	✓
1280×960p@60/85	✓	✓
1280×1024p@60/75/85	✓	✓
1360×768p@60	✓	✓
1366×768p@60	✓	✓
1400×1050p@60	✓	✓
1440×900p@60/75	✓	✓
1600×900p@60RB	✓	✓
1600×1200p@60	✓	✓
1680×1050p@60	✓	✓
1920×1080i@50/60	✓	✓
1920×1080p@24/25/30	✓	✓
1920×1080p@50/60	✓	✓
1920×1200p@60RB	✓	✓
2560×1440p@60RB	✓	✓
2560×1600p@60RB	✓	✓
2048×1080p@24/25/30	✓	✓
2048×1080p@50/60	✓	✓
3840×2160p@24/25/30	✓	✓
3840×2160p@50/60 (4:2:0)	✓	✓
3840×2160p@24, HDR10	✓	✓
3840×2160p@50/60 (4:2:0), HDR10	✓	✓

TABLE 2-8. VIDEO SPECIFICATIONS CONTINUED

	INPUT	OUTPUT
SUPPORTED RESOLUTIONS (HZ)	10GBE	HDMI
3840×2160p@50/60	✓	✓
4096×2160p@24/25/30	✓	✓
4096×2160p@50/60 (4:2:0)	✓	✓
4096×2160p@24, HDR10	✓	✓
4096×2160p@50/60 (4:2:0), HDR10	✓	✓
4096×2160p@50/60	✓	✓

TABLE 2-9. DIGITAL AUDIO HDMI OUTPUT SPECIFICATIONS

SPECIFICATION	DESCRIPTION
LPCM	
Max Channels	8 channels
Sampling Rate (kHz)	32, 44.1, 48
Bitstream	
Supported Formats	Standard and High Definition

TABLE 2-10. CAT5E/6/7 INPUT (COPPER)/FIBER INPUT (FIBER)

SPECIFICATION	DESCRIPTION
LPCM	
Max Channels	8 channels
Sampling Rate (kHz)	32, 44.1, 48
Bitstream	
Supported Formats	Standard and High Definition

TABLE 2-11. ANALOG AUDIO INPUT SPECIFICATIONS

SPECIFICATION	DESCRIPTION
Max Audio Level	1Vrms
Impedance	10kΩ
Type	Unbalanced

TABLE 2-12. ANALOG AUDIO OUPUT SPECIFICATIONS

SPECIFICATION	DESCRIPTION
Max Audio Level	1Vrms
THD+N	< −80dB@0dBFS 1kHz (A-wt)
SNR	> 80dB@0dBFS
Frequency Response	< ±1dB@20Hz~20kHz
Crosstalk	< −80dB@10kHz
Impedance	470Ω
Type	Unbalanced

TABLE 2-13. CABLE SPECIFICATIONS

CABLE LENGTH	1080P 8-BIT	1080P 12-BIT	4K30 (4:4:4) 8-BIT	4K60 (4:4:4) 8-BIT
HIGH SPEED HDMI CABLE				
HDMI OUTPUT	15m	10m	5m	3m
CATEGORY CABLE **(COPPER)**				
CAT. 5E/6	100m		70m	
CAT. 6A/7	100m			
FIBER CABLE				
MULTI-MODE FIBER (OM3)	300m			
MULTI-MODE FIBER (OM4)	550m			
SINGLE-MODE FIBER	30km			

Bandwidth Category Examples:

1080p (FHD Video)

- Up to 1080p@60Hz, 12-bit color
- Data rates lower than 5.3Gbps or below 225MHz TMDS clock

4K30 (4K UHD Video)

- 4K@24/25/30Hz & 4K@50/60Hz (4:2:0), 8-bit color
- Data rates higher than 5.3Gbps or above 225MHz TMDS clock but below 10.2Gbps

4K60 (4K UHD+ Video)

- 4K@50/60Hz (4:4:4, 8-bit)
- 4K@50/60Hz (4:2:0, 10-bit HDR)
- Data rates higher than 10.2Gbps

CHAPTER 3: TRANSCODERS

3.1 INTRODUCTION

This Transcoder is designed for high-quality, IP routable, AV extension with virtually zero latency. The transcoder is able to be configured as an encoder or a decoder, and it is capable of receiving AV and other data for long extension, enhancing the flexibility of any installation. By using a sophisticated ultra-light compression scheme (lossless for most content) it is a great solution for extending 4K audio/video streams (HDMI or DisplayPort™) and data.

For the copper connection, the use of high-quality 10-Gbps Ethernet ports and Cat.6A or better cable allows for point-to-point transmission of the video signal up to 100m.

For the fiber connection, the use of interchangeable, field replaceable, SFP+ modules allows for transmission distances of up to 30km. (Maximum transmission distance depends on the SFP+ modules used.)

Multiple control and data signals may also be transmitted along with the audio and video, including IR, RS-232, and Ethernet.

When combined with the optional MCX Gen2 Controller, or control software, the functionality of the Transcoder expands exponentially. Multiple transcoders may be combined with one or more 10-Gigabit fiber Ethernet switches. The units can be used together to form a distributed video matrix, a multi-viewer system, or a video wall system. This AV network capability provides flexibility in large event installations.

The integrated USB hub of each transcoder can be configured to be in USB Host or Device Mode. It can function as a simple point-to-point KVM extension, freely routed between any two endpoints, or it can be configured into a special “Simultaneous” mode, allowing up to 7 Host Mode units to extend their USB ports to a single Device Mode unit. This type of USB KVM routing flexibility enables a wide range of multi-user, control room, or on-demand installation scenarios.

The built-in EDID and HDCP management functionality enables the unit to fit into every video distribution situation. Basic configuration of the unit can be achieved via front panel buttons with an OSD (On-Screen Display). Advanced control requires the optional MCX Gen2 controller, or control software, and a LAN connection.

3.2 APPLICATIONS

- Video, Audio, LAN, IR, and USB over Copper Cable or Fiber extension
- Long distance data and video transmission immune to RF interference
- Point-to-Point Secure Video Conferencing
- Hotel or convention center display
- Multi-monitor broadcast
- Distributed video matrix system
- Distributed video wall system
- Remote KVM system control

3.3 PACKAGE CONTENTS

- (1) UHD+ Copper/Fiber Transcoder
- (1) 12V/3A DC Power Adapter
- (1) Power Cord
- (1) 3-pin terminal block

3.4 SYSTEM REQUIREMENTS

- HDMI or DisplayPort™ source equipment, such as a media player, video game console, PC, or set-top box
- DisplayPort receiving equipment, such as an HDTV, monitor, or audio amplifier
- Analog audio receiving equipment, such as headphones, an audio amplifier, or powered speakers
- A 10-Gbps Ethernet network switch with jumbo frame and IGMP snooping support is required for distributed video systems. (Optional, required for multi-encoder/decoder copper systems)
- A 10-Gbps fiber Ethernet network switch with jumbo frame and IGMP snooping support is required for distributed video systems. (Optional, required for multi-encoder/decoder fiber systems)
- IEEE 802.3ae compatible SFP+ fiber module supporting a dual-optical fiber connection style, such as LC, or a pre-terminated crossover dual-optical fiber cable (required for fiber decoder)

NOTE: Single-mode and multi-mode support is dependent on the SFP+ modules used.

- MCX Gen2 Controller or control software to configure distributed matrix, video wall or multi-view systems (Optional)

3.5 FEATURES

- Provides AV, IR, RS-232, USB 2.0, and Ethernet extension
- HDMI 2.0, DisplayPort™ 1.2, and DVI 1.0 compatible
- HDCP 2.2 and HDCP 1.4 compliant
- Multiple input/output options:
  Encoder mode: (1) DisplayPort input; (1) HDMI input, and (1) DisplayPort Loop-through;
  Decoder mode: (1) DisplayPort output;

  USB connections:
  Encoder mode: (1) USB Type B; Decoder mode: (3) USB Type A

  Other connections: Encoder mode: (1) 3.5mm phone jack input; Decoder mode: (1) 3.5mm phone jack output, (1) 10G RJ-45 input/output, or (1) SFP+ input/output
- IP switchable with minimum latency (requires optional MCX Gen2 Controller or control software)
- Optional lossless compression to allow video transfer within limited bandwidth
- Extends up to 100m in point-to-point mode (with Cat.6A cable for copper decoder)
- Extends up to 30km (Maximum distance depends on the SFP+ module and type of fiber used for fiber decoder.)
- Supports independent breakaway A/V matrix switching with minimum latency, video wall generation, and multi-view compositing (requires optional MCX Gen2 Controller/control software)
- Enables pass-through of audio formats including LPCM (up to eight channels), Bitstream and HD Bitstream from HDMI or DP sources
- Unit can be powered directly by PoE when connected to a 10 Gigabit Ethernet (10GbE) switch that provides PoE (802.3at) (for copper decoder)
- Signal transmission interfaces with 10-Gigabit Ethernet switches via XFI (IEEE 802.3ae) compatible SFP+ fiber modules (for fiber decoder)
- Basic configuration via front panel buttons with an OSD
- Supports the use of an external control center (MCX Gen2 Controller) or control software to provide expanded functionality (Contact Black Box for more information.)

3.6 OPERATION CONTROLS AND FUNCTIONS

3.6.1FRONT PANEL

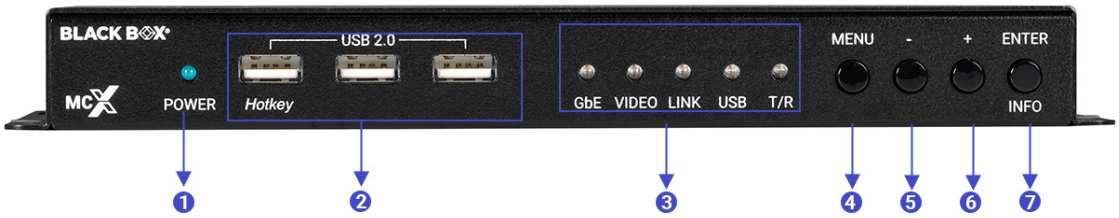

FIGURE 3-1: FRONT PANEL

TABLE 3-1. FRONT-PANEL COMPONENTS

NUMBER IN FIGURE 3-1	COMPONENT	DESCRIPTION
1	(1) Power LED indicator	Lights ON or OFF for Power
2	(3) USB 2.0 (Type A) ports	Connect directly to standard USB devices, such as a mouse, keyboard or flash drive to extend their USB functionality to the currently active/routed USB Device Mode decoder.
3	(1) Status LED Block	**GbE LED:** This LED will illuminate and blink to indicate a live and active connection on the local gigabit Ethernet port. **VIDEO LED:** This LED will illuminate Green when a video signal is live on the optical fiber streaming port or illuminate Amber when streaming a detected input stream. When no video is active, the LED will remain off, even if the streaming connection is valid. **LINK LED:** These LEDs will illuminate and blink to indicate data transmission and reception activity across the optical fiber streaming connection. **USB LED:** This LED will illuminate when the unit's USB ports have successfully paired with the USB ports on another unit. This LED will blink if the unit's USB ports are not currently paired and are in stand-by mode. **T/R LED:** This LED will illuminate Green when device is set as an Encoder. This LED will illuminate Amber when device is set for Decoder.
4	(1) Menu button	Press to enter the OSD menu, or to back out from menu items.
5	(1) Menu button: - Minus button	Press to move up or adjust selections within OSD menus. When not in a menu, press to manually switch between encoder source inputs.
6	(1) Menu button: + button	Press to move up or adjust selections within OSD menus. When not in a menu, press to manually switch between decoder source inputs.
7	(1) Enter/Info button	When inside an OSD menu, press to confirm a selection or to go deeper into a menu item. When not in a menu, press to activate the Information OSD.

3.6.2 REAR PANEL

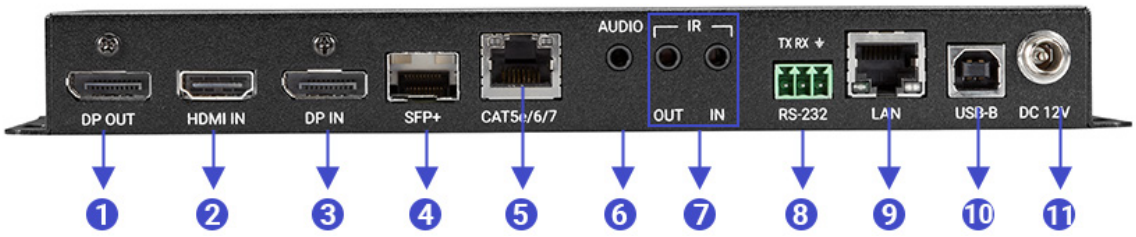

FIGURE 3-2: REAR PANEL (COPPER)

TABLE 3-2. REAR-PANEL COMPONENTS

NUMBER IN FIGURE 3-2	COMPONENT	DESCRIPTION
1	(1) DP OUT Port	Connect to a DisplayPort™ TV, monitor, or amplifier for digital video and audio output.
2	(1) HDMI IN port	Connect to HDMI source equipment, such as a media player, game console, or set-top box
3	(1) DP IN port	Connect to DisplayPort source equipment, such as a media player, game console, or set-top box
4	(1) SFP+ port	For fiber decoder, insert a standard SFP+ module and connect the appropriate optical cable to allow data transmission to a compatible device or to a 10-gigabit optical fiber network switch. **NOTE: The SFP+ module must support a dual-optical fiber connection style, such as LC, or be pre-terminated dual-optical fiber cables. Single-mode and multi-mode support is dependent on the SFP+ modules used.**
5	(1) Cat5E/6/7 port	Connect directly to a compatible encoder/decoder for point-to-point extension, or to a 10 Gigabit Ethernet switch for distributed matrixing (requires MCX Gen2 Controller or control software) with a single Cat.5e/6/7 cable for extension of all data signals (for copper decoder). **NOTE: If the connected network switch supports the IEEE 802.3at-2009 PoE (Power over Ethernet) standard, this unit can optionally be powered directly via this Ethernet port.**
6	(1) Audio port	**As OUT**: Connect to powered speakers or an amplifier for stereo analog audio output. **As IN**: Connect to the stereo analog output of a device, such as a CD player or PC. **NOTE: When the encoder and decoder are connected directly in a point-to-point configuration, audio is routed directly to the opposite end's Ports. Free routing can only be configured by use of the optional MCX Gen2 Master Controller or control software.**
7	(2) IR ports	**OUT Port:** Connect to an IR Blaster to broadcast IR signals from a connected transcoder to devices within direct line-of sight of the IR Blaster. **IN Port:** Connect to an IR Extender to receive IR control signals and extend them to devices connected to a connected transcoder. Ensure that the remote being used is within direct line-of-sight of the IR Extender. **NOTE: Currently, only 38KHz IR signal extension is supported.**
8	(1) RS-232 Terminal Block	Connect directly to a PC, laptop or serial controllable device with a 3-pin adapter cable to extend the RS-232 signal between units.
9	LAN Port	Connection for device configuration only
10	USB-B Port	When configuring the transcoder as an encoder, use a USB Type A to USB Type B cable to connect to a PC.
11	DC 12V Port	Plug the 12V DC power adapter into this port and connect it to an AC wall outlet for power.

3.6.3 IR CABLE PINOUTS

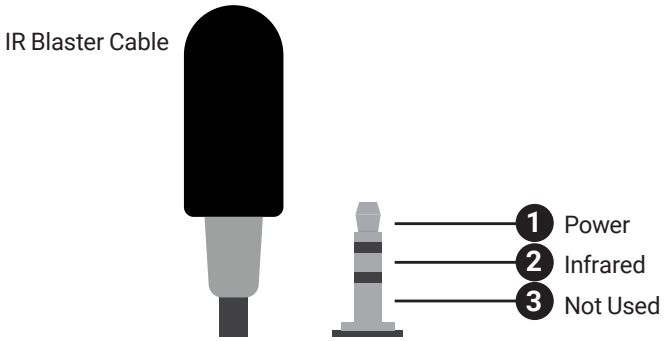

FIGURE 3-3: IR BLASTER CABLE PINOUTS

3.6.4 RS-232 PINOUT AND DEFAULTS

SERIAL PORT DEFAULT SETTINGS	
BAUD RATE	57600
DATA BITS	8
PARITY BITS	NONE
STOP BITS	1
FLOW CONTROL	NONE

FIGURE 3-4: SERIAL PORT DEFAULT SETTINGS

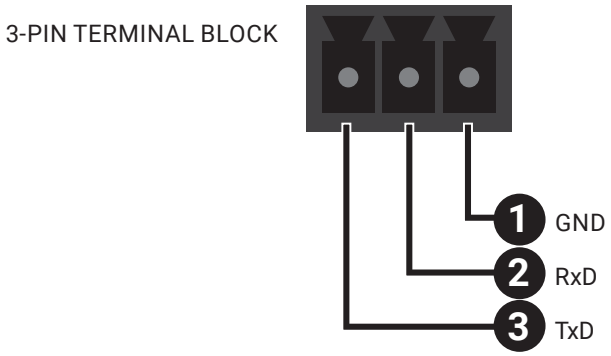

FIGURE 3-5: 3-PIN TERMINAL BLOCK

NOTE: The default Serial Port baud rate can only be changed by use of the optional MCX Gen2 Controller or control software.

3.6.5 OSD MENU

All functions of this unit can be controlled by using the OSD (On Screen Display) which is activated by pressing the **[MENU]** button on the front of the unit. Use the **[+]** (PLUS), **[–]** (MINUS), and **[ENTER]** buttons to navigate the OSD menu. Press the **[MENU]** button to back out from any menu item and then press it again to close the menu.

MAIN MENU
OSD
EDID
HDCP
DEVICE SETTING
INFORMATION
USB INFORMATION
FACTORY SETTING

FIGURE 3-6: MAIN MENU

The individual functions of the OSD will be introduced in the following section. Items marked in **BOLD** are the factory default settings.

OSD	
2ND LEVEL	3RD LEVEL
DISPLAY INFORMATION	**ON**
	OFF
INFORMATION TIMEOUT	OFF
	10~40 SEC **[10 SEC]**
MENU TIMEOUT	OFF
	10~40 SEC **[10 SEC]**
MENU H POSITION	0~100 **[10]**
MENU V POSITION	0~100 **[90]**

FIGURE 3-7: OSD MENU

TABLE 3-3. OSD

SECOND LEVEL IN FIGURE 3-7	SELECTION	DESCRIPTION
Display Information	On/Off	Enable or disable the Information OSD.
Information Timeout	Multiple	Set the display timeout for the Information OSD.
Menu Timeout	Multiple	Set the display timeout for the OSD Menu.
Menu H position	Multiple	Set the horizontal position of the OSD Menu.
Menu V Position	Multiple	Set the horizontal position of the OSD Menu.

NOTE: This function is only available when the transcoder is configured as an encoder.

EDID	
2ND LEVEL	3RD LEVEL
HDMI EDID	**INTERNAL 1 (FHD 2CH)**
	INTERNAL 2 (FHD MCH)
	INTERNAL 3 (UHD 2CH)
	INTERNAL 4 (UHD MCH)
	INTERNAL 5 (UHD+ 2CH)
	INTERNAL 6 (UHD+ MCH)
	EXTERNAL A [HDMI OUTPUT]
	EXTERNAL B [VOIP OUTPUT]
	USER 1
	USER 2
DP EDID	**INTERNAL 1 (FHD 2CH)**
	INTERNAL 2 (FHD MCH)
	INTERNAL 3 (UHD 2CH)
	INTERNAL 4 (UHD MCH)
	INTERNAL 5 (UHD+ 2CH)
	INTERNAL 6 (UHD+ MCH)
	EXTERNAL A [HDMI OUT]
	EXTERNAL B [VOIP OUT]
	USER 1
	USER 2

Figure 3-8: EDID Menu

TABLE 3-4. EDID

SECOND LEVEL IN FIGURE 3-8	SELECTION	DESCRIPTION
HDMI EDID	Multiple	Select the EDID to send to the unit's HDMI input.
DP EDID	Multiple	Select the EDID to send to the unit's DisplayPort™ input.

This unit provides the following six default EDIDs:

UNIT'S DEFAULT EDIDS	
FHD 2CH	1920×1080P@60HZ (4.95GBPS), 8-BIT COLOR, LPCM 2.0
FHD MCH	1920×1080P@60HZ (4.95GBPS), 8-BIT COLOR, LPCM 7.1 & BITSTREAM
UHD 2CH	3840×2160P@30HZ (10.2GBPS), 12-BIT DEEP COLOR, LPCM 2.0
UHD MCH	3840×2160P@30HZ (10.2GBPS), 12-BIT DEEP COLOR, LPCM 7.1 & BITSTREAM
UHD+ 2CH	3840×2160P@60HZ (18GBPS), 12-BIT DEEP COLOR, LPCM 2.0
UHD+ MCH	3840×2160P@60HZ (18GBPS), 12-BIT DEEP COLOR, LPCM 7.1 & BITSTREAM

FIGURE 3-9 DEFAULT EDIDS

NOTE: In some rare cases it is possible for custom or external EDIDs to cause compatibility issues with certain sources. If this happens, it is recommended to switch to one of the six default EDIDs for maximum compatibility.

NOTE: This function is only available when the transcoder is configured as an encoder.

HDCP	
2ND LEVEL	3RD LEVEL
HDMI HDCP	DISABLE
	FOLLOW OUT
	FOLLOW IN
	FOLLOW API
DP HDCP	DISABLE
	FOLLOW OUT
	FOLLOW IN
	FOLLOW API

FIGURE 3-10 HDCP MENU

TABLE 3-5. HDCP

SECOND LEVEL IN FIGURE 3-10	SELECTION	DESCRIPTION
HDMI HDCP	Multiple	Selects the HDCP logic to use with the HDMI input. **Follow In:** The input supports up to the HDCP version required by the connected source. **Follow Out:** The input supports up to the HDCP version supported by the connected display. **Disable:** HDCP support is completely disabled. **Follow API:** Uses the HDCP setting defined by the MCX Gen2 Controller or control software. **NOTE: In a point-to-point configuration, "Follow API" will behave the same as "Follow Out", if the API hasn't been manually redefined.**
DP HDCP	Multiple	Selects the HDCP logic to use with the DisplayPort™ input. **Follow In:** The input supports up to the HDCP version required by the connected source. **Follow Out:** The input supports up to the HDCP version supported by the connected display. **Disable:** HDCP support is completely disabled. **Follow API:** Uses the HDCP setting defined by the MCX Gen2 Controller or control software. **NOTE: In a point-to-point configuration, "Follow API" will behave the same as "Follow Out", if the API hasn't been manually redefined.**

NOTE: The available options depend on the transcoder configuration as either encoder or decoder; some options may not be available.

DEVICE SETTING	
2ND LEVEL	**3RD LEVEL**
STATUS	**ENCODER**
	DECODER
TYPE	**COPPER**
	FIBER
USB CONTROL MODE	HOST
	DEVICE
USB VIRTUAL HUB	**OFF**
	ON
DP OUT SOURCE	**INPUT 1 (DP)**
	INPUT 2 (HDMI)
VOIP OUT SOURCE	**INPUT 1 (DP)**
	INPUT 2 (HDMI)
HDMI OUT AUTO MODE	OFF
	AUTO SWITCH
VOIP OUT AUTO MODE	OFF
	AUTO SWITCH

FIGURE 3-11: DEVICE SETTING MENU

TABLE 3-6. DEVICE SETTINGS

SECOND LEVEL IN FIGURE 3-11	SELECTION	DESCRIPTION
STATUS	ENCODER/DECODER	Select transcoder as encoder or decoder.
TYPE	COPPER/FIBER	(Selection depends on available 10G copper or fiber connection) Device automatically switches between copper and fiber network. If both copper and fiber networks are connected, device will select the copper network. If selection is changed to fiber, the device will only use 10g fiber for connection.
USB Control Mode	DEVICE/HOST	Select DEVICE to enable USB Type-B connector, allowing a connection to a USB host, such as a PC or laptop. Select HOST to enable USB Type-A connectors in front, allowing a connection to USB devices, such as a keyboard, mouse, or USB storage. **NOTE: In a point-to-point extension configuration, only one of the two transcoders should be set as a USB Device to avoid conflicts.**
USB Virtual hub	Off/On	Enables or disables the "simultaneous connection" USB mode which allows the PC/Laptop connected to this unit to be paired with the USB devices on up to seven "Host" mode units. **NOTE: Only available when USB Control Mode is set to "Device." USB routing can only be configured by use of the optional MCX Gen2 Controller or control software and is not valid in point-to-point configurations.**
HDMI Out Source	DP/HDMI	Select the input source to display on the HDMI output.
VOIP Out Source	DP/HDMI	Select the input source to transmit as an AV over IP stream.

TABLE 3-6. DEVICE SETTINGS CONTINUED

SECOND LEVEL IN FIGURE 3-11	SELECTION	DESCRIPTION
HDMI Out Auto Mode	Off/Auto Switch	Enable or disable the HDMI output's automatic source selection mode. When enabled, the unit will automatically switch the input routed to the local HDMI output whenever a new source is detected or if the current source is lost.
VOIP Out Auto Mode	Off/Auto Switch	Enable or disable the AVoIP streaming output's automatic source selection mode. When enabled, the unit will switch the input routed to the AVoIP output whenever a new source is detected or if the current source is lost.

INFORMATION	
2ND LEVEL	3RD LEVEL
RESOLUTION	[CURRENT SOURCE RESOLUTION]
STATUS	[CURRENT TRANSCODER MODE]
FW VERSION	[CURRENT FIRMWARE VERSION]
IP	[CURRENT IP ADDRESS]
MAC	[UNIT'S MAC ADDRESS]
SN	[UNIT'S SERIAL NUMBER]

FIGURE 3-12: INFORMATION MENU

TABLE 3-7. INFORMATION

SECOND LEVEL IN FIGURE 3-12	SELECTION	DESCRIPTION
Resolution	Default	Displays the unit's detected source resolution
Status	Default	Displays the unit's transcoder mode
FW Version	Default	Displays the unit's firmware version
IP	Default	Displays the unit's IP address
MAC	Default	Displays the unit's MAC address
SN	Default	Displays the unit's serial number

USB INFORMATION	
2ND LEVEL	3RD LEVEL
IP MODE	[UNIT'S USB IP MODE]
IP	[UNIT'S USB IP ADDRESS]
MAC	[UNIT'S USB MAC ADDRESS]
PAIRED MAC 1	[USB MAC ADDRESSES OF CONNECTED USB SOURCES]
PAIRED MAC 2	
PAIRED MAC 3	
PAIRED MAC 4	
PAIRED MAC 5	
PAIRED MAC 6	
PAIRED MAC 7	

FIGURE 3-13: USB INFORMATION MENU

TABLE 3-8. USB INFORMATION

SECOND LEVEL IN FIGURE 3-13	SELECTION	DESCRIPTION
IP Mode	Default	Displays the unit's USB IP mode
IP	Default	Displays the unit's USB IP address
MAC	Default	Displays the unit's USB MAC address
PAIRED MAC 1-7	Default	Displays the unit's USB addresses of connected USB sources

FACTORY SETTING	
2ND LEVEL	3RD LEVEL
ARE YOU SURE?	**NO**
	YES

FIGURE 3-14: FACTORY SETTING MENU

TABLE 3-9. FACTORY INFORMATION

SECOND LEVEL IN FIGURE 3-14	SELECTION	DESCRIPTION
Are you sure?	No/Yes	Selecting [**Yes**] will reset the unit's settings back to their factory defaults. Selecting [**No**] will keep the current settings.

3.6.6 BASIC AV EXTENSION

3.6.6.1 POINT-TO-POINT (ONE WAY)

The most basic extension configuration available is a point-to-point system with a single transcoder unit acting as an encoder connected directly to a single transcoder unit acting as a decoder. In this configuration the HDMI/DP input on the encoder side is transmitted to the connected decoder side without modification to the audio or video format. The analog stereo audio input on the encoder transfers audio directly to the analog stereo audio output on the decoder. The LAN, RS-232 and IR ports form direct connections between the encoder and decoder as well. This configuration is ideal for basic video extension as well as remote KVM applications.

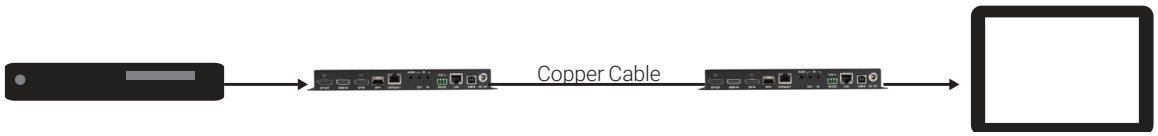

FIGURE 3-15: COPPER POINT-TO-POINT (ONE WAY)

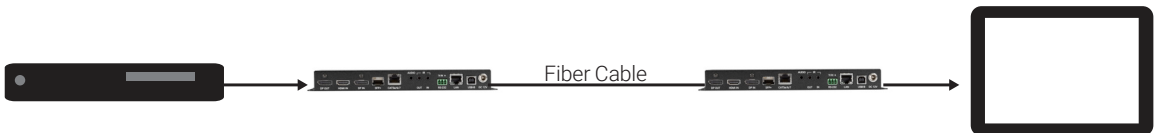

FIGURE 3-16: FIBER POINT-TO-POINT (ONE WAY)

NOTE: These configurations do not use or require an external control center, such as the MCX Gen2 Controller, to function. No audio insertion/extraction is performed in these configurations.

3.6.7 ADVANCED AV EXTENSION

3.6.7.1 MCX GEN2 CONTROLLER

The MCX Gen2 Controller is a hardware solution designed to provide a unified and easy method to access and control all of the encoders and decoders in a system. It provides a user-friendly, and operating system agnostic, web-based interface allowing easy control over all of the most critical functions within a distribution system.

The MCX Gen2 Controller hardware is an optional component and is not included with individual encoder, decoder, or transcoder units. Please contact your authorized dealer for more information.

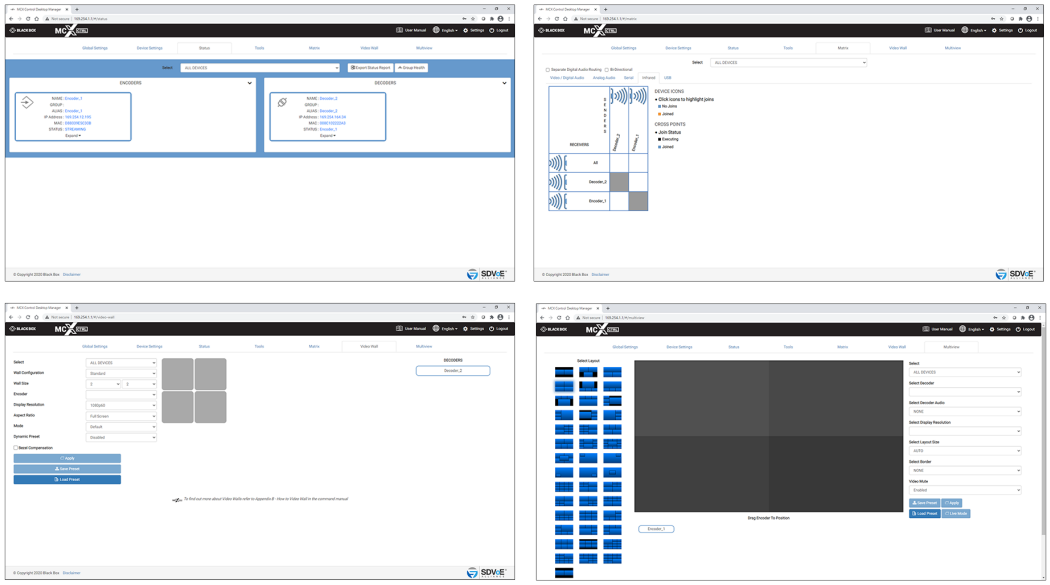

FIGURE 3-17: SAMPLE MCX GEN2 CONTROLLER SCREENSHOTS.

NOTE: Interface images are for example only and may differ from the delivered product.

3.6.7.2 CONFIGURATION EXAMPLES

When combined with the MCX Gen2 Controller, and a 10 Gigabit fiber Ethernet switch, this extension system gains a large number of additional configuration options including: multi-in/multi-out matrix switching with breakaway audio, video wall creation, and a multiview output mode. Audio extraction and embedding is fully controllable. Additionally, audio, USB, IR, and RS-232 routing can be fully controlled.

(1) **Matrix Configuration**

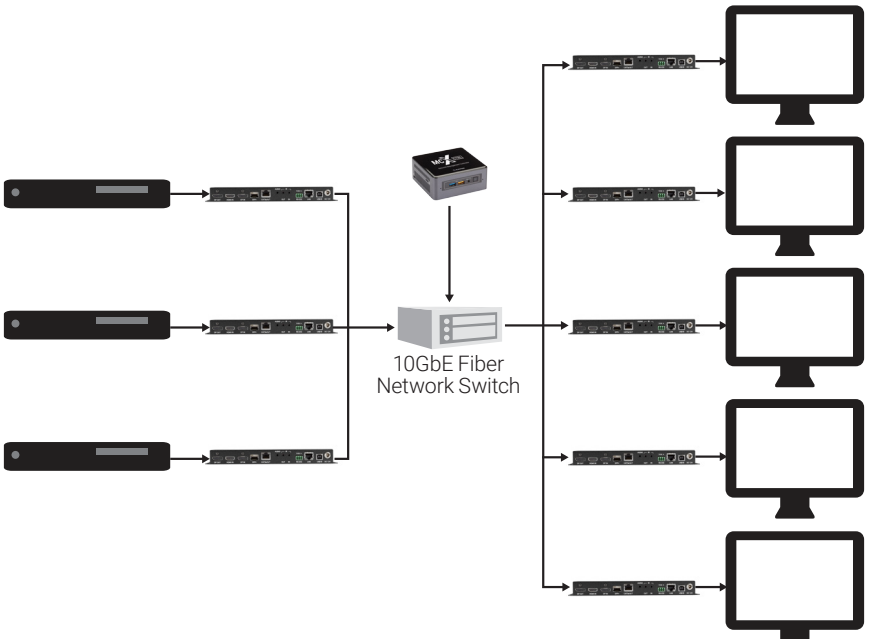

FIGURE 3-18: COPPER MATRIX CONFIGURATION

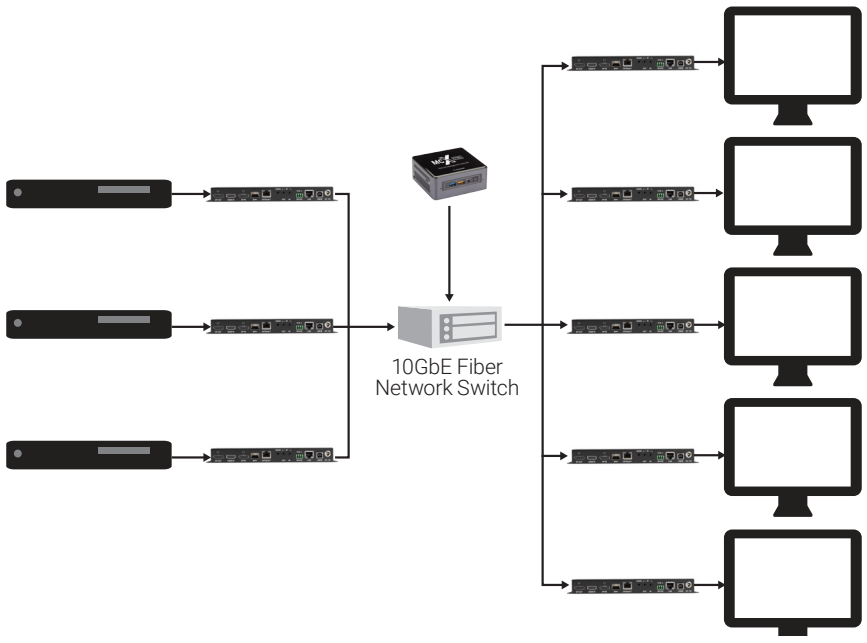

FIGURE 3-19: FIBER MATRIX CONFIGURATION

(2) **Video Wall Configuration**

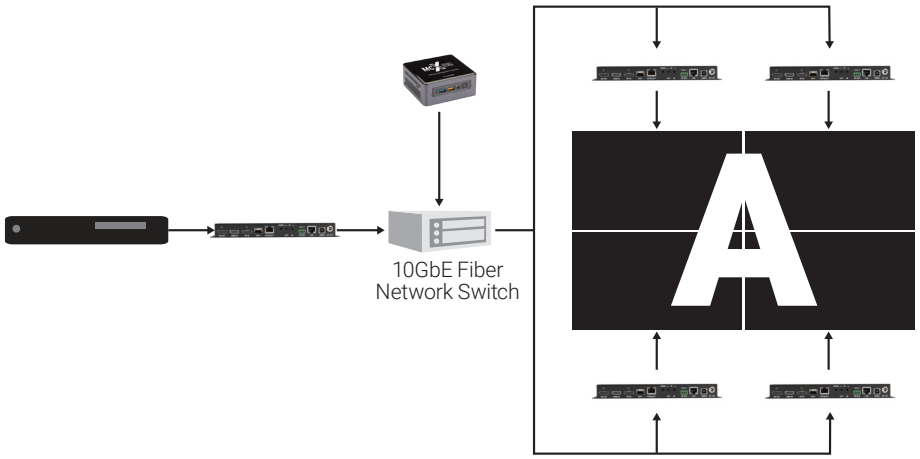

FIGURE 3-20: COPPER VIDEO WALL CONFIGURATION

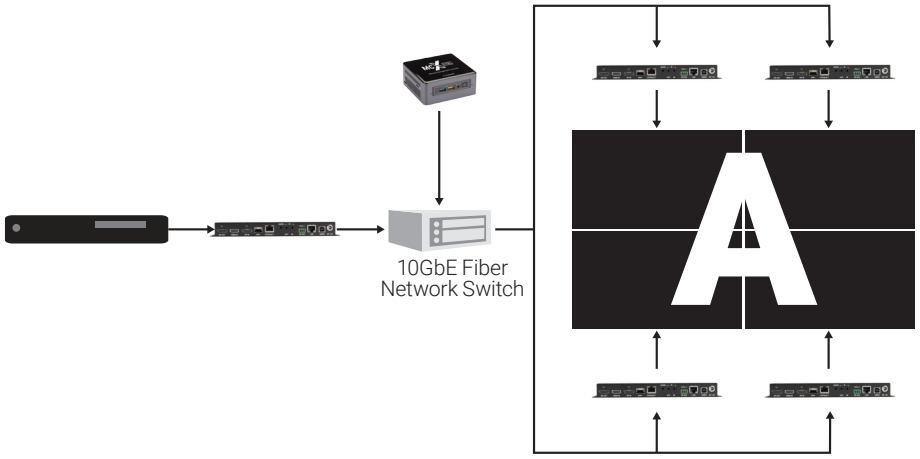

FIGURE 3-21: FIBER VIDEO WALL CONFIGURATION

(3) **Multiview (PiP/PoP/Quad/Etc.) Configuration**

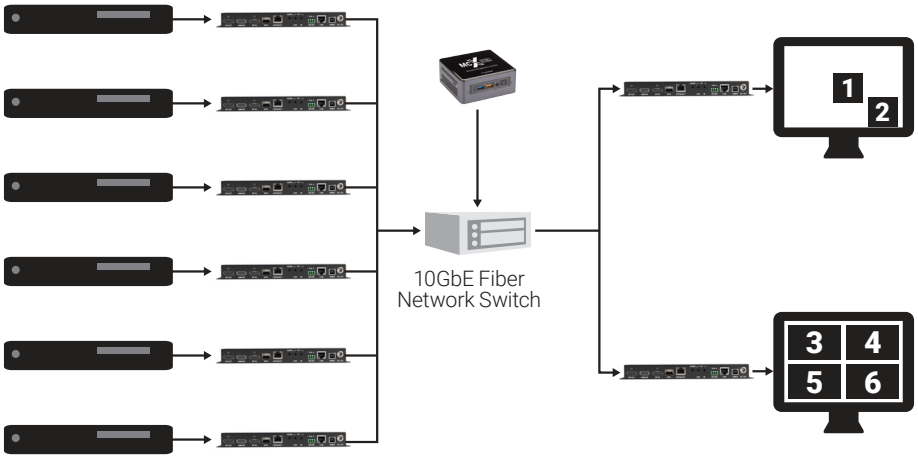

FIGURE 3-22: COPPER MULTIVIEW (PIP/POP/QUAD/ETC.) CONFIGURATION

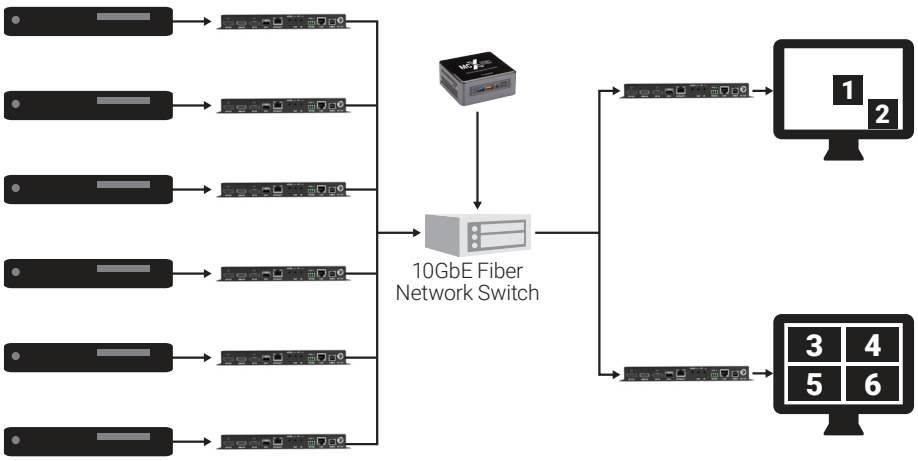

FIGURE 3-23: FIBER MULTIVIEW (PIP/POP/QUAD/ETC.) CONFIGURATION

(4) **KVM Switch Configuration**

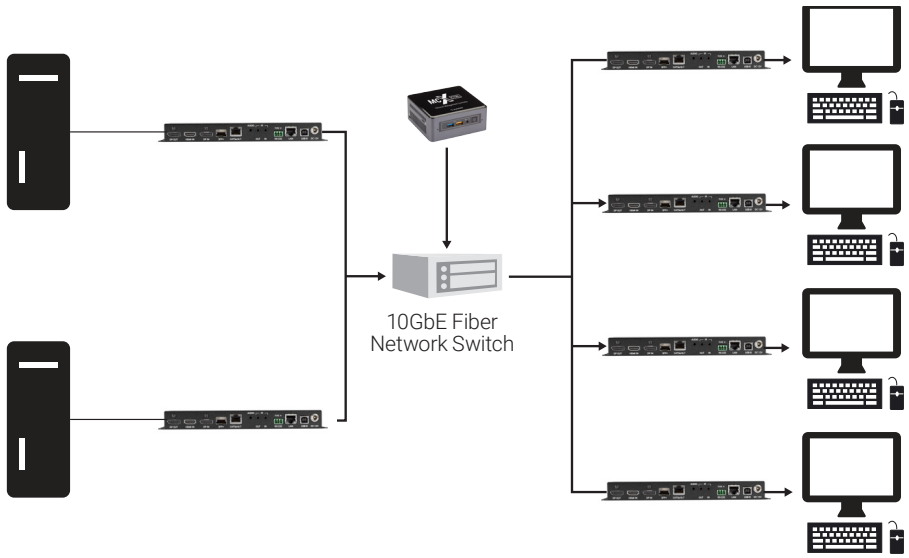

FIGURE 3-24: COPPER KVM SWITCH CONFIGURATION

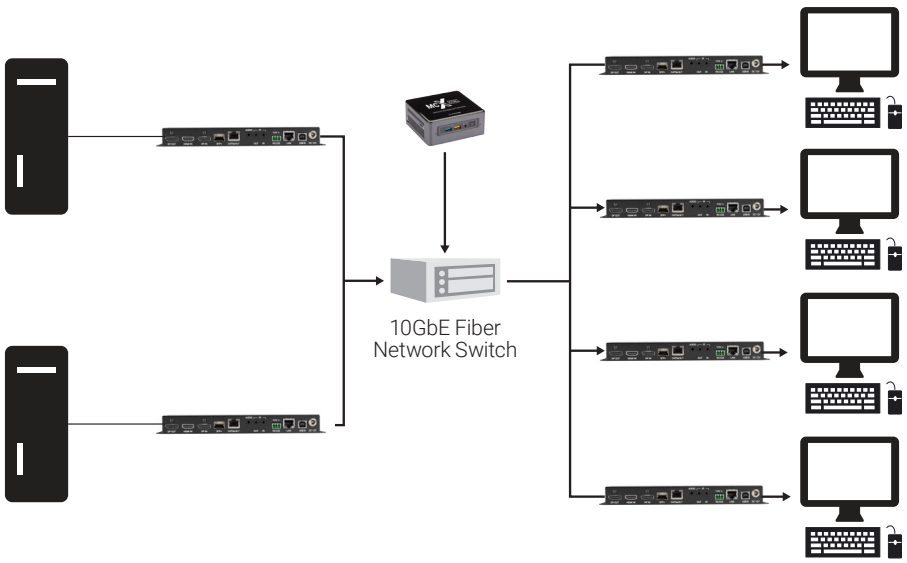

FIGURE 3-25: FIBER KVM SWITCH CONFIGURATION

3.7 CONNECTION DIAGRAM

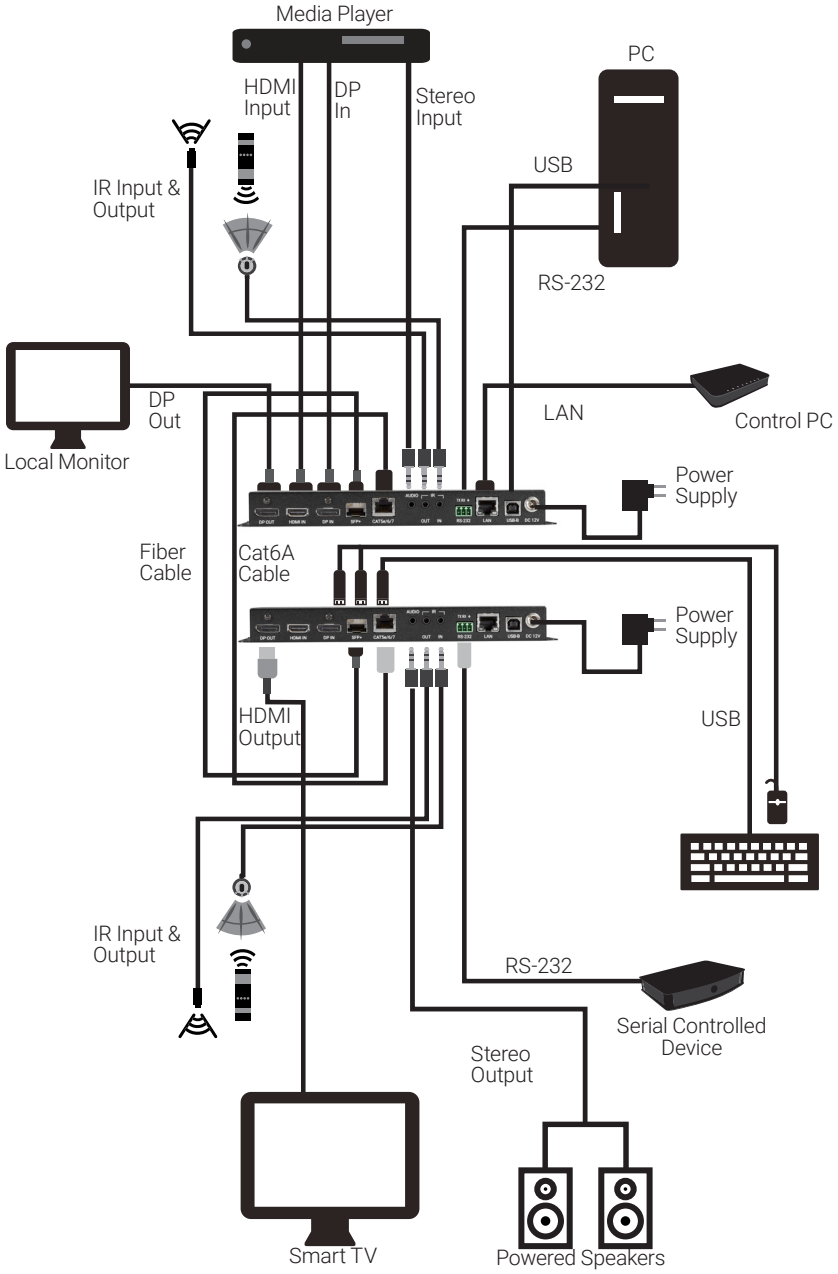

FIGURE 3-26: COPPER/FIBER CONNECTION DIAGRAM

3.8. SPECIFICATIONS

TABLE 3-10. GENERAL SPECIFICATIONS

SPECIFICATION	DESCRIPTION
DisplayPort Version	DisplayPort™ 1.2
HDMI Version	HDMI 2.0b
10GbE Bandwidth	10 Gbps
Input Ports	(1) DisplayPort; (1) HDMI Type A
Output Ports	(1) DisplayPort (Loop -through in encoder mode)
Input or Output Port	(1) Stereo Audio (3.5mm) female
Pass-Through Ports	(1) 10GbE LAN (RJ-45 or SFP+); (2) IR (3.5mm); (1) RS-232 (3-pin terminal block); (1) LAN (RJ-45); (3) USB 2.0 (Type A) (under decoder mode); (1) USB 2.0 (Type B) (under encoder mode)
IR Frequency	38kHz
Baud Rate	57600 (default), up to 115200 bps
Power Supply	12V/3A DC (US/EU standards, CE/FCC/UL certified)
ESD Protection (HBM)	±8kV (air discharge); ±4kV (contact discharge);
Dimensions	9.1” x 1” x 4.6” (231.5 x 25 x 116.7 mm)
Weight	2 lb. (916g)
Chassis Metal	Metal (steel)
Chassis Color	Black
Operating Temperature	32 to 104˚F (0 to 40˚C)
Storage Temperature	-4 to to +140˚F (-20 to +60˚C)
Relative Humidity	20 to 90% RH (Non-condensing)
Power Consumption	14.3w (for copper); 18.51w (for fiber)

TABLE 3-11. VIDEO SPECIFICATIONS

	INPUT	OUTPUT
SUPPORTED RESOLUTIONS (HZ)	10GBE	HDMI
720x400p@70/85	✓	✓
640x480p@60/72/75/85	✓	✓
720x480i@60	✓	✓
720x480p@60	✓	✓
720x576i@50	✓	✓
720x576p@50	✓	✓
800x600p@56/60/72/75/85	✓	✓
848x480p@60	✓	✓
1024x768p@60/70/75/85	✓	✓
1152x864p@75	✓	✓
1280x720p@50/60	✓	✓
1280x768p@60/75/85	✓	✓
1280x800p@60/75/85	✓	✓
1280x960p@60/85	✓	✓
1280x1024p@60/75/85	✓	✓
1360x768p@60	✓	✓
1366x768p@60	✓	✓
1400x1050p@60	✓	✓
1440x900p@60/75	✓	✓
1600x900p@60RB	✓	✓
1600x1200p@60	✓	✓
1680x1050p@60	✓	✓
1920x1080i@50/60	✓	✓
1920x1080p@24/25/30	✓	✓
1920x1080p@50/60	✓	✓
1920x1200p@60RB	✓	✓
2560x1440p@60RB	✓	✓
2560x1600p@60RB	✓	✓
2048x1080p@24/25/30	✓	✓
2048x1080p@50/60	✓	✓
3840x2160p@24/25/30	✓	✓
3840x2160p@50/60	✓	✓
3840x2160p@24	✓	✓
3840x2160p@50/60	✓	✓
3840x2160p@50/60	✓	✓
4096x2160p@24/25/30	✓	✓
4096x2160p@50/60	✓	✓
4096x2160p@24	✓	✓
4096x2160p@50/60	✓	✓
4096x2160p@50/60	✓	✓

TABLE 3-12. DIGITAL AUDIO HDMI OUTPUT SPECIFICATIONS

SPECIFICATION	DESCRIPTION
LPCM	
Max Channels	8 channels
Sampling Rate (kHz)	32, 44.1, 48
Bitstream	
Supported Formats	Standard and High Definition

TABLE 3-13. CAT5E/6/7 INPUT (COPPER)/FIBER INPUT (FIBER)

SPECIFICATION	DESCRIPTION
LPCM	
Max Channels	8 channels
Sampling Rate (kHz)	32, 44.1, 48
Bitstream	
Supported Formats	Standard and High Definition

TABLE 3-14. ANALOG AUDIO INPUT SPECIFICATIONS

SPECIFICATION	DESCRIPTION
Max Audio Level	1Vrms
Impedance	10kΩ
Type	Unbalanced

TABLE 3-15. ANALOG AUDIO OUPUT SPECIFICATIONS

SPECIFICATION	DESCRIPTION
Max Audio Level	1Vrms
THD+N	< −80dB@0dBFS 1kHz (A-wt)
SNR	> 80dB@0dBFS
Frequency Response	< ±1dB@20Hz~20kHz
Crosstalk	< −80dB@10kHz
Impedance	470Ω
Type	Unbalanced

TABLE 3-16. CABLE SPECIFICATIONS

CABLE LENGTH	1080P 8-BIT	1080P 12-BIT	4K30 (4:4:4) 8-BIT	4K60 (4:4:4) 8-BIT
HIGH SPEED HDMI CABLE				
HDMI OUTPUT	15m	10m	5m	3m
CATEGORY CABLE **(COPPER)**				
CAT. 5E/6	100m		70m	
CAT. 6A/7	100m			
FIBER CABLE				
MULTI-MODE FIBER (OM3)	300m			
MULTI-MODE FIBER (OM4)	550m			
SINGLE-MODE FIBER	30km			

Bandwidth Category Examples:

1080p (FHD Video)

- Up to 1080p@60Hz, 12-bit color
- Data rates lower than 5.3Gbps or below 225MHz TMDS clock

4K30 (4K UHD Video)

- 4K@24/25/30Hz, 8-bit color
- Data rates higher than 5.3Gbps or above 225MHz TMDS clock but below 10.2Gbps

4K60 (4K UHD+ Video)

- 4K@50/60Hz (4:4:4, 8-bit)
- Data rates higher than 10.2Gbps

APPENDIX A: ACRONYMS

A.1 ACRONYMS

TABLE A-1 ACRONYMS

ACRONYM	COMPLETE TERM
10GBE	10 GIGABIT ETHERNET
ADC	ANALOG-TO-DIGITAL CONVERTER
AVOIP	AUDIO/VIDEO OVER IP
CAT.5E	ENHANCED CATEGORY 5 CABLE
CAT.6	CATEGORY 6 CABLE
CAT.6A	AUGMENTED CATEGORY 6 CABLE
CAT.7	CATEGORY 7 CABLE
DAC	DIGITAL-TO-ANALOG CONVERTER
DB	DECIBEL
DHCP	DYNAMIC HOST CONFIGURATION PROTOCOL
DP	DISPLAYPORT
DVI	DIGITAL VISUAL INTERFACE
EDID	EXTENDED DISPLAY IDENTIFICATION DATA
GBE	GIGABIT ETHERNET
GBPS	GIGABITS PER SECOND
GUI	GRAPHICAL USER INTERFACE
HDCP	HIGH-BANDWIDTH DIGITAL CONTENT PROTECTION
HDMI	HIGH-DEFINITION MULTIMEDIA INTERFACE
HDR	HIGH DYNAMIC RANGE
IEEE	INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS
IGMP	INTERNET GROUP MANAGEMENT PROTOCOL
IP	INTERNET PROTOCOL
IR	INFRARED
KHZ	KILOHERTZ
KVM	KEYBOARD/VIDEO/MOUSE
LAN	LOCAL AREA NETWORK
LED	LIGHT-EMITTING DIODE
LPCM	LINEAR PULSE-CODE MODULATION
MAC	MEDIA ACCESS CONTROL
MHZ	MEGAHERTZ
OSD	ON-SCREEN DISPLAY
PIP	PICTURE IN PICTURE
POP	PICTURE OUTSIDE OF PICTURE
SDVOE	SOFTWARE DEFINED VIDEO OVER ETHERNET
SNR	SIGNAL-TO-NOISE RATIO
TCP	TRANSMISSION CONTROL PROTOCOL
THD+N	TOTAL HARMONIC DISTORTION PLUS NOISE
TMDS	TRANSITION-MINIMIZED DIFFERENTIAL SIGNALING
4K UHD	4K ULTRA-HIGH-DEFINITION (10.2GBPS MAX)
4K UHD+	4K ULTRA-HIGH-DEFINITION (18GBPS MAX)

APPENDIX A: ACRONYMS

TABLE A-1 ACRONYMS CONTINUED

ACRONYM	COMPLETE TERM
USB	UNIVERSAL SERIAL BUS
VGA	VIDEO GRAPHICS ARRAY
VOIP	VIDEO OVER IP
WUXGA (RB)	WIDESCREEN ULTRA EXTENDED GRAPHICS ARRAY (REDUCED BLANKING)
XGA	EXTENDED GRAPHICS ARRAY
Ω	OHM

APPENDIX B: REGULATORY INFORMATION

B.1 FCC STATEMENT

This equipment has been tested and found to comply with the regulations for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with this Quick Installation Guide, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case, the user will be required to correct the interference at his/her own expense.

B.2 CE STATEMENT

This is a Class B product in a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.

B.3 ROHS

This product is RoHS compliant.A.4 NOM Statement

B.4 NOM STATEMENT

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.
2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.
3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.
4. Todas las instrucciones de operación y uso deben ser seguidas.
5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc.
6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.
7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.
8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.
9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.
10. El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.
11. El aparato eléctrico deberá ser connectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.
12. Precaución debe ser tomada de tal manera que la tierra fisica y la polarización del equipo no sea eliminada.
13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.
14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.
15. En caso de existir, una antena externa deberá ser localizada lejos de las lineas de energia.
16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.
17. Cuidado debe ser tomado de tal manera que objectos liquidos no sean derramados sobre la cubierta u orificios de ventilación.
18. Servicio por personal calificado deberá ser provisto cuando:
    A: El cable de poder o el contacto ha sido dañado; u
    B: Objectos han caído o líquido ha sido derramado dentro del aparato; o
    C: El aparato ha sido expuesto a la lluvia; o
    D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o
    E: El aparato ha sido tirado o su cubierta ha sido dañada.

APPENDIX C: DISCLAIMER/TRADEMARKS

C.1 DISCLAIMER

Black Box Corporation shall not be liable for damages of any kind, including, but not limited to, punitive, consequential or cost of cover damages, resulting from any errors in the product information or specifications set forth in this document and Black Box Corporation may revise this document at any time without notice.

C.2 TRADEMARKS USED IN THIS MANUAL

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