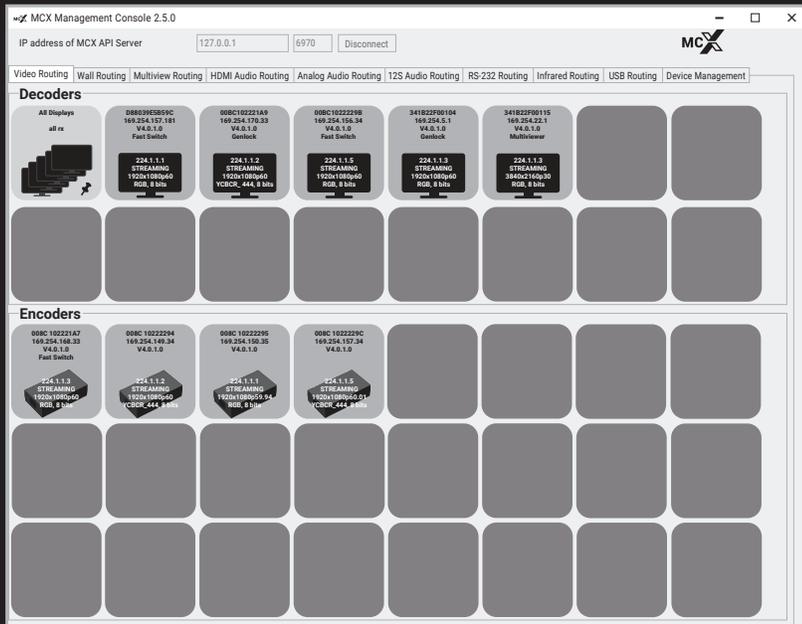


# USER MANUAL

MCX-MGMT

# MCX CONTROLLER SOFTWARE

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



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## CHAPTER 1: OVERVIEW

This document provides instructions for installing and using the MCX Controller and MCX Management Console software. The software works with Black Box MCX S7 and S9 Encoders and Decoders.

NOTE: In this manual, the Encoders are sometimes referred to as Transmitters (TX) or Senders. The Decoders are sometimes called Receivers (RX).

The target audience for this document is anyone involved in analyzing and testing the MCX Controller platform; this includes, but is not limited to, project managers, system designers, support personnel, as well as integrators.

Chapter 2 describes how to install the MCX Controller.

Chapter 3 provides an MCX Management Console overview.

Chapter 4 explains how to use the MCX Management Console.



## CHAPTER 2: INSTALLATION

### 2.1 INSTALLING THE MCX CONTROLLER

#### 2.1.1 MCX CONTROLLER INSTALLER FOR WINDOWS

This installer automatically installs the MCX Controller, the MCX Management Console, and MCX Controller Component Updater simultaneously on the same Windows computer.

Follow the steps below to install the MCX Controller package:

1. Copy the file provided by MCX Controller support to a known location on the computer it will be installed on, such as to the Desktop or a subfolder of "Documents."
2. Extract the file archive.
  - a. Right-mouse-click over the zip file and select Extract all...
  - b. An Extract Compressed (Zipped) Folders window appears.
  - c. Click Extract.
  - d. Extraction will be completed.
3. Connect the network port of the Windows computer on same network where the MCX Controller devices are located. There are couple of connections suggested for the network, either:
  - a. Directly to Gigabit Ethernet port on any of the MCX Controller devices; or
  - b. To any unused port on the 10G switch.
4. Click on the MCX ControllerSetup.exe file extracted previously. The MCX Controller Setup screen appears.

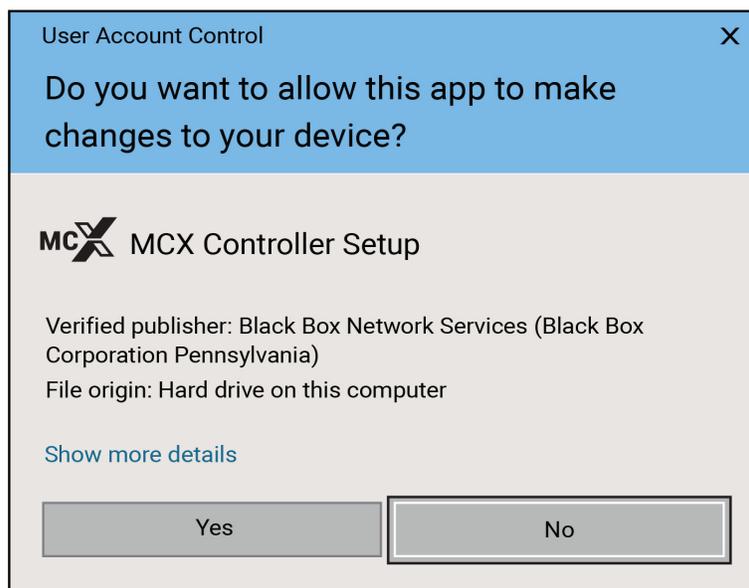


FIGURE 2-1. MCX CONTROLLER SETUP SCREEN

5. Select Yes to start setup. The License agreement page appears.

## CHAPTER 2: INSTALLATION

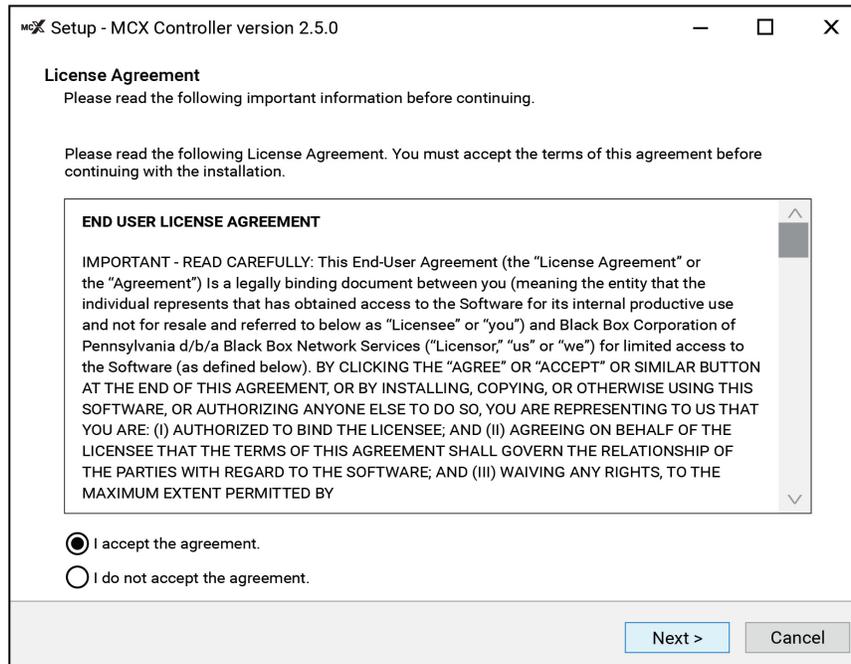


FIGURE 2-2. LICENSE AGREEMENT PAGE

6. Select “I accept the agreement” and press the Next button. The Select Install Directory screen appears.
7. Enter the location where you want to install the MCX Controller. Click on the Browse.. button if required.

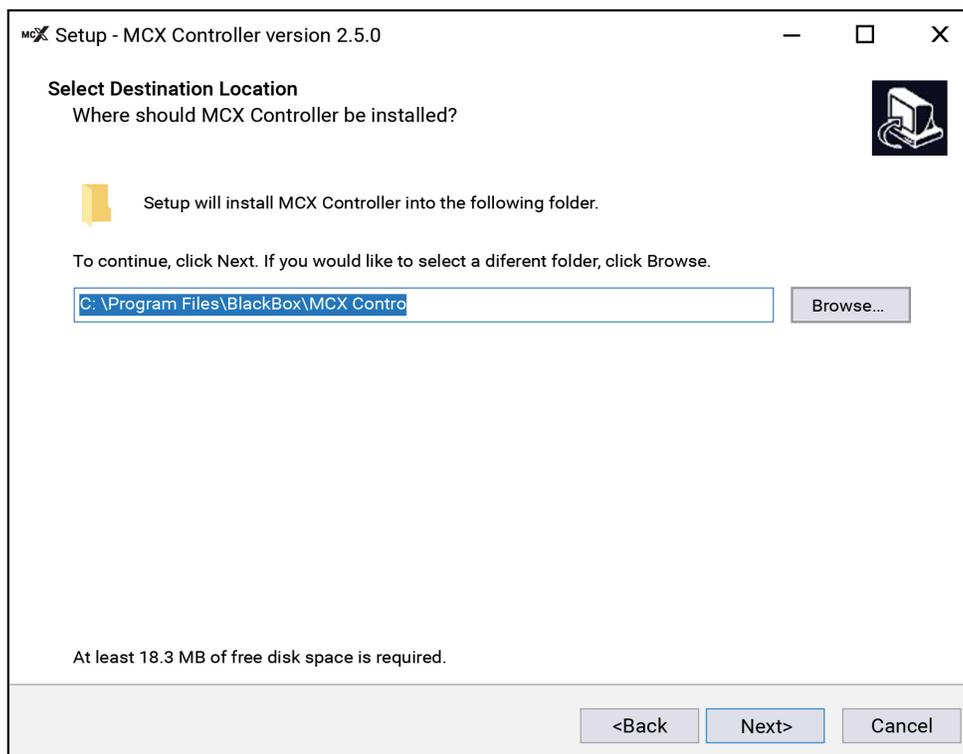


FIGURE 2-3. INSTALLATION LOCATION

## CHAPTER 2: INSTALLATION

8. In the Select Additional Tasks window that appears, confirm Create a desktop shortcut checkbox is selected if you want to create a desktop shortcut.

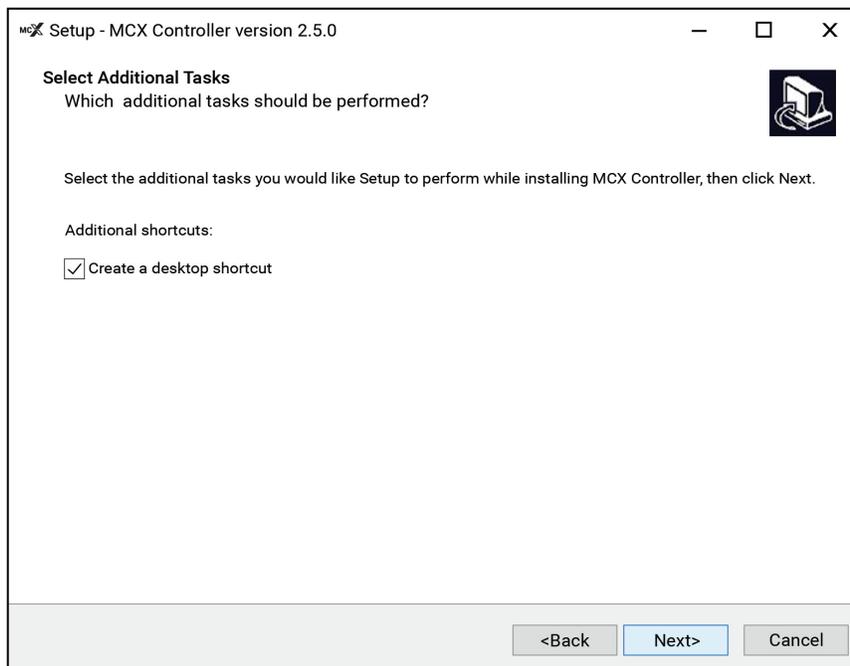


FIGURE 2-4. DESKTOP SHORTCUT

9. Click Next. The Ready to Install screen appears.

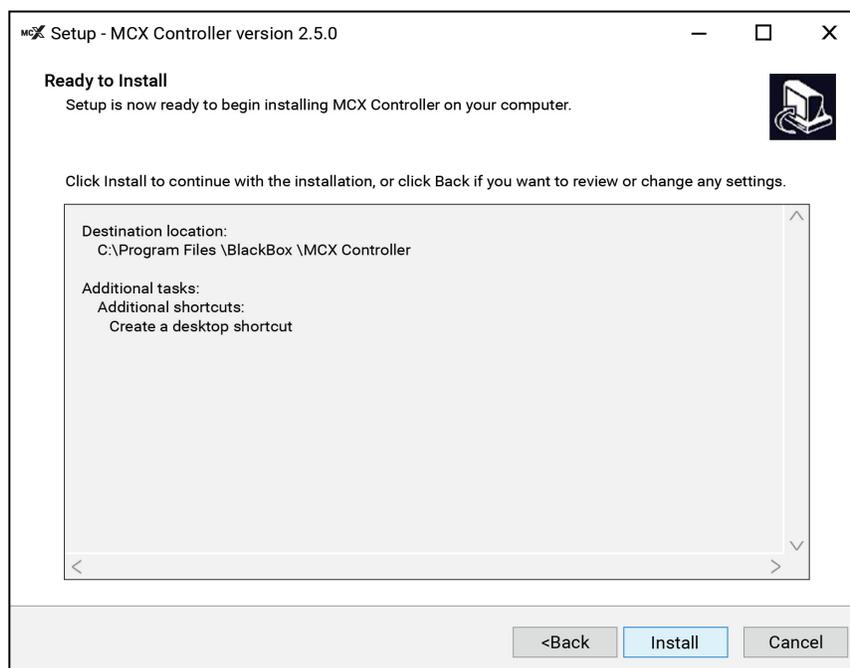


FIGURE 2-5. READY TO INSTALL SCREEN

## CHAPTER 2: INSTALLATION

10. Click the Install button. A progress bar appears showing the progress of the installation of the MCX Controller.

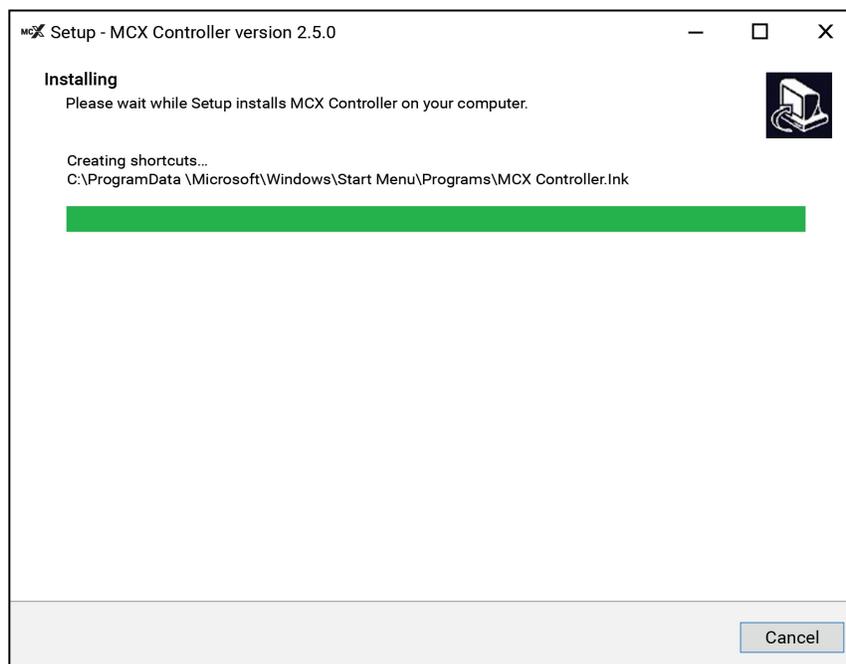


FIGURE 2-6. INSTALLING SCREEN

11. Once the installation is complete, the Completing the MCX Controller Setup Wizard window appears. Click Finish to complete the installation.

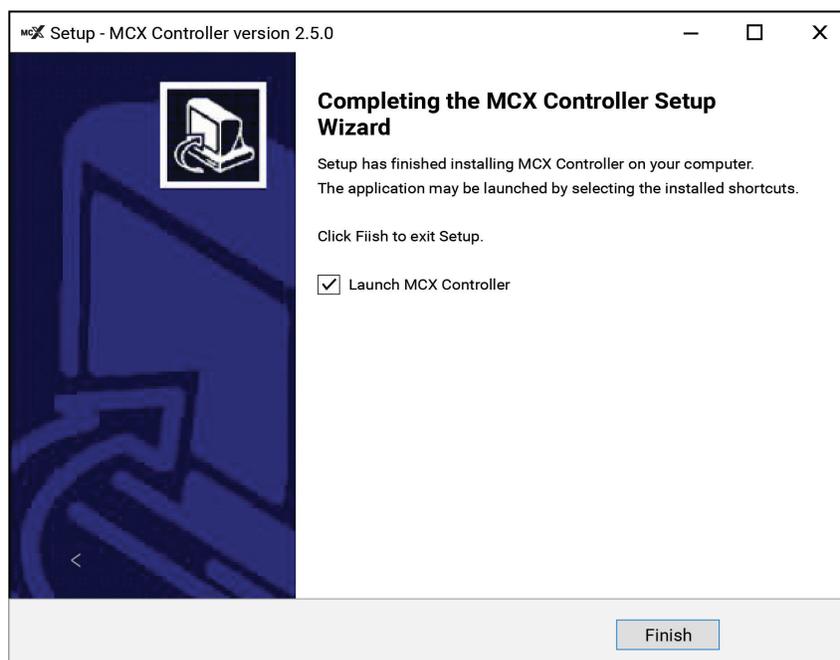


FIGURE 2-7. COMPLETING THE MCX CONTROLLER SETUP WIZARD SCREEN

## CHAPTER 2: INSTALLATION

### 2.1.2 POINT-TO-POINT SETUP

---

An MCX S7 or S9 Encoder/Decoder pair (one transmitter and one receiver) can be connected directly in a point-to-point configuration without the use of a network switch.

When set in point-to-point mode, all signals (video, audio, RS-232, IR, USB, etc.) are automatically paired by default for an MCX hardware configuration.

To control and configure MCX devices in point-to-point mode:

1. Install the MCX Controller and MCX Controller Control Server on the same computer as outlined in the previous section.
2. Connect this computer to the 1-GbE interface port on either the transmitter (TX) or receiver (RX).
3. Then double-click the desktop shortcut, MCX Controller Launcher to launch the MCX Management Console and MCX Controller Control Server.
4. Proceed to use the MCX Controller platform.

## 2.2 LAUNCHING THE MCX MANAGEMENT CONSOLE

To run the MCX Controller Server, start the executable file. Example screenshots shown next are running on Windows 10.

1. Launch the MCX Management Console using one of the options outlined below:
  - a. If the MCX Management Console was installed using the MCX Controller Evaluation package installer and the desktop shortcut option selected, a MCX Management Console launch icon will be present on the Windows desktop.  
Double-click the desktop icon and both the MCX Controller Server and MCX Management Console will automatically launch simultaneously.
  - b. However, if the MCX Controller Control Server and the MCX Management Console were installed individually:
    - Launch the MCX Controller Control Server (MCX Controller\_control.exe) first.
    - Then once the Control Server is running, launch the MCX Management Console (MCX Controller\_manager.exe).
2. The MCX Management Console Graphical User Interface (GUI) loads.
3. Next detect all transmitter (TX) and receiver (RX) devices on the Network.
  - a. Enter the IP address of the computer hosting the MCX Controller Server in the field next to the IP address of MCX Controller Server.
  - b. Click the Connect button, located beside the label IP address of MCX Controller Server.

#### NOTES:

- i. If the Control Server is running on same computer as the MCX Controller client, it is possible to use the IP address 127.0.0.1, which is the IPV4 loop-back address for 'localhost'.
- ii. Do not modify the default port number of 6970. The MCX Controller Server currently requires port 6970 as it only listens to this port.

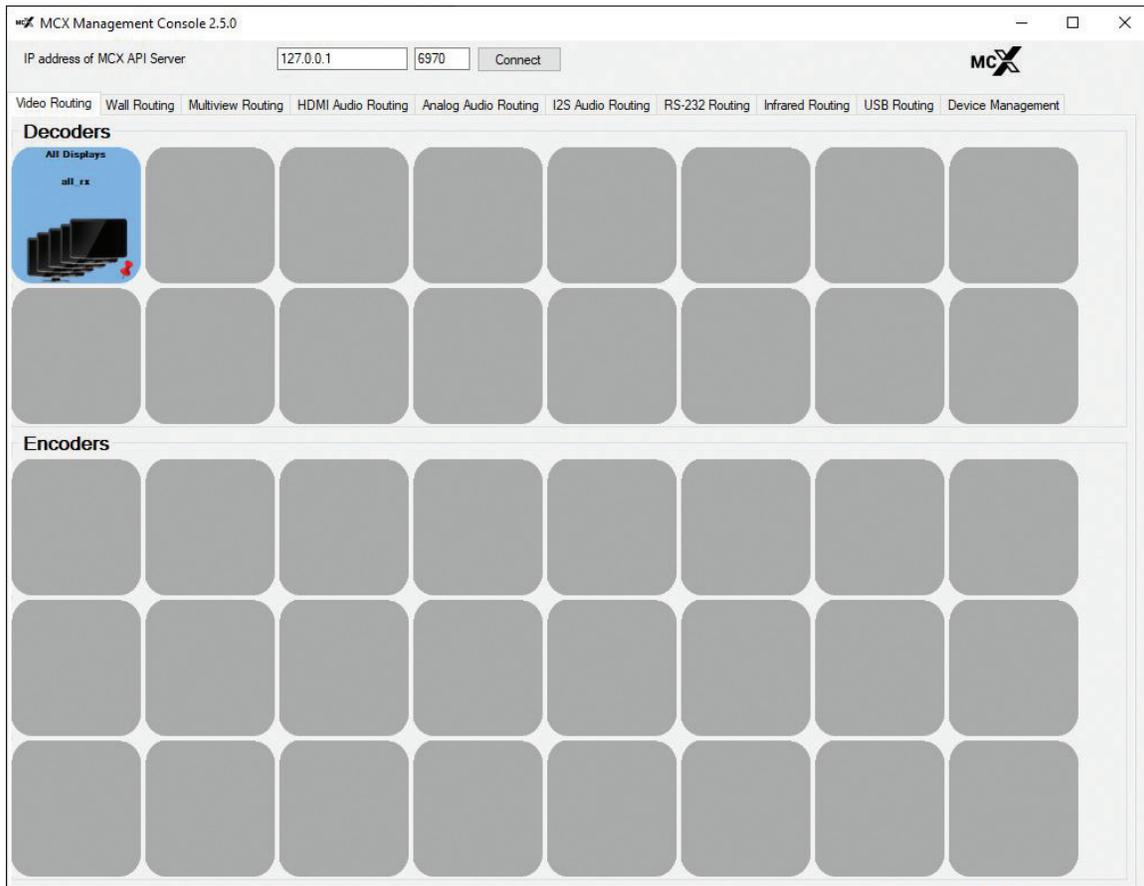


FIGURE 2-8. MCX MANAGEMENT CONSOLE IP ADDRESS AND CONNECT

1. Once connected to the MCX Controller Server, the application displays all discovered MCX Controller transmitter (encoder) and receiver (decoder) devices on the network as green tiles.

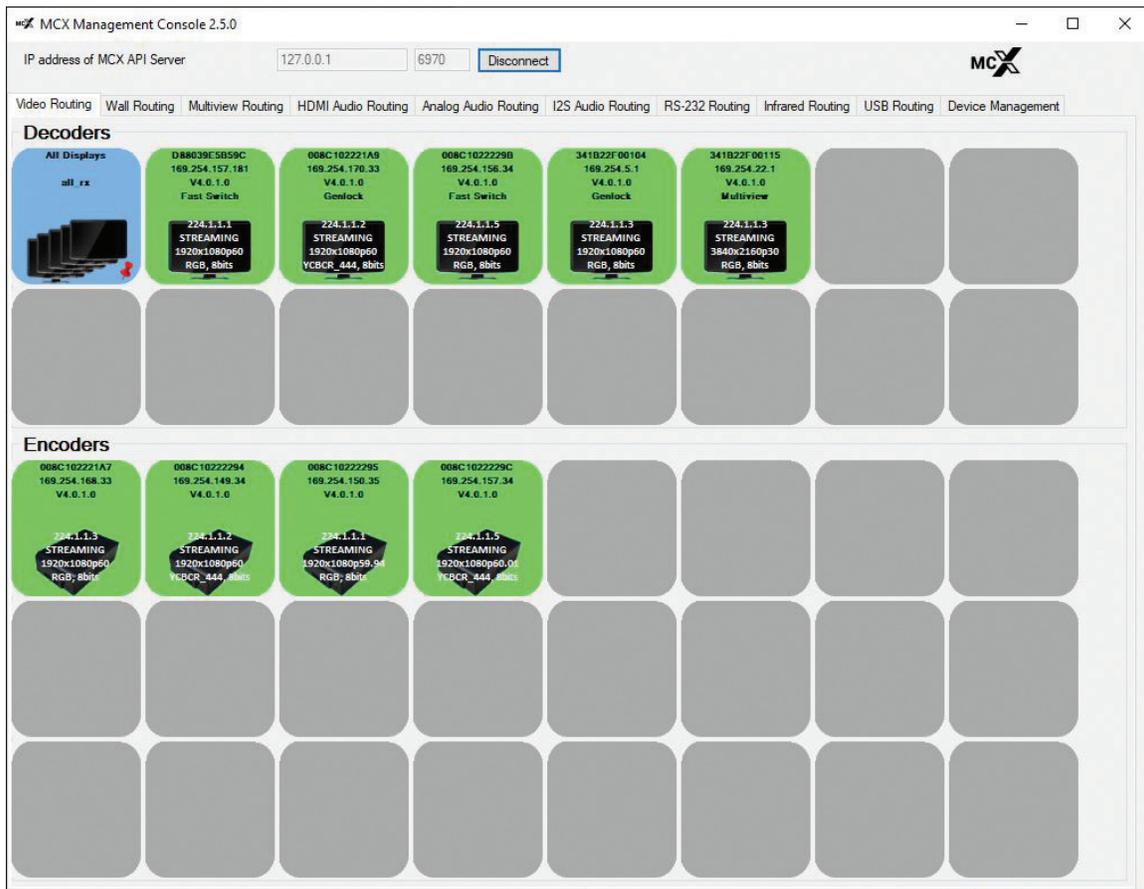


FIGURE 2-9. MCX MANAGEMENT CONSOLE DISPLAYING DETECTED DEVICES

## MCX MANAGEMENT CONSOLE DEVICE STATUS

The MCX Management Console indicates the status of the decoders and encoders discovered on the network. Each status is assigned a color code for easy recognition:

- ◆ Green: Device active
- ◆ Gray: Device previously discovered but not currently active. If in the device tab and an update file has been loaded, devices that are detected as not appropriate for the update are also shown as gray tiles.
- ◆ Yellow: Device booted from the Golden image file.

## CHAPTER 3: MCX MANAGEMENT CONSOLE OVERVIEW

### 3.1 DATA ROUTING AND SWITCHING

The MCX Management Console application has a series of tabs that provide tools to control the various types of routing supported by the MCX Controller platform, including:

- ◆ Video (default)
- ◆ Wall
- ◆ Multiview
- ◆ HDMI Audio
- ◆ Single I2S Audio (Sometimes referred to as Analog audio.)
- ◆ Quad I2S Audio
- ◆ RS-232
- ◆ Infrared (IR)
- ◆ USB
- ◆ An additional tab, the Device Management tab, is also provided.

When referring to video routing in relation to the MCX Controller platform, it means that the current video source displayed by a Decoder (RX) device can be exchanged for another source coming from a different Encoder (TX) device.

MCX Controller video processing modes support the joining of multicast streams to support the requirements of Pro-AV applications. A transmitter video stream is sent out in a multicast stream that the receiver subscribes to. When a source change is requested, the receiver unsubscribes from the first transmitter's stream and subscribes to the multicast stream of the transmitter streaming the new source.

Video processing modes each have unique characteristics. For example, when a receiver is set in Genlock mode, the display is genlocked to the source at zero-frame latency. When set in Fast Switch mode, the latency between the display and source is between 1 and 2 video frames; however, switching between sources occurs seamlessly (instantaneous to the human eye).

Configuring and managing video modes is outlined in Section 4.1, Video Routing tab.

### 3.2 MCX MANAGEMENT CONSOLE INTERFACE

The MCX Management Console graphic interface is divided into sections:

- ◆ The upper area of the user interface is labeled Decoders. All receiver (RX) devices detected on the network are displayed in this section.
- ◆ The lower area of the user interface is labeled Encoders. All transmitter (TX) devices detected on the network are displayed in this section.

Each discovered Decoder and Encoder device is represented in the MCX Management Console by a green tile. In turn, each tile provides helpful information specific to the individual device it represents.

Tile information displayed includes a device's Hostname, IP Address and Firmware Version.

**NOTE:** The default Hostname assigned to an MCX Controller device is the device's MAC address. This can be modified and the change is persistent during power recycling, unless a factory reset is performed.

For details on managing the receiver (decoder) network settings, refer to Section 4.11.3.4, Decoder Network Interface Settings and for the transmitter (encoder) network settings refer to Section 4.11.4.3, Encoder Network Interface Settings.

If a source device, such as a Blu-ray player, is connected to the HDMI Input port of an encoder (TX) device, a picture representing the source appears within the associated tile. Additionally, data is provided regarding the HDMI stream. This includes the multicast address used for streaming, the video resolution and the video color space information.

## CHAPTER 3: MCX MANAGEMENT CONSOLE OVERVIEW

Similarly, if a display is connected to a decoder (RX) device, an illustration of a display appears within the corresponding decoder's tile.

If there is no illustration visible within a tile, this indicates that the MCX Controller device is detected but currently there is either no source or display connected.

For receivers, the video mode is also displayed indicating the mode a device is currently operating in, such as Fast Switch, Genlock or Wall mode.

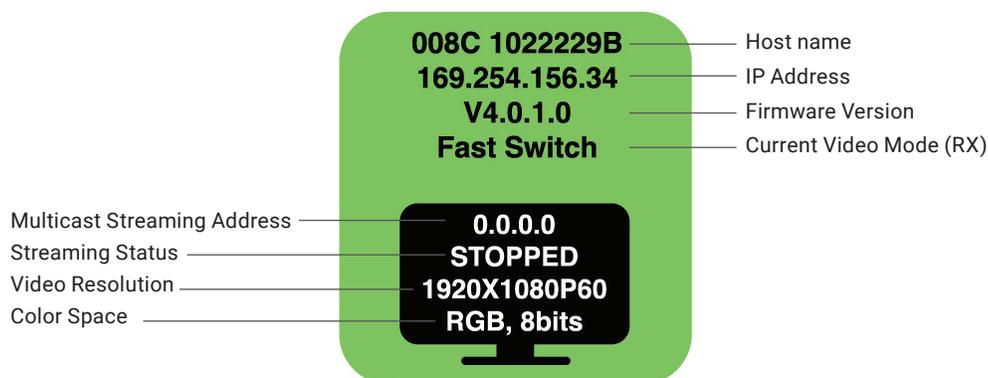


FIGURE 3-1. EXAMPLE OF DATA DISPLAYED FOR DECODER (RX) DEVICE TILE

### 3.3 MCX CONTROLLER VIDEO MODES

The Video Routing tab is used to set up and manage video routing. This tab is used to join decoder (RX) devices to a specific encoder (TX) HDMI Video stream.

A decoder (RX) device can operate in one of the following five video modes as outlined below.

- ♦ Genlock mode
- ♦ Fast Switch mode
- ♦ Genlock Scaler mode
- ♦ Genlock and Fast Switch Wall modes
- ♦ Multiview mode

For information about configuring and managing the processing modes, refer to:

- ♦ Genlock mode: refer to Section 4.1.2, Genlock mode.
- ♦ Fast Switch mode: refer to Section 4.1.3, Fast-Switch Mode.
- ♦ Genlock Scaling mode: refer to Section 4.1.4, Genlock Scaling mode.
- ♦ Wall mode: refer to Section 4.2, Wall Routing tab.
- ♦ Multiview mode: refer to Section 5.3, Multiview Routing tab.

## CHAPTER 3: MCX MANAGEMENT CONSOLE OVERVIEW

### 3.4 HDMI AUDIO ROUTING FROM THE MCX CONTROLLER

To allow for HDMI audio to be routed separately from the HDMI video, the audio data is extracted from the HDMI input on the encoder (TX) side.

NOTE: The MCX Management Console automatically applies the split audio MCX Controller API command.

Exception to above: when a decoder (RX) is operating in Genlock mode, the audio follows the video and is always unchanged regardless of the audio format (LPCM, Dolby, DTS, Stereo, Surround).

NOTES:

- i. For MCX encoder (TX) devices, the original multichannel (up to 8 channels) audio and downmixed 2-channel (stereo) is sent to subscribed decoder (RX) devices.
- ii. For MCX encoder (TX) devices, if the HDMI audio received from the source is in LPCM format it is possible to “locally” breakout the audio as downmixed 2-channel and then output as an additional audio stream.
- iii. Decoder (RX) devices receiving HDMI audio can either:
  - a. Embed the audio into the HDMI output signal; or
  - b. Extract the audio over Quad I2S; or
  - c. Extract the downmixed audio version over Single I2S.

For more information about configuring and managing audio through the MCX Controller chipsets:

- ♦ HDMI Audio routing: refer to Section 5.4, HDMI Audio Routing tab.
- ♦ Single IS2 (Analog) Audio routing: refer to Section 5.5, Analog Audio Routing tab.
- ♦ Quad IS2 Audio routing: refer to Section 5.6, I2S Audio Routing tab.

### 3.5 RS-232 AND INFRARED (IR) ROUTING

RS-232 and Infrared (IR) data is routed between encoders (TX) and decoders (RX) using Unicast or Broadcast protocols when sending data to one or all devices respectively.

Unlike audio and video, where data is always routed from an encoder (TX) to one or more decoders (RX), transmitters (TX) and receivers (RX) can both send and receive RS-232 and Infrared data. Therefore, all encoders (TX) and decoders (RX) are shown as both Senders and Receivers.

When a Receiver is joined to a sender, a one-directional data tunnel is created.

To establish two-way RS-232 or IR communication, the devices must be joined twice, once as a sender and then again as a receiver.

NOTE: RS-232 and IR data transport is not limited to communication between devices only; it is also possible to inject RS-232 and IR data through the MCX Controller Server.

For details on configuring and managing:

- ♦ RS-232 data routing: refer to Section 5.7, RS-232 Routing tab.
- ♦ IR data routing: refer to Section 5.8, Infrared Routing tab.

### 3.6 USB 2.0 ROUTING

Routing of USB 2.0 data between encoders (TX) and decoders (RX) is done using ExtremeUSB over LAN chip technology from Icron Technologies. Icron ExtremeUSB eliminates the USB's 5-meter distance limitation, enabling applications where the host computer or USB device is required to be located away from the user.

For details on configuring and managing USB routing, refer to Section 5.9, USB Routing tab.



## CHAPTER 4: USING THE MCX MANAGEMENT CONSOLE

### 4.1 VIDEO ROUTING TAB

The Video Routing tab is used to setup and manage Video/HDMI routing between the encoders (TX) and decoders (RX). After connecting to the MCX Controller Control Server, the MCX Management Console by default loads the Video-Routing tab.

There are three (3) modes available for Video Routing:

- ◆ Genlock
- ◆ Fast Switch
- ◆ Genlock Scaling

#### 4.1.1 CONFIRMING WHICH ENCODERS ARE JOINED TO DECODERS

To verify which Decoders (RX) and Encoders (TX) are joined together, with the left mouse click on the decoder (RX) or encoder (TX) tile it is desired to see the connection status for. All the associated “joined” tiles will be highlighted in orange.

The above functionality is enabled for each MCX Management Console tab, Video, Audio, RS-232, etc. For example, if Infrared Routing tab selected the joined senders and receivers will be highlighted.

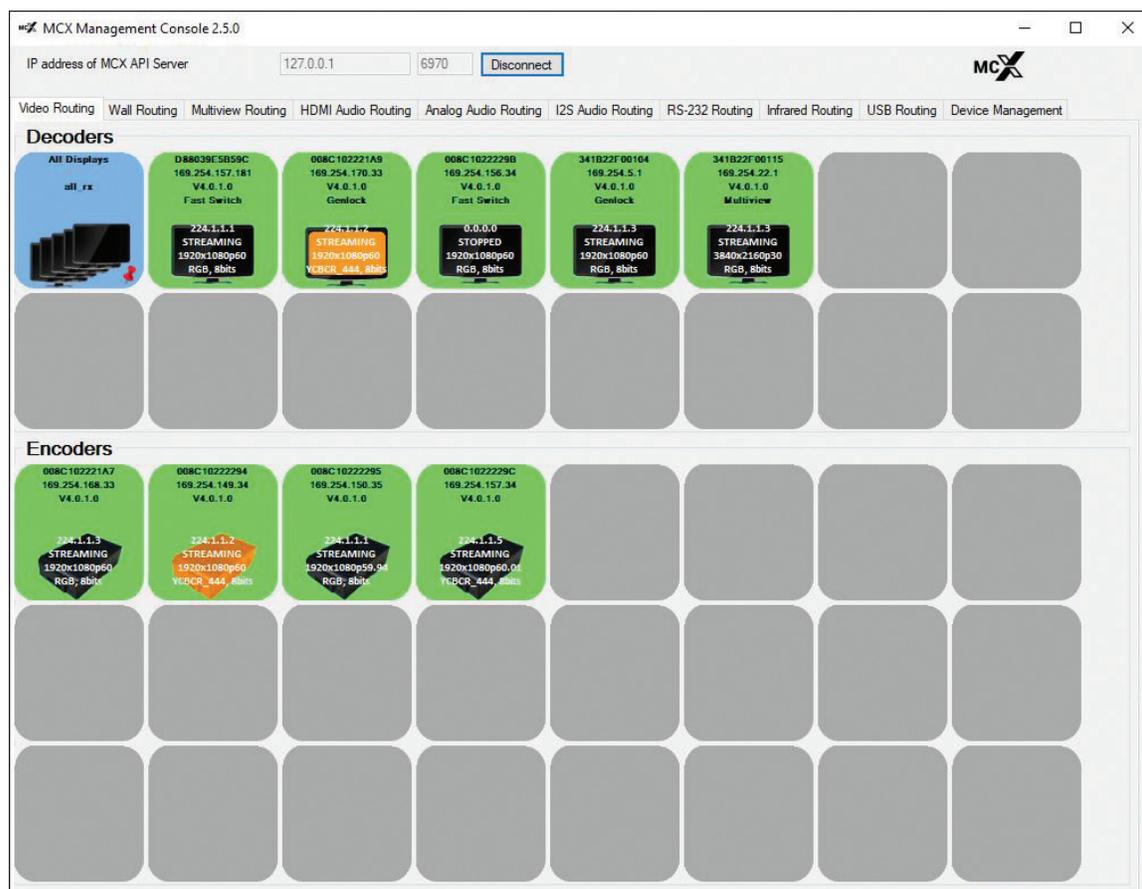


FIGURE 4-1. EXAMPLE OF DECODERS JOINED TO AN ENCODER

## CHAPTER 4: USING THE MCX MANAGEMENT CONSOLE

### 4.1.2 GENLOCK MODE

---

As mentioned earlier, the primary benefit of the Genlock mode is very low (zero-frame) latency between the source and the decoder. When a decoder (RX) is set in Genlock mode, what is sent to the attached display is a byte-by-byte replication of what was received from the source. The display is genlock to the source as if it is directly connected, making it the closest representation to a wire.

There is one exception to the above statement. If the input video bandwidth is too high to fit into the 10G network pipe, the video is lightly compressed to allow the stream to fit into the 10G network pipe. An example of a signal that is over 10G is a UHD 60Hz with full color sampling (RGB or YCbCr 444).

#### 4.1.2.1 SETTING DECODER TO GENLOCK MODE

---

If not currently running, launch the MCX Management Console application. For information on starting the GUI, refer to section 4.5 Launching MCX Management Console.

Reminder: All discovered receiver (RX) devices are listed in the top half of under the header Decoder and all the transmitter (TX) devices are listed on the bottom half under the header Encoder.

1. Select the Video Routing tab.
2. Verify if the Encoder (RX) (green tile) is indicating that the device(s) is currently set to the Genlock mode.

If it is indicated that it is presently in Genlock mode, skip to step 4 below.

NOTE: Refer to Figure 3-1, Example of data displayed for decoder (RX) device tile.

3. If Genlock is not currently the active mode, apply the setting as follows:
  - a. Right-mouse-click over the appropriate Decoder (RX) tile.
  - b. In the menu that appears under the Set Video Mode heading, select Genlock.
  - c. The decoder changes to the selected video mode.
4. Next, join the decoder (RX) to the encoder (TX).
  - a. In the Encoder section, select an encoder (TX) by clicking on its associated active (green) tile with left mouse button.
  - b. While holding down the left button, drag the encoder (TX) over the decoder (RX) tile it is to be joined with.
  - c. Release the mouse button to drop the encoder tile onto the decoder tile.
  - d. The encoder and decoder devices are now joined



## CHAPTER 4: USING THE MCX MANAGEMENT CONSOLE

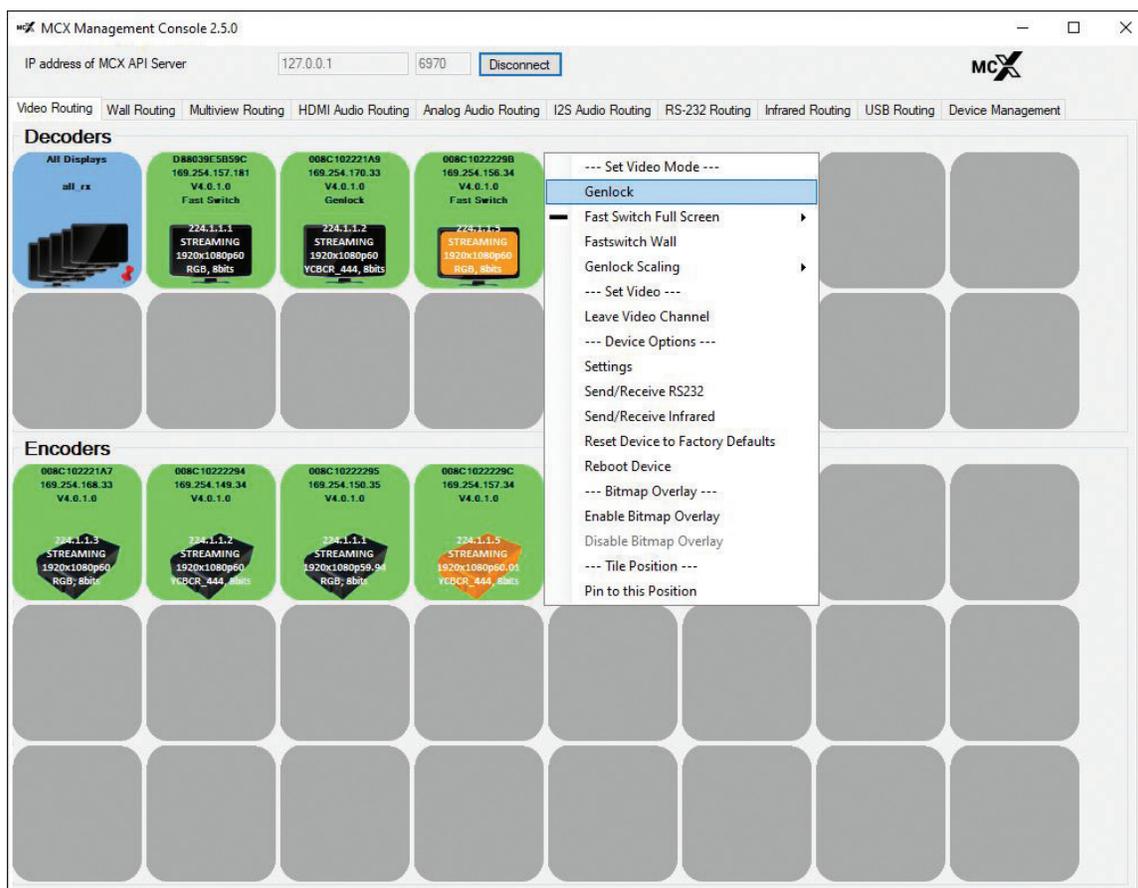


FIGURE 4-2. APPLYING GENLOCK MODE TO A DECODER

5. The video source connected to the encoder (TX) now appears on the display connected to the decoder (RX).

If the video is not being displayed, then verify the following:

- ◆ Ensure that the network switch is properly configured.
- ◆ Confirm that the display supports the source resolution being sent.
- ◆ Also, verify that the HDMI cable used is of high quality. This is particularly important for 4K 60 Hz, which requires a premium HDMI cable.

#### 4.1.2.2 ASSIGNING A NEW SOURCE TO A SINGLE DECODER (RX)

To assign a new source to a decoder (RX), repeat the above steps.

That is, drag the encoder (TX) with the desired source over the appropriate decoder (RX) to join the receiver itself to the new source.

## CHAPTER 4: USING THE MCX MANAGEMENT CONSOLE

### 4.1.2.3 SENDING A SINGLE SOURCE TO ONE OR MULTIPLE DECODERS

---

To feed the source of an encoder (TX) to one or more additional decoders (RX), drag and drop the encoder tile over each of the decoder devices the source is desired to be output from.

The same source will then be displayed and visible on all the associated displays.

Remember that when in Genlock mode, since each of the decoder (RX) displays are synchronized to the source, they are all synchronized to each other.

### 4.1.2.4 SENDING A SINGLE SOURCE TO ALL DECODERS

---

To send the same source to ALL decoders (RX), drag and drop the encoder (TX) that the desired source is connected to onto the blue tile labeled All Displays. This tile is found in the Decoder section.

All the decoders (RX) will now be synchronized to the source and since in Genlock mode to each other.

### 4.1.2.5 STOPPING/STARTING VIDEO

---

To stop video being transmitted out of an encoder (TX), right-click over the appropriate encoder and select Stop Video.

To start or restart video transmission, right-click over the appropriate encoder (TX) and then select Start Video.

It is also possible to stop video and free the multicast IP addresses assigned to the streams. This is done with the Stop and Free Channel option.

**WARNING!** If any decoders are currently subscribed to the multicast IP in question, they will remain subscribed. To prevent these decoders from potentially streaming an incorrect source if the multicast is assigned to a new stream, we recommend that you disconnect the decoder before freeing the channel. Refer to the next section.



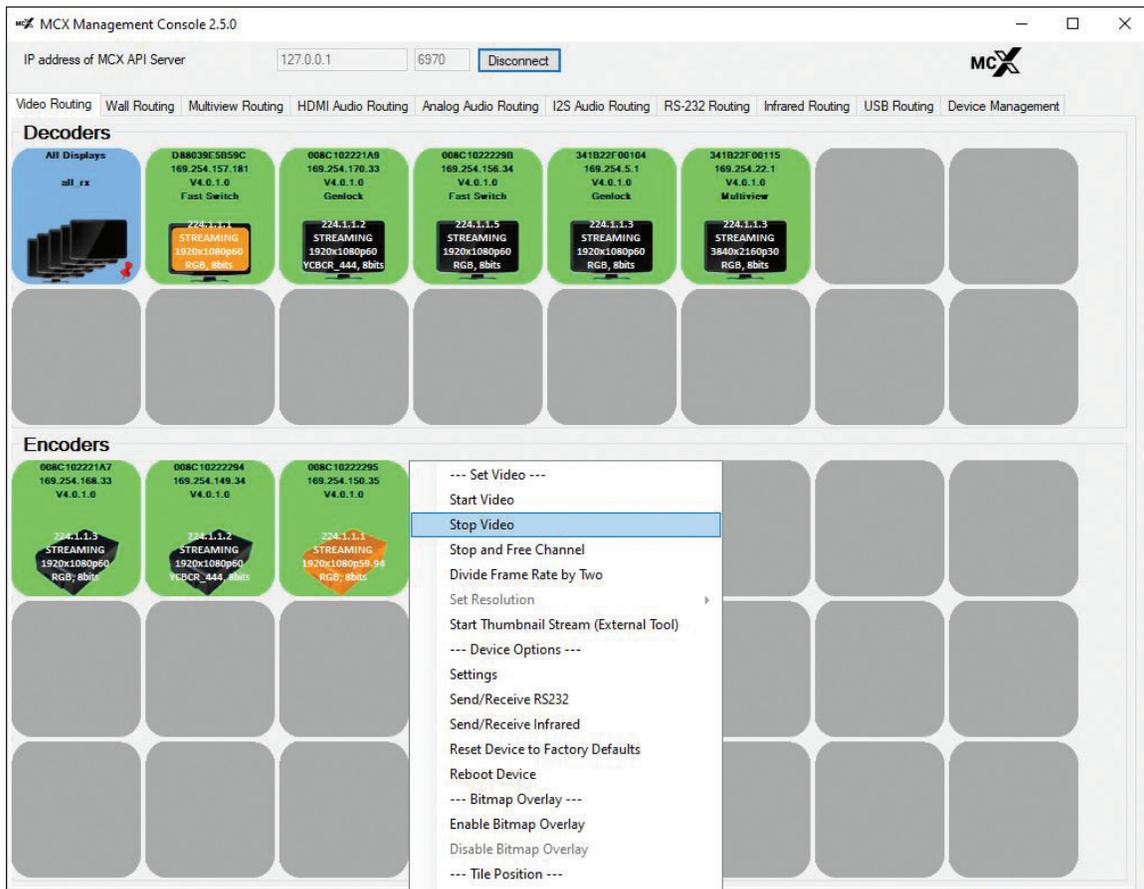


FIGURE 4-3. START/STOP OPTIONS OF ENCODER (TX) MENU

# CHAPTER 4: USING THE MCX MANAGEMENT CONSOLE

## 4.1.2.6 DISCONNECTING A SOURCE FROM A DECODER (RX)

To disconnect/unsubscribe a decoder (RX) from an encoder (TX) source, right-click over the appropriate decoder tile and select Leave Video Channel. This will unsubscribe only the decoder in question from the encoder stream.

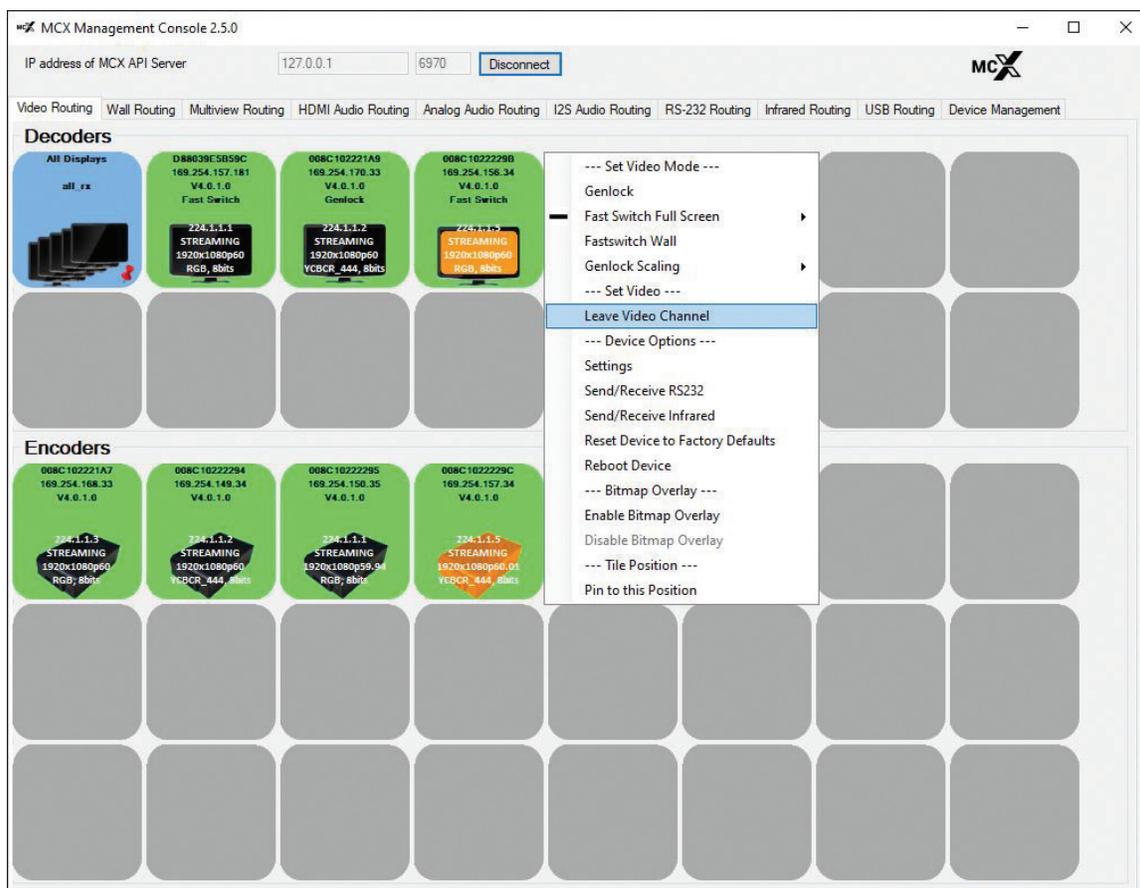


FIGURE 4-4. LEAVE VIDEO CHANNEL OPTION OF DECODER (RX) MENU

Disconnecting an encoder leaves the encoder (TX) stream active and available to other decoder (RX) devices that are currently subscribed to it.

## 4.1.3 FAST SWITCH MODE

The Fast Switch mode is only available on the MCX NT2000 chipset. One of the main advantages to using the Fast Switch mode is that when a source change is requested the switch occurs very quickly (it appears seamless to the human eye).



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### 4.1.3.1 SETTING A DECODER TO FAST SWITCH MODE

To implement Fast Switch:

If not currently running, launch the MCX Management Console application. For information on starting the GUI, refer to Section 2.5 Launching MCX Management Console.

Reminder: All discovered receiver (RX) devices are listed in the top half of under the header, Decoder and all the transmitter (TX) devices are listed on the bottom half under the header, Encoder.

1. Select the Video Routing tab.
2. Verify if the Encoder (RX) (green tile) is indicating that the device(s) is currently set to the Fast Switch mode.

If it is indicated that it is presently in Fast Switch mode, skip to step 4 below.

NOTE: Refer to Figure 3-1, Example of data displayed for decoder (RX) device tile.

3. If Fast Switch, as well as the desired resolution, is not currently set, apply the setting(s) as follows.
  - a. Right-mouse-click over the appropriate Decoder (RX) tile.
  - b. Select Fast Switch Full Screen.
  - c. From the list that appears, select the desired Framebuffer mode. Example: Crop to Fit> HD 1080p 60Hz.
  - d. The decoder changes to the selected video mode.

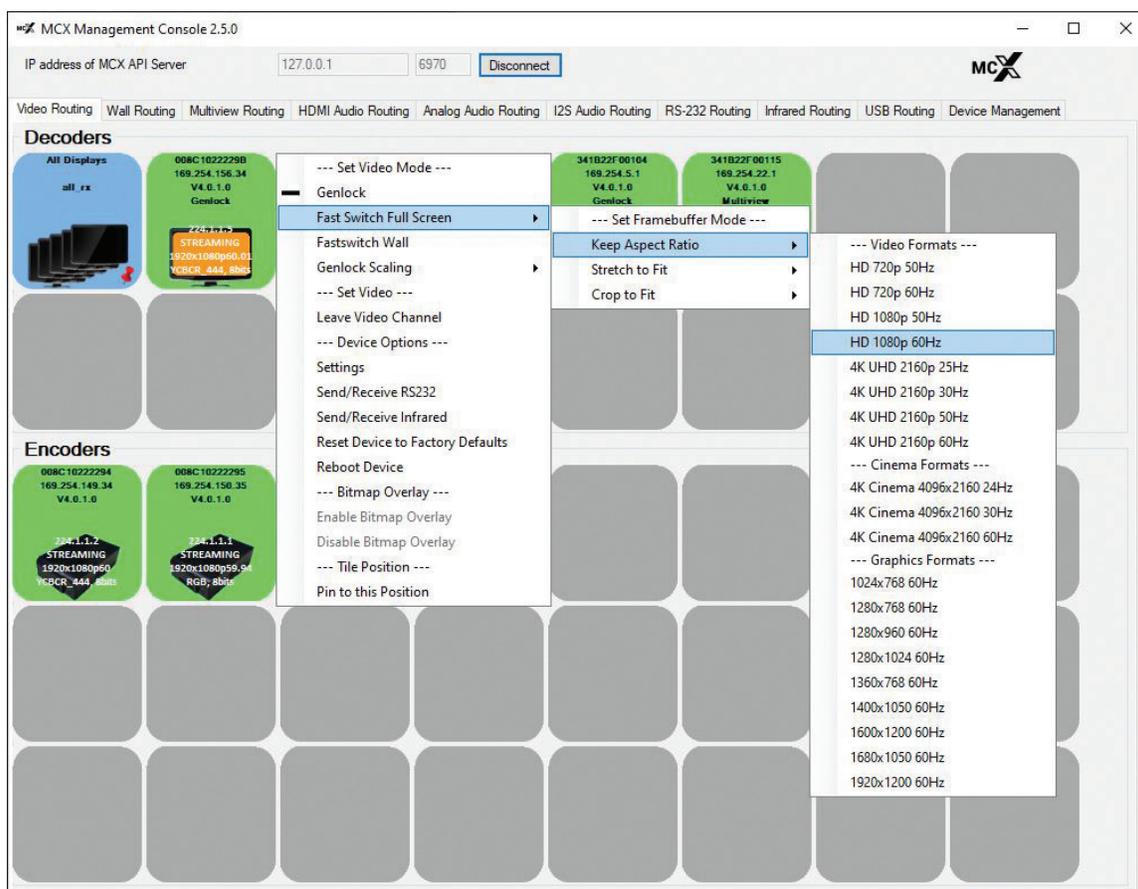


FIGURE 4-5. APPLYING FAST SWITCH MODE TO A DECODER (RX)

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4. Next, join the decoder (RX) to the desired encoder (TX).
  - a. In the Encoder section, select an encoder (TX) by clicking on its associated active (green) tile with left mouse button.
  - b. While holding down the left button, drag the encoder (TX) over the decoder (RX) tile it is to be joined with.
  - c. Release the mouse button to drop the encoder tile onto the decoder tile.
  - d. The encoder and decoder devices are now joined.
5. Video source connected to the encoder (TX) now appears on the display connected to the decoder (RX).

If the video is not being displayed, then verify the following:

- ◆ Ensure that the network switch is properly configured.
- ◆ Confirm that the display supports the source resolution being sent.
- ◆ Also, verify that the HDMI cable used is of high quality. This is particularly important for 4K 60Hz which requires a premium HDMI cable.

### 4.1.3.2 ASSIGNING A NEW SOURCE TO A SINGLE DECODER (RX)

---

To assign a new source to a decoder (RX), repeat the above steps.

That is drag the encoder (TX) with the desired source over the appropriate decoder (RX) to associate the receiver itself to the new source.

### 4.1.3.3 SENDING A SINGLE SOURCE TO ONE OR MULTIPLE DECODERS

---

To feed the source of an encoder (TX) to one or more additional decoders (RX), drag and drop the encoder tile over each of the decoder devices the source is desired to be output from.

The same source will then be displayed and visible on all the associated displays.

### 4.1.3.4 SENDING A SINGLE SOURCE TO ALL DECODERS (RX)

---

To send the same source to ALL decoders (RX), drag and drop the encoder (TX) that the desired source is connected to onto the blue tile labeled All Displays. This tile is found in the Decoder section.

### 4.1.3.5 STOPPING/STARTING VIDEO

---

To stop video being transmitted out of an encoder (TX), right-click over the appropriate encoder and select Stop Video.

To start or restart video transmission, right-click over the appropriate encoder (TX) and then select Start Video.

It is also possible to stop video and free the multicast IP addresses assigned to the streams. This is done with the Stop and Free Channel option.

**WARNING!** If any decoders are currently subscribed to the multicast IP in question, they will remain subscribed. To prevent these decoders from potentially streaming an incorrect source if the multicast is assigned to a new stream, we recommend that you disconnect the decoder before freeing the channel. Refer to the next section.

Refer to Figure 4-3, Start/Stop options of encoder (TX) menu.



## CHAPTER 4: USING THE MCX MANAGEMENT CONSOLE

### 4.1.3.6 DISCONNECTING SOURCE FROM DECODER (RX)

---

To disconnect/unsubscribe a decoder (RX) from an encoder (TX) source, right-click over the appropriate decoder tile and select Leave Video Channel.

Disconnecting an encoder leaves the encoder (TX) stream active and available to other encoder (RX) devices that are currently subscribed to it.

Refer to Figure 4-4, Leave Video Channel option of decoder (TX) menu.

### 4.1.4 GENLOCK SCALING MODE

---

The Genlock Scaling mode is only available on the MCX Controller NT2000 chipset. This mode combines the low latency and source locking benefits of Genlock with the output scaler found in the Fast Switch mode.

#### 4.1.4.1 SETTING A DECODER TO GENLOCK SCALING MODE

---

To implement Genlock Scaling:

If not currently running, launch the MCX Management Console application. For information on starting the GUI, refer to Section 2.5, Launching MCX Management Console.

Reminder: All discovered receiver (RX) devices are listed in the top half of under the header, Decoder and all the transmitter (TX) devices are listed on the bottom half under the header, Encoder.

1. Select the Video Routing tab.
2. Verify if the Encoder (RX) (green tile) is indicating that the device(s) is currently set to the Genlock Scaling mode.

If it is indicated that it is presently in Genlock Scaling mode, skip to step 4 below.

NOTE: Refer to Figure 2-1, Example of data displayed for decoder (RX) device tile.

3. If Genlock Scaling is not the currently active mode, apply the setting(s) as follows.
  - a. Right-mouse-click over the appropriate Decoder (RX) tile.
  - b. Select Genlock Scaling and the appropriate video format from the list provided.
  - c. The decoder changes to the selected video mode.

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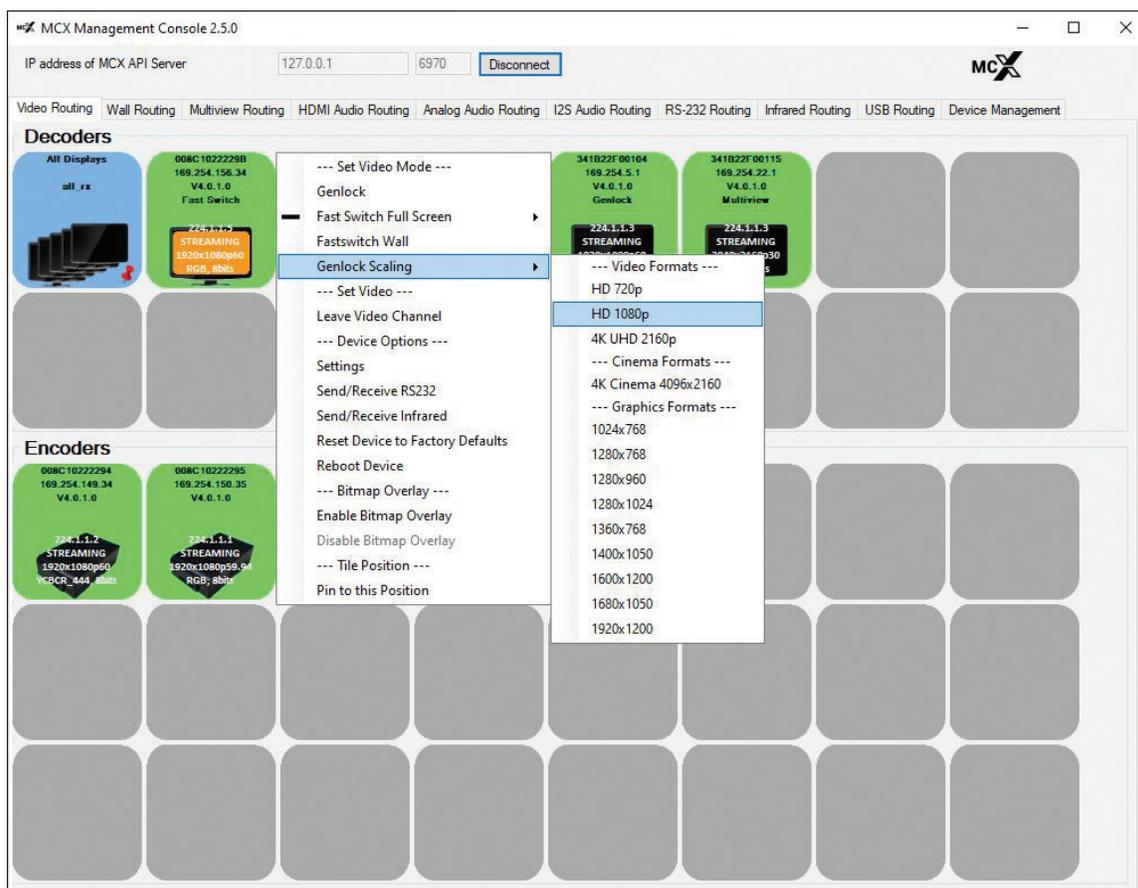


FIGURE 4-6. APPLYING GENLOCK SCALING MODE TO A DECODER (RX)

4. Next join the decoder (RX) to the desired encoder (TX).
  - a. In the Encoder section, select an encoder (TX) by clicking on its associated active (green) tile with left mouse button.
  - b. While holding down the left button, drag the encoder (TX) over the decoder (RX) tile it is to be joined with.
  - c. Release the mouse button to drop the encoder tile onto the decoder tile.
  - d. The encoder and decoder devices are now joined.
5. Video source connected to the encoder (TX) now appears on the display connected to the decoder (RX).

If the video is not being displayed, then verify the following:

- ◆ Ensure that the network switch is properly configured.
- ◆ Confirm that the display supports the source resolution being sent.
- ◆ Also, verify that the HDMI cable used is of high quality. This is particularly important for 4K 60 Hz, which requires a premium HDMI cable.

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### 4.1.4.2 ASSIGNING A NEW SOURCE TO A SINGLE DECODER (RX)

---

To assign a new source to a decoder (RX), repeat the above steps.

That is, drag the encoder (TX) with the desired source over the appropriate decoder (RX) to associate the receiver itself to the new source.

### 4.1.4.3 SENDING A SINGLE SOURCE TO ONE OR MULTIPLE DECODERS

---

To feed a source input of an encoder (TX) to one or more additional encoders (RX), drag and drop the encoder to each of the decoder devices the source is desired to be output from.

The same source is then displayed and visible on all the associated displays. In Genlock mode, since each of the decoder (RX) displays are synchronized to the source, they are all synchronized to each other.

### 4.1.4.4 SENDING A SINGLE SOURCE TO ALL DECODERS

---

To send the same source to ALL decoders (RX) devices, drag and drop the encoder (TX) device that the desired source is connected to onto the blue tile located in the Decoder section labeled All Displays.

All decoders (RX) will be synchronized to the encoder (TX) and in Genlock mode to each other.

### 4.1.4.5 STOPPING/STARTING VIDEO

---

To stop video being transmitted out of an encoder (TX), right-click over the appropriate encoder and select Stop Video.

To start or restart video transmission, right-click over the appropriate encoder (TX) and then select Start Video.

It is also possible to stop video and free the multicast IP addresses assigned to the streams. This is done with the Stop and Free Channel option.

**WARNING!** If any decoders are currently subscribed to the multicast IP in question, they will remain subscribed. To prevent these decoders from potentially streaming an incorrect source if the multicast is assigned to a new stream, we recommend that you disconnect the decoder before freeing the channel. Refer to the next section.

Refer to Figure 4-3, Start/Stop options of encoder (TX) menu.

### 4.1.4.6 DISCONNECTING A SOURCE FROM A DECODER (RX)

---

To disconnect/unsubscribe a decoder (RX) from an encoder (TX) source, right-click over the appropriate decoder tile and select Leave Video Channel.

Disconnecting an encoder leaves the encoder (TX) stream active and available to other encoder (RX) devices that are currently subscribed to it.

Refer to Figure 4-4. Leave Video Channel option of decoder (TX) menu.

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### 4.2 WALL ROUTING TAB

Wall Routing allows for a single source of an encoder (TX) to be assigned to multiple decoders (RX). Then, each decoder (RX) will display an assigned portion of the source allowing for it to be distributed across multiple displays as a single wall.

There are two Wall modes supported by the MCX Controller NT2000 chipset:

- ♦ Genlock Wall mode (synchronized)
- ♦ Fast Switch Wall mode (asynchronous)

#### 4.2.1 OVERVIEW OF THE WALL ROUTING TAB

---

The Wall Routing tab is divided into a few sections:

The Wall Parameter section provides a series of parameters that specify:

- ♦ The MCX Controller Wall Size represents the number of displays that will make up the Video wall. It is adjusted by changing the number of rows and columns.
  - Bezel correction values are specified in number of image pixels. The Bezel default value is set to 16 pixels. Increasing this value applies a thicker bezel correction, while a value of zero would indicate no bezel correction is to be applied.
  - Checkbox to enable the Fast Switch Wall mode.
- ♦ The Wall Decoders section is reserved for configuring and setup of the Wall itself. It is a graphical representation of the displays that assemble the Wall.
- ♦ The bottom portion of the Wall Routing tab is divided into two sub-sections where all available Decoders (receivers) and Encoders (transmitters) are listed.



## CHAPTER 4: USING THE MCX MANAGEMENT CONSOLE

The Wall Routing tab shown next illustrates the Wall Routing tab of the MCX Management Console.

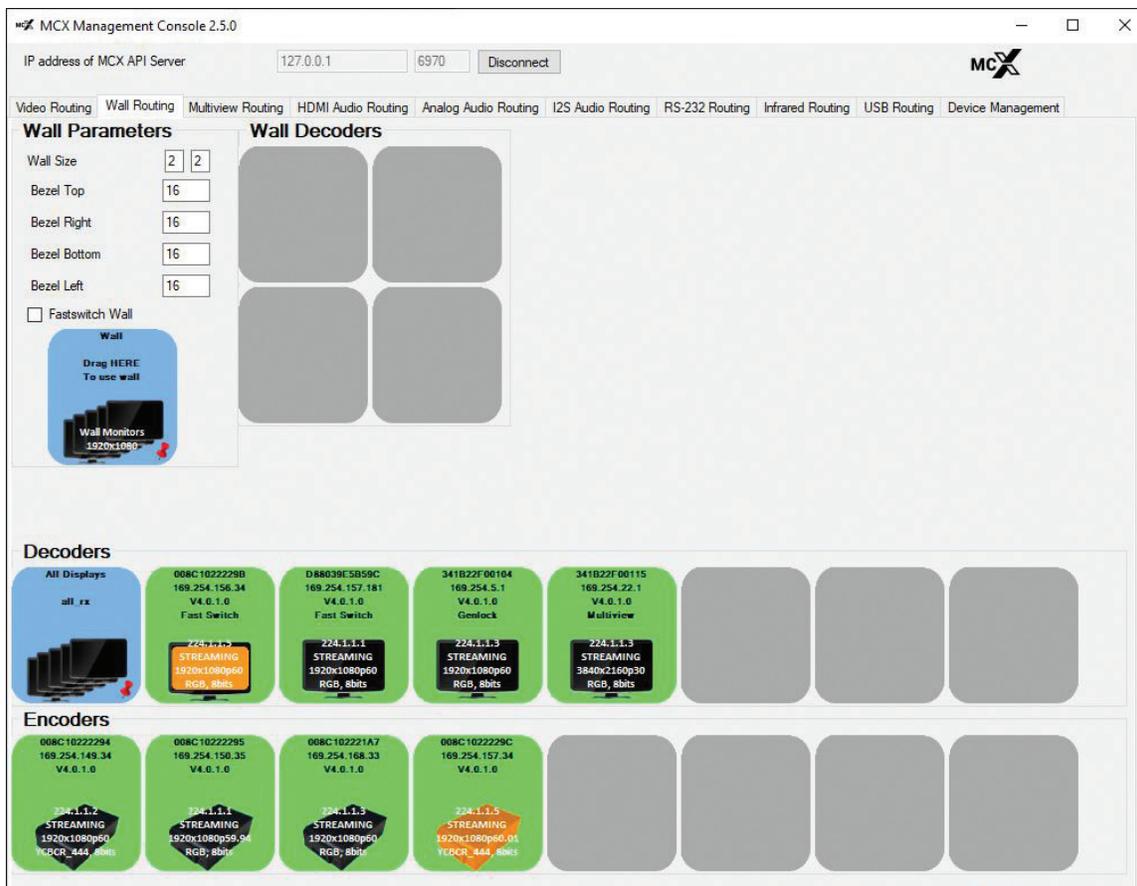


FIGURE 4-7. WALL ROUTING TAB

### 4.2.2 CONFIGURING A SYNCHRONIZED WALL

In this section, the procedure to configure and assign a Wall using the MCX Management Console is reviewed. Specifically, this section outlines:

- ◆ Specifying the Wall size.
- ◆ Assigning decoders (RX's) to a Video Wall display.
- ◆ Assign a source from an encoder (TX) to a Wall.
- ◆ Adjusting Bezel correction.

Before configuring the Wall, if not currently running, launch the MCX Management Console application. For information on starting the GUI, refer to Section 2.5, MCX Management Console.

1. Select the tab labeled Wall Routing. All the discovered receiver (RX) devices will appear under the header, Decoder and the transmitter (TX) devices under the header, Encoder.

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### 2. Specify the Wall Size.

- Under the section Wall Parameter beside the heading Wall Size, enter the number of displays in rows and columns that make up the Video Wall array.

Example, enter 2x2 beside heading Wall Size to specify four displays mounted in a 2x2 array or 3x2 to represent six displays, mounted in a three horizontal by two vertical wall array.

- Enter the Bezel Compensation to be applied for the top, right, bottom and left inside borders of displays that incorporate the wall array.



FIGURE 4-8. 3 X 2 WALL ARRAY

- Next, assign the appropriate decoders (RX) to the Wall. Assign each of the decoders (RX) that are attached to the displays that are to create the wall onto the Wall Decoders tile located in the position it is to be assigned to. Example, upper left tile or bottom right tile, etc.

- From the Decoders section, left-click on decoder (RX) that is to be assigned to the Wall.
- Drag and drop it over the tile on the Wall Decoders layout in the position it is to be assigned to.

### 4. Next assign the source that will feed the Wall.

Drag the encoder (TX) source tile and drop it onto the blue tile that is labeled Wall.

- From the Encoders section, left-click on encoder (TX) that is attached to the source that is to be displayed on the Wall.
- Drag and drop it over the Wall tile.

- The source will now be distributed across the complete Wall matrix.

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6. If appropriate, adjust the Bezel's correction values (top-right-bottom-left), to adjust the Bezel thickness that is to be applied. Reminder that Bezel correction is applied in image pixels.

NOTE: To apply the new bezel values, you may need to reassign the transmitter to the wall. This is completed by reassigning the source to the Wall (drag-and-drop the encoder (TX) onto the blue Wall tile).

### 4.2.3 APPLYING A FAST SWITCH WALL MODE

---

To apply the Fast Switch mode:

1. Click on the Wall Routing tab.
2. Select the checkbox, FastSwitch Wall.
3. Drag the Encoder (TX) that is to be the source over the blue tile labeled Wall.

### 4.2.4 REMOVING A DECODER (RX) FROM A WALL

---

This section reviews the process to remove (unassign) a decoder (RX) from a Wall configuration using the MCX Management Console.

To remove a decoder (RX) from the Video Wall:

1. Under the header Wall Decoders, right-mouse-click over the Wall tile that represents the decoder (RX) that is to be removed from the wall.
2. Then from the menu that appears, select the option Remove from wall.

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FIGURE 4-9. REMOVING A DECODER (RX) FROM A WALL

## 4.2.5 CHANGING THE OUTPUT RESOLUTION

You can manage all the output resolution for the decoders (RX) assigned to a Video Wall.

**NOTE:** When using the MCX Management Console, the selected output resolution is applied to the whole of the Video Wall. The MCX Controller Server supports applying different output resolutions to each decoder (RX), but this could result in notable distortion to the source.

1. To control the decoder output resolution, right-click over the blue Wall tile.
2. Select Wall Monitors Resolutions and then choose the appropriate resolution from list of available options. See the figure shown next for supported resolutions.
3. The selected output resolution is applied to all the decoders (RX) that are assigned to the wall.

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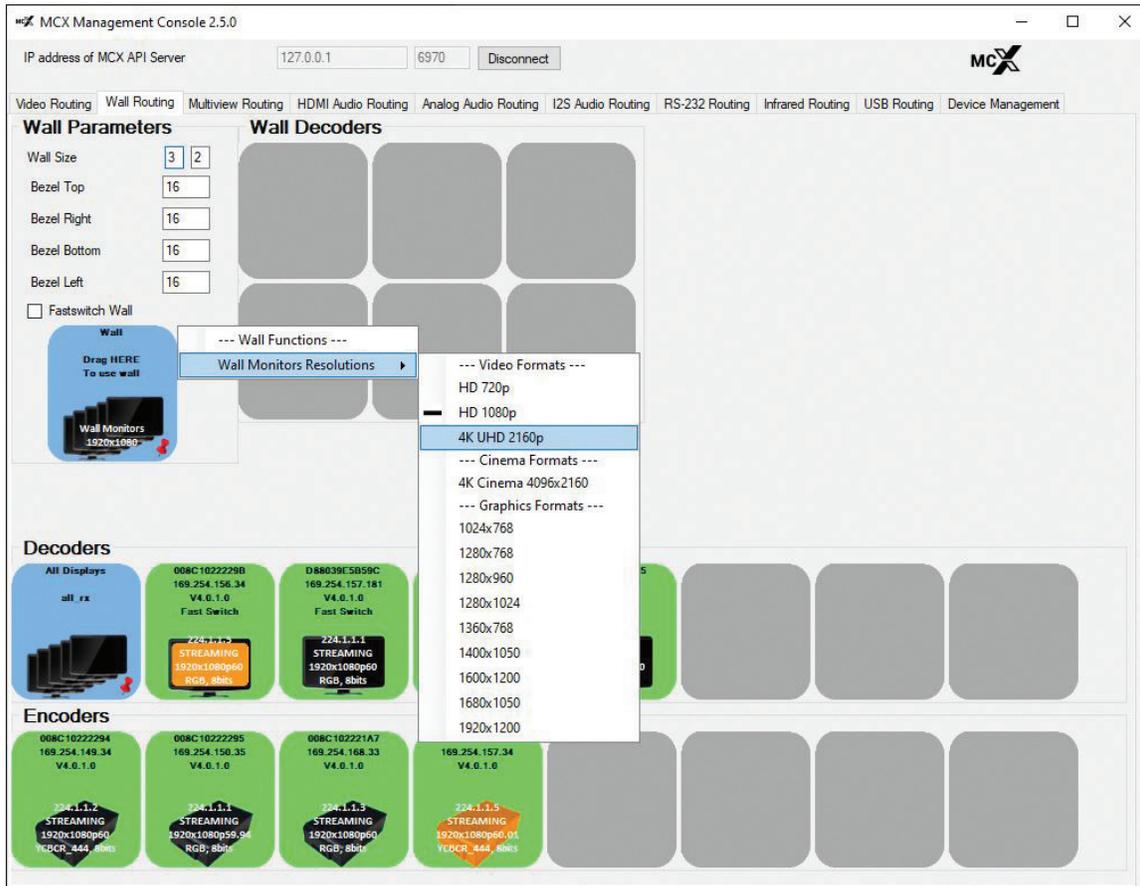


FIGURE 4-10. CHANGING WALL RESOLUTIONS

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### 4.3 MULTIVIEW ROUTING TAB

The MCX Controller NT2000 chipset supports the ability to display multiple sources from encoders (TXs) on a single decoder (RX) output display. The Multiview Routing tab is used to create and setup the Multiview layouts, as well as switch between configured Multiview layouts.

Before loading multiview layouts, if not currently running, launch the MCX Management Console application. For information on starting the GUI, refer to Section 2.5, Launching MCX Management Console.

1. Select the tab labeled Multiview Routing. All the discovered receiver (RX) devices will appear under the header, Decoder and the transmitter (TX) devices under the header, Encoder.



FIGURE 4-11. MULTIVIEW ROUTING PAGE IN THE MCX MANAGEMENT CONSOLE

#### 4.3.1 MULTIVIEW ROUTING: LOADING SAMPLE LAYOUT

Next, load the multiview script that contains the layout you want to load into the MCX Management Console.

An example script is provided with the GUI that defines a series of sample layouts that can be loaded during the evaluation of the MCX Controller platform. This file is named example-layouts.txt.

To load the example layout script:

1. In the MCX Management Console, select the tab labeled, Multiview Routing.
2. Click the button labeled Load.

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3. Select the script file provided with the MCX Management Console labeled example-layouts.txt from the dialog box that appears.

NOTE: By default, the example script is in the same folder as where the MCX Management Console executable is installed.

4. The Multiview script will load the sample layouts into the MCX Controller Control Server.

The default Multiview layouts provided with the example script are:

example\_picture\_in\_picture\_1080p: This layout has a size of 1920 x 1080 pixels that displays picture-in-picture.

example\_4k\_single\_source\_2x2\_1080p: This layout has a size of 3840 x 2160 that displays a single 1080p video source four times in a 2x2 arrangement.

example\_4k\_three\_sources\_1080p\_half\_1080p\_640x480: This is a more complex layout with a size of 3840 x 2160 pixels that displays a 1080p video source (source 0) in the center with two smaller sources repeated around the first: 960x540 video source (source 1) and a 640x480 video source (source 2).

In addition, the Multiview layout dropdown provides one predefined layout that supports the "legacy" MCX Controller NT+ chipsets:

Compatibility\_4k\_2x2: This is a layout set with total size of 3840x2160 that display four 1080p video sources in 2x2 arrangement. It is a read only so not modifiable.

To load the Multiview Layout, click on the Load button.

5. Next apply a layout and assign to a decoder (RX):

a. Click on the drop-down list next to the heading Multiview layout.

b. Select the layout to load.

c. Then drag the appropriate decoder tile from the Decoders section and drop it over the blue Multiview tile.

This option is located in the top-left corner of the interface under the label, Multiview Device. The Multiview tile contains the message, Drag HERE To use Multiview.

d. The layout is applied and the various video subscriptions are shown in the Multiview Surfaces panel, located in top of the interface immediately beneath the Multiview layout drop-down list.

The surfaces that are associated with a window in the selected layout will have a display screen icon displayed.

The figure shown next is a screen capture of the Multiview Routing tab, outlining the four distinct areas the Multiview Routing tab is divided into:

1. Multiview Device – assign an Encoder by dragging and dropping it over the Multiview tile.
2. Multiview Surfaces – indicates a display for the selected layout showing the active tiles.
3. Decoders – displays the discovered Decoders (RX) on the network.
4. Encoders – displays the discovered Encoders (TX) on the network

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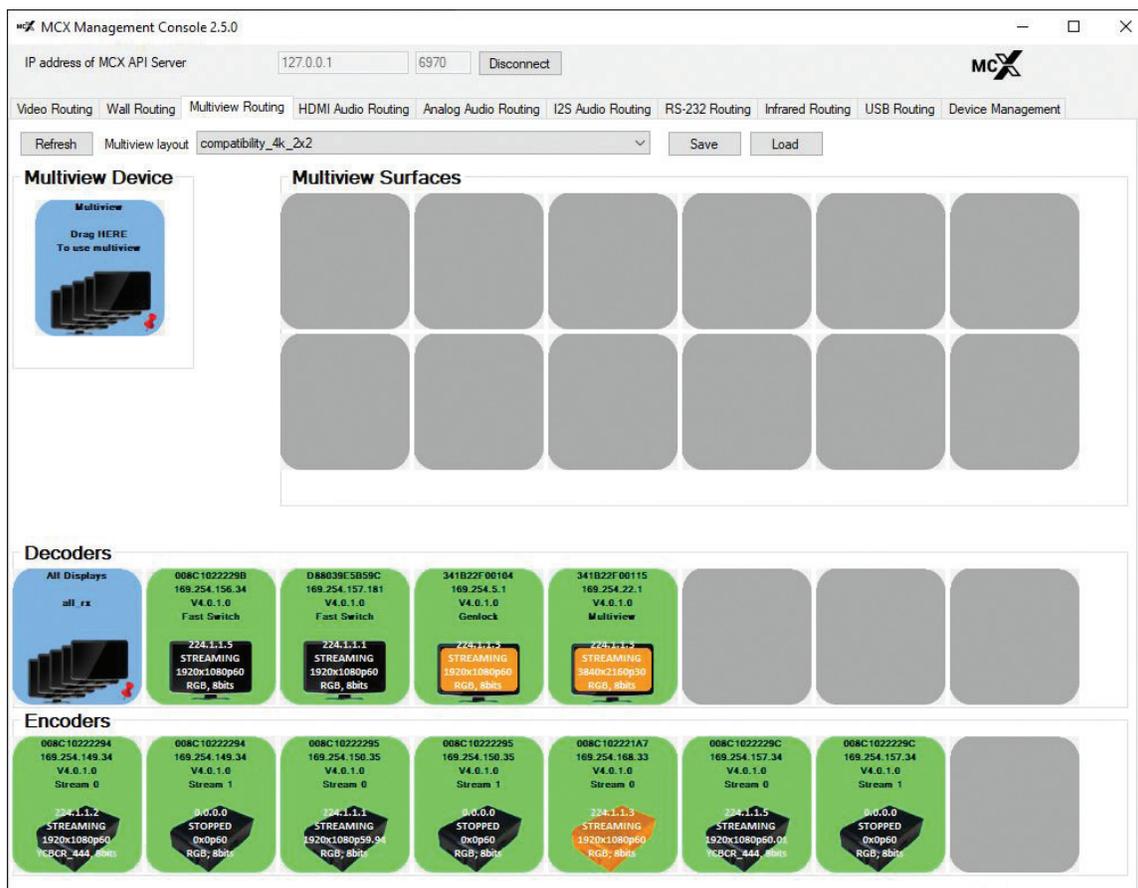


FIGURE 4-12. MULTIVIEW ROUTING INTERFACE

### 4.3.2 JOINING ENCODERS TO A MULTIVIEW DECODER

To subscribe an encoder(s) to the Multiview layout, drag-and-drop the desired encoder stream onto the subscription(s) that are associated to a layout window.

The Encoders panel displays a tile for each of the two (2) streams for each individual MCX Encoder (TX) device:

- ♦ Stream 0 Provides the native stream and is available to all receivers on the network. The receivers can use it when in Genlock, Fast Switch, Genlock Scaling, Video Wall or Multiview mode.
- ♦ Stream 1 A scaled stream, which is also available to all receivers. While it is meant for Multiview, it can be used by decoders operating in Fast Switch mode. The scaled down stream is not available to receivers operating in Genlock, Genlock Scaling or Video Wall modes.

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FIGURE 4-13. EXAMPLES OF ENCODER TILES FOR STREAM 0 AND STREAM 1

## 4.3.3 MULTIVIEW MODE TIPS AND WARNINGS

For these tips, the MCX Management Console Multiview Routing tab with the compatibility\_4K\_2x2 layout loaded is being used as the example. As explained earlier, this layout has size of 3840 x 2160 pixels and displays four 1080p video sources in a 2 x 2 layout arrangement. Total of 4 subscriptions are available, each connected to a layout window.



FIGURE 4-14. EXAMPLE USING COMPATIBILITY\_4K\_2X2 LAYOUT

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### 4.3.3.1 TIPS

When using one of the sample layouts, drag-and-drop an Encoder source onto each Multiview tile to subscribe the source to the layer. For the example layout loaded here, we would drag-and-drop four different 1920 x 1080 Encoder streams onto each of the “active” subscriptions.

If streams do not automatically start, right-click over the appropriate encoder (RX) and select Start Video.

To change the current resolution of a Scaled stream:

- ◆ Right-click on the encoder “Scaled” stream.
- ◆ From the menu that appears, select Set Resolution.
- ◆ Select the desired Scaler resolution from the list provided.
- ◆ Refer to Figure 4-15, Changing Multiview Resolution.

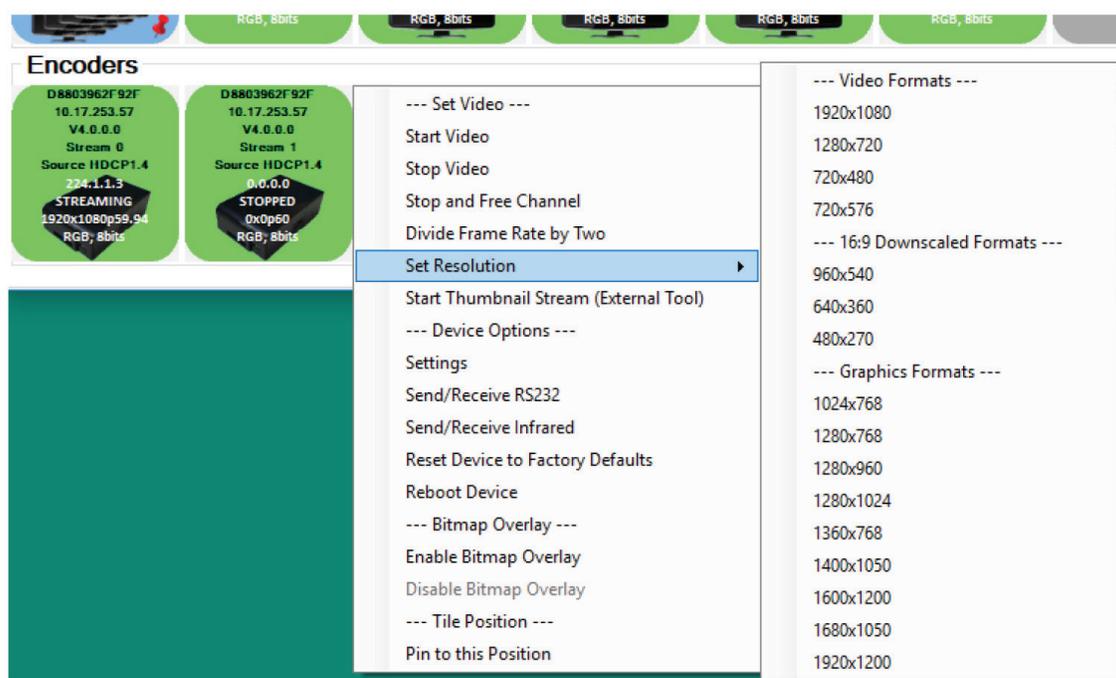


FIGURE 4-15. CHANGING MULTIVIEW RESOLUTION

**Divide Frame Rate by Two option:**

- ◆ If the total bandwidth usage is going to surpass the 10GbE network pipe, then apply the frame rate conversion option to lower the total bandwidth used.
- ◆ Looking at the above example, if sources are 60 Hz, four 1920 x 1080 60 Hz streams will exceed the 10G bandwidth pipe on the decoder.
- ◆ To drop the frame rate down to 30 Hz, right-click over the Encoder (TX) and select Divide Frame Rate by Two. This will reduce the bandwidth usage.

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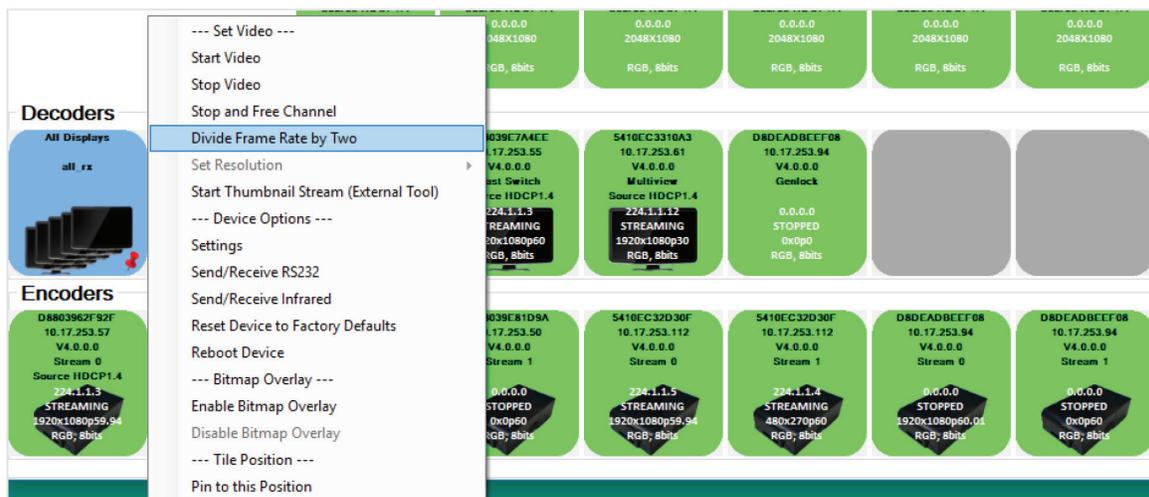


FIGURE 4-16. DIVIDE FRAME RATE BY TWO OPTION

### 4.3.3.2 WARNINGS!

- If Divide Frame Rate by Two is applied to the native stream (stream 0), the native stream will no longer be able to be used by a Decoder (RX) operating in Genlock, Genlock Scaling or Wall Routing modes.
- The Decoder (RX) can still use the native stream (stream 0) when in Fast Switch or Multiview mode.
- Multiview cannot use the native stream (stream 0) if the native stream is interlaced (not progressive), uses sub-sampled color space (i.e. YUV 422 or 420) or has a higher than 8-bit color depth. In these cases, the scaled stream (stream 1) will need to be applied.

### 4.3.4 MULTIVIEW SCRIPT FILE

An MCX Controller Multiview script consists of MCX Controller API commands.

The API commands are a set of text commands that control software, in this case the MCX Management Console, sent to the MCX Controller Server to control and manage discovered devices.

When a Multiview script file is loaded through the MCX Management Console, the GUI reads each command within the script and issues it as a text command to the MCX Controller Server. The MCX Controller Server then sends each of the commands to the appropriate MCX devices.

As outlined earlier a default sample script is provided with the MCX Management Console, however, it is possible to create custom layout scripts.

To create and/or apply additional Multiview layouts, the example file can either be modified to include new Multiview layouts or a new text file can be created containing the required API commands to manage the desired layouts. The text file can contain additional supported API commands, then when the script is applied, these commands will automatically be executed.

Example of commands that could be included in the script:

- Join encoders to layout subscriptions
- Start streams
- Scale the native stream

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- ♦ Reduce video frame rate coming from an encoder

To load a new script file, use the Load button of the MCX Management Console and browse to location of the new file and select it.

### 4.4 HDMI AUDIO ROUTING TAB

When using the MCX Management Console, the HDMI audio is routed separately from the video. The HDMI Audio Routing tab is used to manage HDMI audio.

Reminder: The MCX Controller issues the MCX Controller API split audio command automatically when it launches. In many use cases, it is required to route HDMI audio separately. As an example, routing the HDMI audio to additional or different decoders than the HDMI video.

Exception: When in Genlock mode, the HDMI audio follows the video when one or more decoders (RX) are joined with an encoder (TX) from any of the video routing tabs (Video, Wall, Multiview, etc.). Simply put, this means that when a decoder (RX) is in Genlock, it receives both the HDMI video and the HDMI audio.



FIGURE 4-17. HDMI AUDIO TAB

## CHAPTER 4: USING THE MCX MANAGEMENT CONSOLE

### 4.4.1 ROUTING HDMI AUDIO

---

Before managing HDMI Audio, if not currently running, launch the MCX Management Console application. For information on starting the GUI, refer to Section 2.5 Launching MCX Management Console.

1. To route HDMI audio, select the tab labeled HDMI Audio Routing.

All discovered receiver (RX) devices are listed under the header, Decoder and the transmitter (TX) devices are listed on the bottom half under the header, Encoder.

2. Verify the decoder (RX) is currently joined to the appropriate encoder (TX).

a. Click on the appropriate decoder (RX) and the encoder(s) (TX) it is joined with are highlighted in orange.

b. Selecting an Encoder (RX) will also highlight all the Decoders (RX) it is joined with.

c. Refer to Section 4.1.1, Confirming which Encoders joined to Decoder, for details.

3. If presently the appropriate encoder (TX) is not joined to the desired decoder (RX), join them:

a. In the Encoder section, select an encoder (TX) by clicking on its associated active (green) tile with the left mouse button.

b. Drag-and-drop the tile over the decoder (RX) tile it is to be joined with.

c. The Encoder (TX) and Decoder (RX) are now joined.

d. Repeat above steps to join additional decoders (RX) to the encoder (TX).

4. To specify where the HDMI audio is sent out on a decoder (RX), complete the following steps:

a. Right-click over the decoder (RX) tile that the audio is to be configured for, and from the menu that appears, select Settings.

b. To direct audio to the HDMI output, select the HDMI Encoder tab and then choose one of the following options:

- HDMI Audio (All Available Channels) to select the original multichannel audio.
- HDMI Audio (Stereo Downmix) to select downmixed 2-channel audio (NT2000 only).
- Analog Audio option to send the audio to the Analog output connector.
- I2S Audio to send the audio to the quad I2S output connector.

5. Click Save to apply the changes.

6. The sound device connected to the decoder (RX) will now play out the HDMI audio stream.

TIP: If audio is not playing out, confirm that the encoder (TX) device is streaming. Also, verify that the decoder (RX) audio output settings are correct.

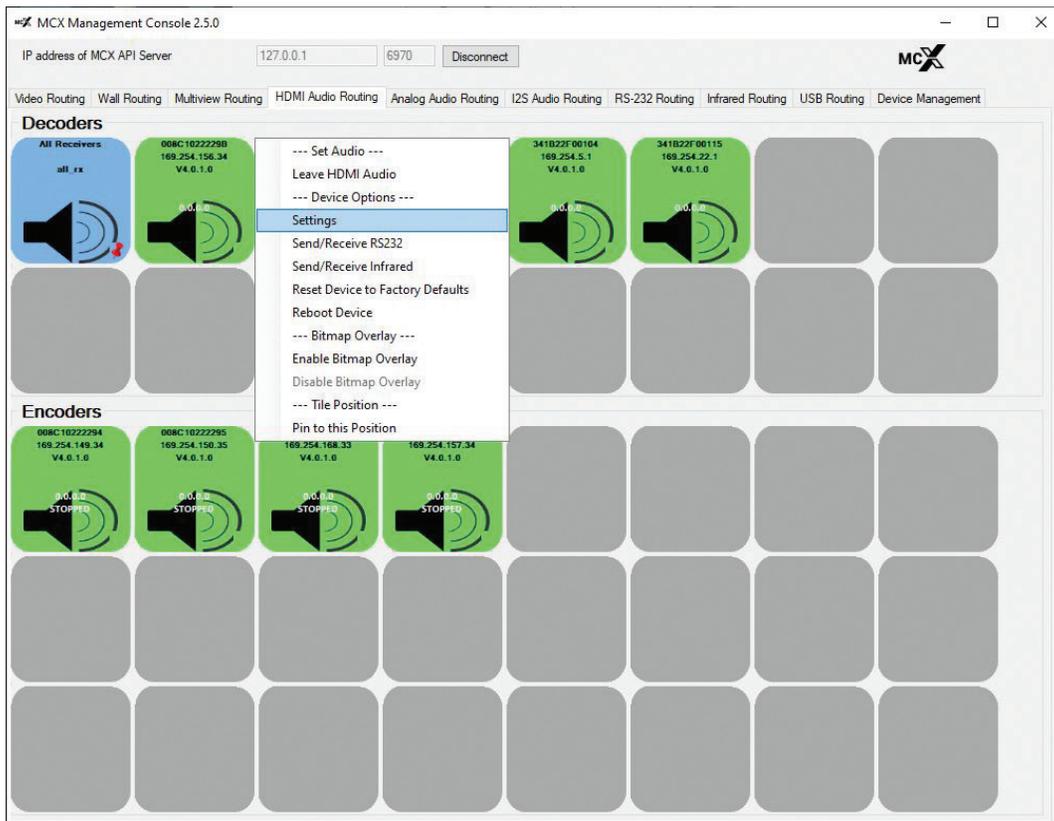


FIGURE 4-18. HDMI AUDIO ROUTING TAB – SETTINGS OPTION

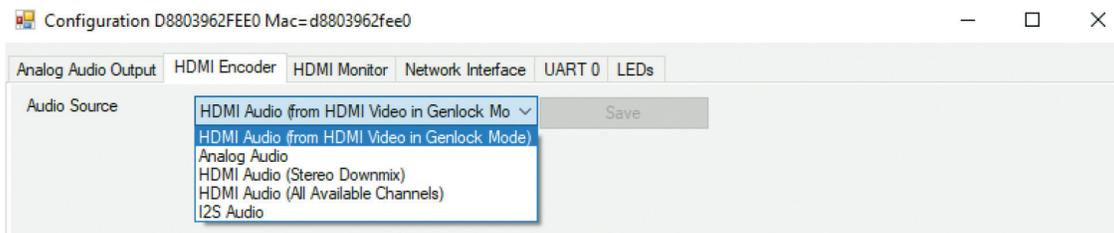


FIGURE 4-19. DECODER (RX) HDMI AUDIO SOURCE SELECTION OF HDMI ENCODER TAB

## CHAPTER 4: USING THE MCX MANAGEMENT CONSOLE

### 4.4.2 SENDING AN HDMI AUDIO SOURCE TO ALL DECODERS

To distribute the HDMI audio from a single encoder (TX) device to all decoder (RX) devices, from the HDMI Audio Routing tab drag-and-drop the appropriate Encoder onto the blue tile labeled All Receivers.

### 4.4.3 STARTING/STOPPING HDMI AUDIO

To stop HDMI Audio being transmitted from an encoder (TX) device, right-click over the encoder device and select Stop HDMI Audio.

To start or restart the audio transmission, right-click over the appropriate encoder (TX) device and select Start HDMI Audio.

You can also stop the HDMI audio and free the multicast IP addresses assigned to the stream. This is done with the Stop and Free Channel option.

**WARNING!** If there are currently any decoders subscribed to the multicast IP in question, they will remain subscribed. To prevent these decoders from potentially streaming an incorrect source if the multicast is assigned to a new stream, we recommend that you disconnect the decoder before freeing the channel. Refer to the next section.



FIGURE 4-20. ENCODER (TX) HDMI AUDIO TAB – START/STOP OPTIONS

### 4.4.4 DISCONNECTING AN HDMI AUDIO SOURCE FROM A DECODER

To disconnect a decoder (RX) device from an encoder (TX) source, right-click over the decoder tile and select Leave HDMI Audio.

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FIGURE 4-21. DECODER (RX) HDMI AUDIO TAB – LEAVE OPTION

## 4.5 ANALOG AUDIO ROUTING TAB

The Analog Audio tab is used to setup and manage Single IS2 Audio Routing between decoder (TX) devices and encoder (RX) devices.

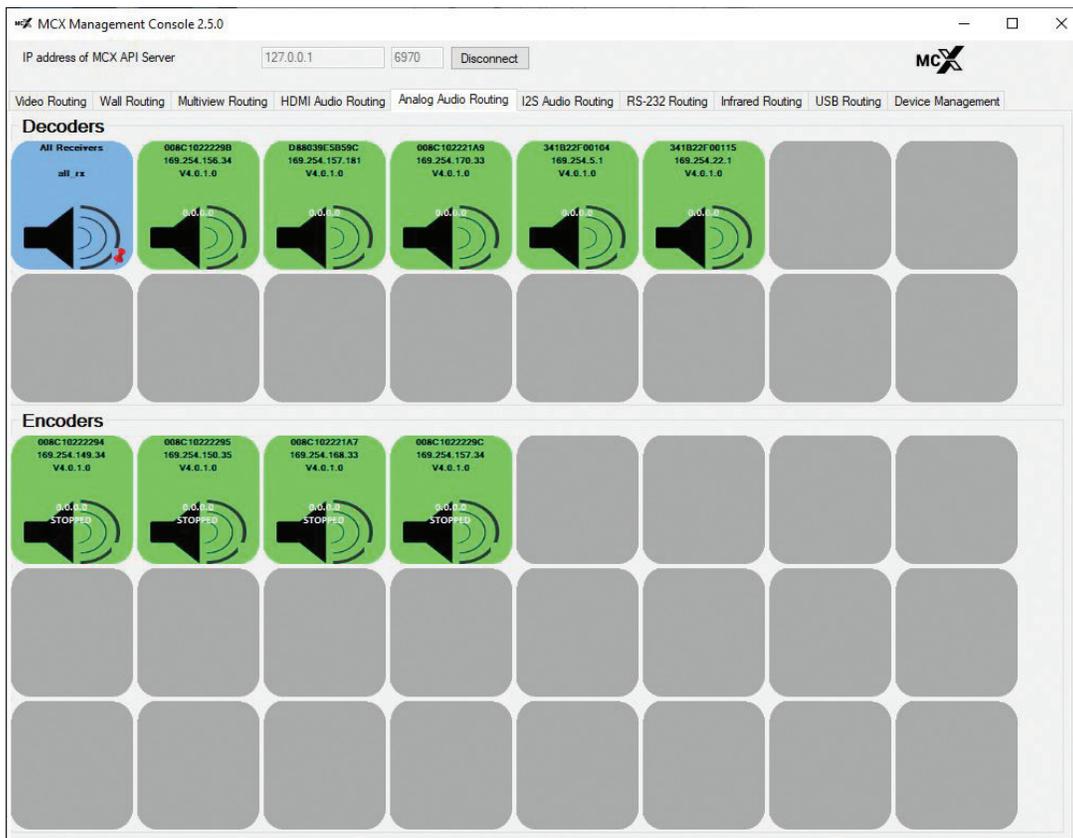


FIGURE 4-22. I2S (ANALOG) AUDIO ROUTING TAB

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### 4.5.1 ROUTING ANALOG AUDIO

Before managing Single I2S (Analog) Audio, if not currently running, launch the MCX Management Console application. For information on starting the GUI, refer to Section 2.5, Launching MCX Management Console.

1. Select the tab labeled Analog Audio routing.

All the discovered receiver (RX) devices are listed under the header, Decoder and the transmitter (TX) devices are listed on the bottom half under the header, Encoder.

2. Verify if the decoder (RX) is currently joined to the appropriate encoder (TX).

a. Click on the decoder (RX) and the encoder (TX) it is joined with is highlighted in orange.

b. Selecting the encoder will highlight all the decoders that it is joined with.

c. Refer to Section 4.1.1, Confirming which Encoders joined to Decoder for details.

3. If presently the appropriate encoder (TX) is not joined to the desired decoder (RX), join them:

a. In the Encoder section, select an encoder (TX) by clicking on its associated active (green) tile with the left mouse button.

b. Drag-and-drop the encoder (TX) tile over the decoder (RX) tile it is to be joined with.

c. The encoder and decoder are now joined.

d. Repeat the above steps if additional decoders are to be joined to the same encoder.

4. To control where and how Analog Audio is sent out, complete the following:

a. Connect a speaker or any type of analog audio receiver to the decoder (RX).

b. Right-click on the decoder (RX) and select Settings.

5. Next, to choose how the Analog audio is to be sent out on the Analog output connector port, complete the following steps:

a. Click on the Analog Audio Output tab

b. Choose the desired audio output option from the drop-down list provided:

- HDMI Audio (Downmix) - MCX NT2000 chipset only
- Analog Audio
- I2S Audio

6. Click Save to apply changes.

7. The sound device connected to the decoder (RX) will now play out the Analog audio stream.

Tip: If audio is not playing out, confirm that the encoder (TX) device is streaming. Also, verify the decoder (RX) audio output settings are correct.

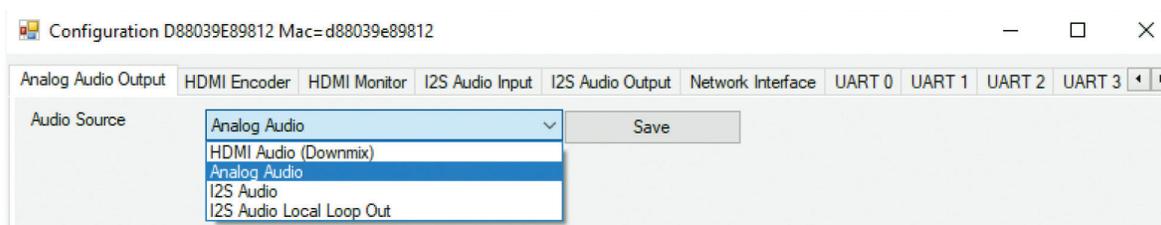


FIGURE 4-23. ANALOG AUDIO ROUTING TAB – SETTINGS > DECODER ANALOG AUDIO OUTPUT TAB

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## 4.5.2 SENDING A SINGLE ANALOG AUDIO SOURCE TO ALL DECODERS

To distribute separate Analog audio from a single encoder (TX) device to all decoder (RX) devices, in the Analog Audio Routing tab, drag-and-drop the Encoder onto the blue tile labeled All Receivers.

## 4.5.3 STARTING/STOPPING ANALOG AUDIO

To stop Analog Audio being transmitted from an encoder (TX) device, right-click over the encoder device and select Stop Analog Audio.

To start or restart the audio transmission, right-click over the appropriate encoder (TX) device and select Start Analog Audio.

You can also stop the Analog audio and free the multicast IP addresses assigned to the stream. This is done with the Stop and Free Channel option.

**WARNING!** If there are any decoders currently subscribed to the multicast IP in question, they will remain subscribed. To prevent these decoders from potentially streaming an incorrect source if the multicast is assigned to a new stream, we recommend that you disconnect the decoder before freeing the channel. Refer to the next section.



FIGURE 4-24. ENCODER (TX) ANALOG AUDIO TAB -- START/STOP OPTIONS

## 4.5.4 DISCONNECTING AN ANALOG AUDIO SOURCE FROM A DECODER

To disconnect a decoder (RX) device from an encoder (TX) source, right-click over the decoder (RX) tile and select Leave Analog Audio.

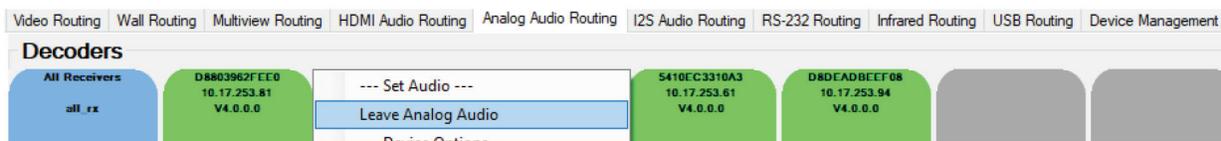


FIGURE 4-25. DECODER (RX) ANALOG AUDIO TAB -- LEAVE OPTION



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### 4.6 I2S AUDIO ROUTING TAB

The I2S Audio tab is used to setup and manage Quad I2S audio routing between encoder (TX) devices and decoder (RX) devices. Each device discovered on the network, whether it is an encoder (TX) or decoder (RX), is listed as both a Sender and a Receiver. This is because each device can potentially send or receive I2S Audio data.

NOTE: I2S may not be present in all hardware designs, if available the I2S tab automatically appears.

#### 4.6.1 ROUTING I2S AUDIO

If it is not currently running, launch the MCX Management Console application. For information on starting the GUI, refer to Section 2.5 Launching MCX Management Console.

1. Select the tab labeled I2S Audio routing. All the discovered MCX Controller devices, encoders (TX) and decoders (RX), are listed in both groups, Receivers and Senders.
2. Verify if the receiver(s) is currently joined to the appropriate Sender.
  - a. Click on the Sender or Receiver and the devices it is joined with be highlighted in orange.
3. If presently the appropriate senders and receivers are not joined, join them:
  - a. In the Encoder section, select a Sender by clicking on its associated active (green) tile with the left mouse button.
  - b. Drag-and-drop the tile over the Receiver tile it is to be joined with.
  - c. The MCX Controller devices are now joined.
  - d. Repeat above steps if additional devices are to be joined.
4. To control where and how I2S Audio is sent out complete the following steps:
  - a. Right click a Sender and select Settings.
  - b. Choose how the Quad I2S audio is to be managed on the I2S Input:
    - Click on the I2S Audio Input tab
    - Set the desired Sampling Frequency from the drop-down list provided. 22.05 kHz to 768 kHz range is supported.
    - Click Save to apply changes.
  - c. Select the number of channels from the Nb of channels drop-down list. From 2-to-8 channels supported.
    - Click Save to apply changes.

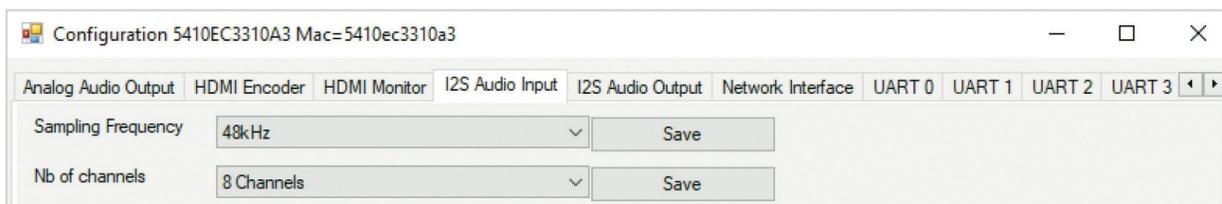


FIGURE 4-26. QUAD I2S SETTINGS WINDOW – I2S AUDIO INPUT OPTIONS

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5. Choose how the audio is to be managed on the I2S Output:
  - a. Click on the I2S Audio Output tab
  - b. Select the Audio Source to I2S Audio.
6. If it is appropriate, set either I2S Audio or I2S Audio Local Loop Out as the Analog Audio Output.
  - a. Select the Analog Audio Output tab.
  - b. From the Audio Source drop-down list select I2S Audio.
  - c. Click Save to apply changes.

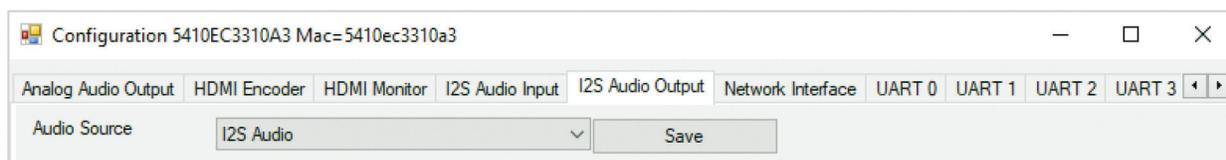


FIGURE 4-27. QUAD I2S SETTINGS WINDOW – IS2 AUDIO OUTPUT OPTION

7. The sound device connected to the Receiver will now play out the Analog audio stream.

Tip: If audio is not playing out, confirm that the I2S Audio is streaming. Also, verify the Receiver audio output settings are correct.

### 4.6.2 SENDING A QUAD I2S AUDIO SOURCE TO ALL RECEIVERS

---

To distribute Quad I2S audio from a single sender to all receivers, from the I2S Audio Routing tab, drag-and-drop the Sender onto the Blue tile labeled All Receivers.

### 4.6.3 STARTING/STOPPING QUAD I2S AUDIO

---

To stop Quad I2S Audio from being transmitted from a sender (TX) device, right-click over the encoder device and select Stop I2S Audio.

To start or restart the audio transmission, right-click over the appropriate sender (TX) and select Start I2S Audio.

You can also stop the I2S audio and free the multicast IP addresses assigned to the stream. This is done with the Stop and Free Channel option.

**WARNING!** If there are any decoders currently subscribed to the multicast IP in question, they will remain subscribed. To prevent these decoders from potentially streaming an incorrect source if the multicast is assigned to a new stream, we recommend that you disconnect the decoder before freeing the channel. Refer to the next section.



FIGURE 4-28. SENDER I2S AUDIO TAB — START/STOP OPTIONS

## 4.6.4 DISCONNECTING A QUAD I2S AUDIO SOURCE FROM A RECEIVER

To disconnect a Receiver from a Sender source, right-click over the receiver tile and select Leave I2S Audio.

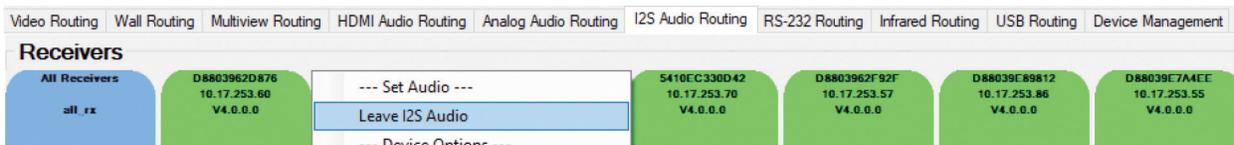


FIGURE 4-29. DECODER (RX) I2S AUDIO TAB — LEAVE OPTION

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### 4.7 RS-232 ROUTING TAB

The RS-232 Routing tab is used to setup and manage RS-232 data routing for MCX devices.

The MCX chipset supports up to four UART ports.

The MCX Management Console application will display a tab for each available port based on the hardware configuration. These tabs are labeled UART0 through UART3 respectively. See the figure shown next for an example.

Supported baud rate ranges from 9,600 to 115,400 baud.

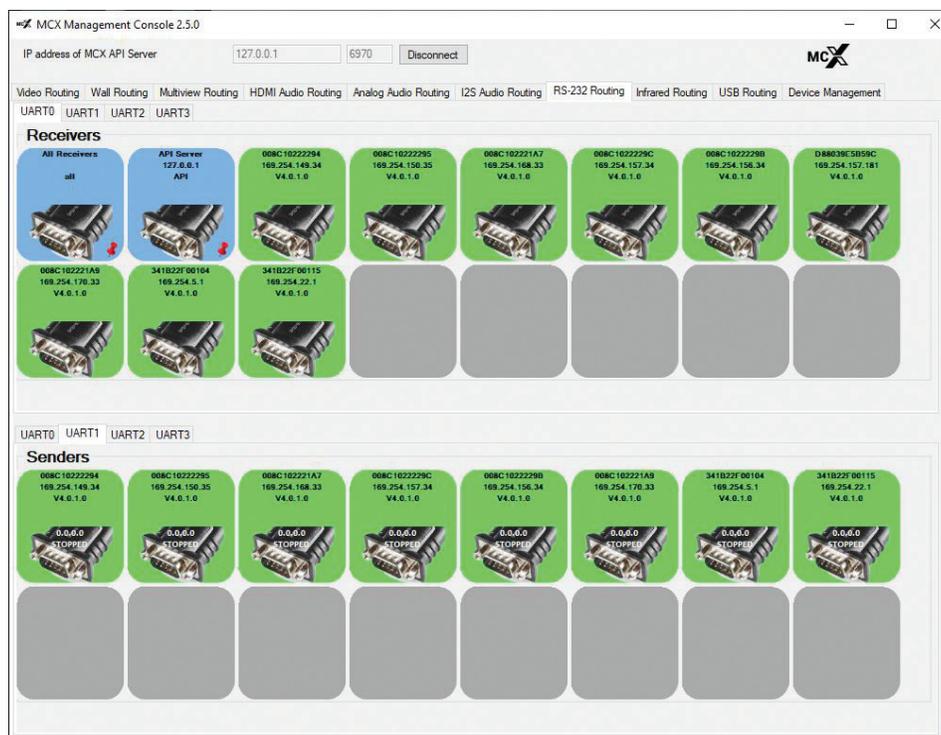


FIGURE 4-30. RS-232 UART PORTS 0–3

#### 4.7.1 PAIRING RS-232 RECEIVERS AND SENDERS

The RS-232 Routing tab is divided into two sections in the MCX Management Console: the first is labeled Receivers, while the second is labeled Senders.

Each device discovered on the network, whether an encoder (TX) or decoder (RX), is listed in both groups. This is because each device can potentially send or receive RS-232 data.

If it is not currently running, launch the MCX Management Console application. For information on starting the GUI, refer to Section 2.5, Launching MCX Management Console.

1. Select the tab labeled RS-232 routing.
2. Verify which Senders and Receivers are joined.
  - a. Using the left mouse, click on the MCX device tile that you want to see the connection status for. All the joined tiles will be highlighted in orange.

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### 4.7.1.1 PAIRING A SENDER TO A RECEIVER

1. Pair a device by dragging the tile representing the Sender and dropping it over the desired Receiver to create one-way communication.
2. To create a two-way RS-232 path between two devices, two separate pairings are required, repeat step 4 but in reverse to create the second pairing. This is demonstrated in the figure shown next.

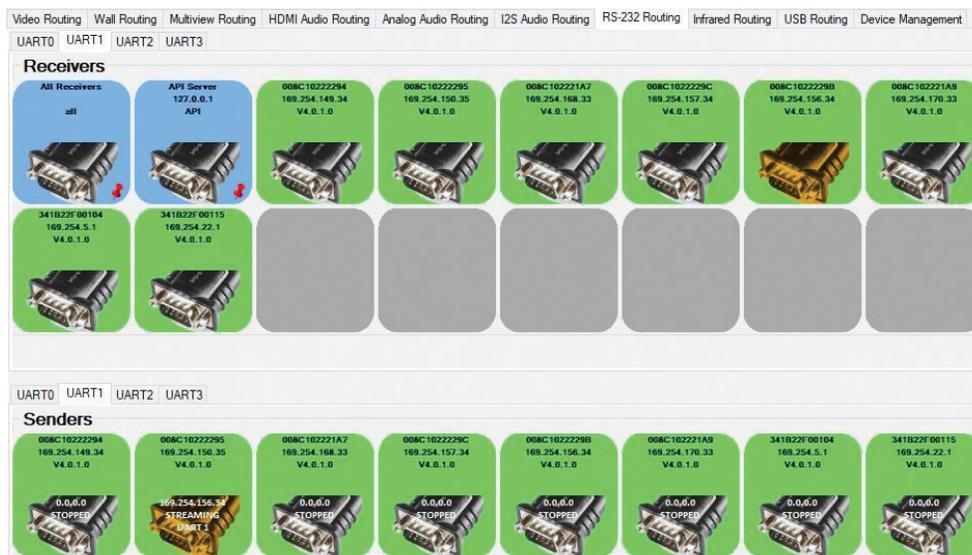


FIGURE 4-31. RS-232 ROUTING – EXAMPLE OF 2-WAY PAIRING OF DEVICES

### 4.7.1.2 PAIRING A SENDER TO ALL RECEIVERS

To distribute RS-232 data from a single sender device to all receiving devices, drag-and-drop the respective Sender tile onto the blue tile labeled All Receivers located in the Receivers section of the RS-232 Routing tab.

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### 4.7.1.3 PAIRING A SENDER TO THE MCX CONTROLLER SERVER (API SERVER)

To distribute RS-232 data from a single sender device to the MCX Controller Server (API Server), drag and drop the respective Sender tile onto the blue tile labeled API Server located in the Receivers section of the RS-232 Routing tab.



FIGURE 4-32. RS-232 ROUTING – ALL RECEIVERS AND API SERVER TILES

## 4.7.2 SENDING RS-232 DATA

### 4.7.2.1 RS-232 DATA FROM SENDER TO PAIRED RECEIVER(S)

To send RS-232 data from a Sender to only paired Receiver(s):

1. If it is not presently paired, pair the Sender to the desired Receiver.
  - a. Left-click on the Sender tile.
  - b. Drag-and-drop it over the Blue tile representing the Receiver sender to paired with.
2. Right-click over the tile representing the appropriate Sender from the Senders section of the RS-232 Routing tab.
3. Select Send/Receive RS-232.
4. The Send/Receive RS-232 dialog box opens.
5. Enter the RS-232 string that is to be sent in the field located next to the Send button.
6. Then, click the Send button to send out the string.
7. Only the paired device will receive the RS-232 data.

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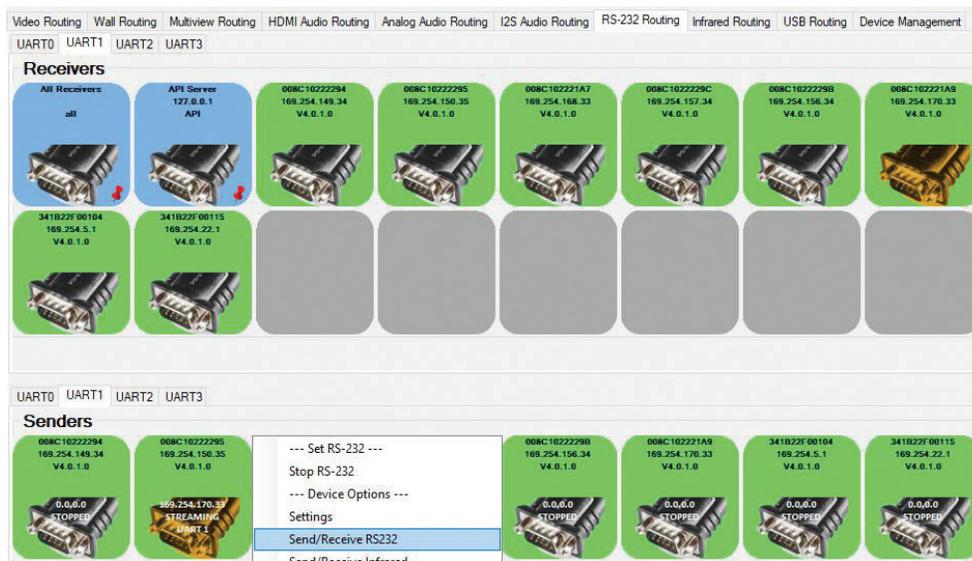


FIGURE 4-33. RS-232 ROUTING – SENDING/RECEIVING RS-232 DATA

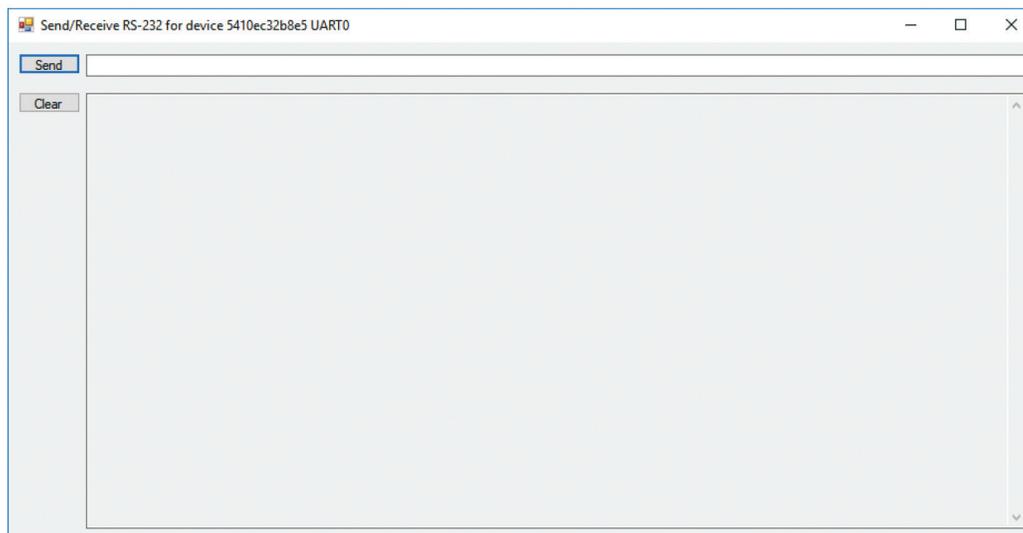


FIGURE 4-34. RS-232 ROUTING – SENDING/RECEIVING RS-232 DATA

## 4.7.2.2 RS-232 DATA FROM SENDER TO ALL RECEIVERS

To send RS-232 data from a Sender to All Receivers:

1. If not presently paired, pair the appropriate Sender to the All Receivers.
  - a. Left-click on the Sender tile.
  - b. Drag-and-drop it over the Blue tile, All Receivers.
2. Right-click over the tile representing the appropriate Sender from the Senders section of the RS-232 Routing tab.

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3. Select Send/Receive RS-232.
4. The Send/Receive RS-232 dialog box opens.
5. Enter the RS-232 string that is to be sent in the field located next to the Send button.
6. Then click the Send button to send out the string.
7. All receiver devices will receive the RS-232 data.

### 4.7.2.3 RS-232 DATA TO MCX CONTROL LAYER

---

To route RS-232 data from a Sender to the MCX Controller Server (API Server):

1. If not presently paired, pair the Sender to the API Server.
  - a. Left-click on the Sender tile.
  - b. Drag-and-drop it over the Blue tile, API Server.
2. Right-click the appropriate tile and select Send/Receive RS-232.
3. The Send/Receive RS-232 dialog box opens.
4. Enter the RS-232 string that is to be sent in the field located next to the Send button.
5. Then click the Send button to send out the string.
6. The MCX Controller Control Server will receive the RS-232 data.

### 4.7.3 RS-232 LIMITATIONS

---

The following limitations apply to the RS-232:

- ♦ During a MCX Controller device update, do not send RS-232 commands.
- ♦ A Sender can either send RS-232 data to a specific device (unicast), all Senders or all Receivers (multicast) or broadcast to all devices active on the network (broadcast).
- ♦ A sender can NOT send RS-232 data simultaneously to a range of devices using multi-unicast.

## 4.8 INFRARED ROUTING TAB

Infrared data routing is set up and managed for MCX devices from the Infrared Routing tab.

### 4.8.1 PAIRING INFRARED RECEIVERS AND SENDERS

---

The Infrared Routing tab is divided into two sections in the MCX Management Console: the first is labeled Receivers, while the second is labeled Senders.

Each device discovered on the network, whether it is an encoder (TX) or decoder (RX) is listed in both groups. This is because each device can potentially send or receive Infrared (IR) data.

If not currently running, launch the MCX Management Console application. For information on starting the GUI, refer to Section 2.5, Launching the MCX Management Console.

1. Select the tab labeled Infrared routing.



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2. To verify which Senders and Receivers are joined, using the left mouse, click on the MCX device tile that you want to see the connection status for. All the joined tiles will be highlighted in orange.

### 4.8.1.1 PAIRING A SENDER TO A RECEIVER

1. Pair a device by dragging the tile representing the Sender and dropping it over the desired Receiver to create one-way communication.

It is not likely required to create a two-way Infrared path but it is possible to create this path. To do this, create two separate pairings in the same way as it is done for RS-232, drag-and-drop the Sender over the Receiver, then repeat the pairing in reverse. Refer to Figure 4-32, RS-232 Routing – Example of 2-Way Pairing of Devices.

### 4.8.1.2 PAIRING A SENDER TO ALL RECEIVERS

To distribute infrared (IR) data from a single sender to all Receivers, drag-and-drop the respective Sender tile onto the blue tile labeled All Receivers located in the Receivers section of the Infrared Routing tab.

NOTE: To verify which senders and Receivers are paired, using the left mouse, click on the device tile you want to see the connection status for. All the joined tiles will be highlighted in orange.

### 4.8.1.3 PAIRING A SENDER TO THE MCX CONTROLLER SERVER (API SERVER)

To distribute Infrared data from a single sender to the MCX Controller Control Server (API Server), drag and drop the respective Sender tile onto the blue tile labeled API Server located in the Receivers section of the Infrared Routing tab.



FIGURE 4-35. INFRARED ROUTING – ALL RECEIVERS AND API SERVER TILES

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### 4.8.2 SENDING INFRARED DATA

#### 4.8.2.1 INFRARED DATA FROM A SENDER TO A PAIRED RECEIVER

To send Infrared data from a sender to a paired Receiver:

1. If not presently paired, pair the sender to the desired Receiver.
  - a. Left-click on the Sender tile.
  - b. Drag-and-drop it over the Blue tile representing the Receiver sender to paired with.
2. Right-click over the tile representing the appropriate Sender from the Senders section of the Infrared Routing tab.
3. Select Send/Receive Infrared.
4. The Send/Receive Infrared dialog box opens.
5. Enter the Infrared data that is to be sent in the field located next to the Send button.
6. Then, click the Send button to send out the string.
7. Only the paired device will receive the Infrared data.



FIGURE 4-36. MCX CONTROLLER INFRARED – SENDING/RECEIVING IR DATA

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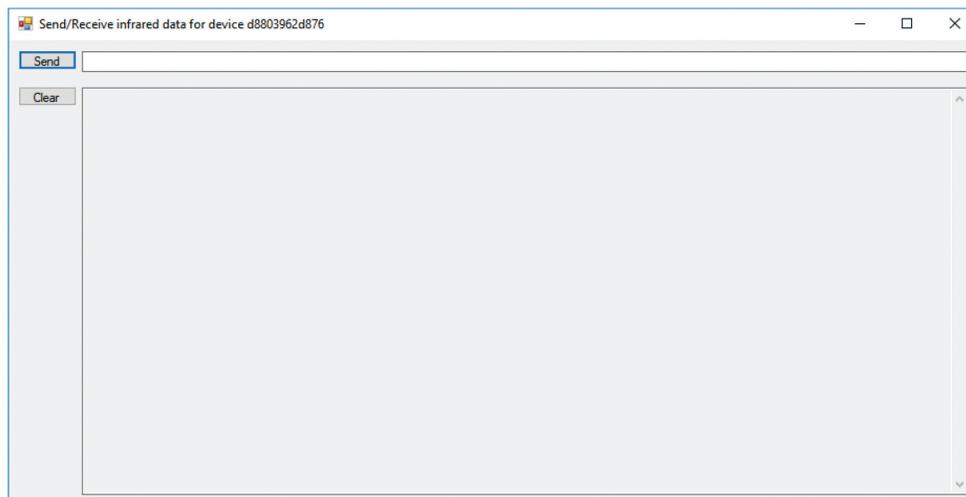


FIGURE 4-37. INFRARED – SENDING/RECEIVING DATA WINDOW

### 4.8.2.2 INFRARED DATA FROM A SENDER TO ALL RECEIVERS

---

To send Infrared data from a sender to all receivers:

1. If not presently paired, pair the Sender to the All Receivers.
  - a. Left-click on the Sender tile.
  - b. Drag-and-drop it over the Blue tile, All Receivers.
2. Right-click over the tile representing the appropriate Sender from the Senders section of the Infrared Routing tab.
3. Select Send/Receive Infrared.
4. The Send/Receive Infrared dialog box opens.
5. Enter the Infrared data that is to be sent in the field located next to the Send button.
6. Then, click the Send button to send out the string.
7. All paired devices will receive the Infrared data.

### 4.8.2.3 INFRARED DATA TO MCX CONTROLLER LAYER

---

To route Infrared data from a sender to the MCX Controller Server (API Server):

1. If not presently paired, pair the Sender to the API Server.
  - a. Left-click on the Sender tile.
  - b. Drag-and-drop it over the Blue tile, API Server.
2. Right-click the appropriate tile and select Send/Receive, and the Infrared dialog box opens.
4. Enter the Infrared data that is to be sent in the field located next to the Send button.
5. Then click the Send button to send out the string.
6. The MCX Controller Server will receive the Infrared data.

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### 4.8.3 INFRARED LIMITATIONS

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Although a sender can either send infrared (IR) data to a specific device (unicast) or broadcast to all devices active on the network (broadcast), a sender can NOT send data simultaneously to a range of devices using multi-unicast.

### 4.9 USB ROUTING TAB

The MCX Controller platform has integrated the Black Box extenders command protocol into the MCX Management Console to control Black Box USB extender modules, including part numbers IC101A, IC280A-R2, IC282A, IC400A-R2, IC401A-R2, IC402A-R2, IC404A-R2, IC406A-R2, IC408A-R2, IC502A-R2, ICU504A, USB3ACE-15M, ACU1500A-R3 and ACU2500A-R3.

The USB Routing tab is used to setup and manage USB data routing between MCX devices.

The Infrared Routing tab in the MCX Management Console is divided into two sections:

- ◆ Remote Extenders
- ◆ Local Extenders

Each device discovered on the network, whether it is an encoder (TX) or decoder (RX) listed in the section for which it is configured. Devices configured in the hardware configuration file as REX are displayed in the Remote Extenders (REX) group and devices configured as LEX are displayed in the Local Extenders (LEX) group.

If it is not currently running, launch the MCX Management Console application. For information on starting the GUI, refer to Section 2.5, Launching the MCX Management Console.

To verify which Remote Extenders (REX) and Local Extenders (LEX) are joined:

1. Select the tab labeled USB Routing.
2. Using the left mouse, click on the MCX device tile that you want to see the status for.
3. All the joined tiles are highlighted in orange.

#### 4.9.1 PAIRING A REMOTE EXTENDER (REX) AND A LOCAL EXTENDER (LEX)

---

To pair USB devices:

1. Select the USB Routing tab.
2. To pair a LEX module with a REX module, drag-and-drop the desired LEX tile over the REX tile it is to be joined with. Then, release the left mouse button and the LEX/REX will be paired.
3. Connect a USB device to the USB port on the Remote Extender (REX) device and host device as Local Extender (LEX). For example, connect a mouse or keyboard to REX and a computer to the LEX.
4. The devices will now interact as if they are directly connected.



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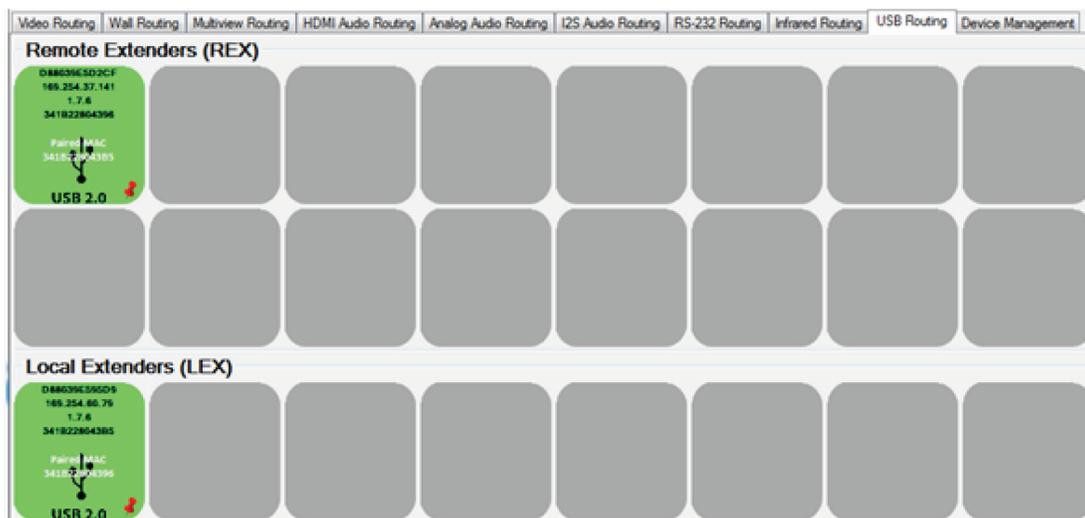


FIGURE 4-38. USB ROUTING TAB

### 4.9.2 USB ROUTING LIMITATIONS

When using the MCX Management Console to control the Icron USBExtreme functionality, there are some restrictions to be aware of, these are:

- i. MCX Management Console only supports one-to-one pairing between Icron LEX and REX modules. Icron's protocol however, does support virtual hub functionality that allows for many REX devices to be connected to a single LEX. Contact Technical Support for details.
- ii. MCX Management Console assumes the Encoders (TX) host LEX type devices, while the Decoders (RX) host REX type devices. This is a limitation of the MCX Management Console. The MCX Controller API does have the capability to switch an Icron device from LEX to REX and vice versa.
- iii. For the MCX Management Console to find all Icron devices, make sure that the Control System, i.e. MCX Controller Server, is connected to the 10GbE network.

## CHAPTER 4: USING THE MCX MANAGEMENT CONSOLE

### 4.10 DEVICE MANAGEMENT TAB

The primary function of the Device Management tab is to update the device firmware.

#### 4.10.1 UPDATING DEVICE FIRMWARE

Device firmware updates are done over the network. MCX Controller has a special update protocol that updates either an individual device or consecutively updates all discovered devices simultaneously.

Firmware updates (bit streams) for Evaluation hardware are in a special file format that has the file extension of APZ.

To prepare for the update, place a copy of the update file (APZ) into the update folder. This folder must exist in the same directory as where the MCX Controller Control Server (API) is installed. The MCX Controller Control Server is then instructed to update devices from a selected file archive.

Example of where the update folder would need to be created:

C:\Program Files (x86)\MCX Controller\update

#### 4.10.2 PERFORMING A DEVICE FIRMWARE UPDATE

To update MCX Controller device firmware, follow the step-by-step procedure outlined below:

1. If not already completed, copy the new MCX Controller update file (APZ) containing the firmware update into the update folder. Contact Black Box Technical Support at 877-877-2269 or [info@blackbox.com](mailto:info@blackbox.com) for the latest version of firmware.
2. If the MCX Controller evaluation installer was used for the installation of the MCX Controller evaluation package, the update folder is located in the same directory as the MCX Controller Server (API) executable.

**IMPORTANT!** If the update folder does not exist, you must create it.

3. Then select the Firmware Update tab in the MCX Management Console.
4. The MCX Management Console automatically discovers all devices currently active on the network. The devices are not divided by function; are all shown under heading All Devices.

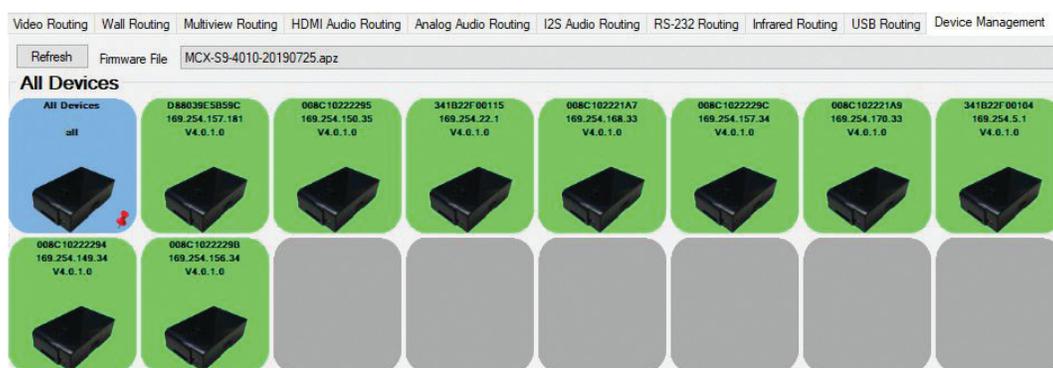


FIGURE 4-39. DEVICE MANAGEMENT TAB

# CHAPTER 4: USING THE MCX MANAGEMENT CONSOLE

5. Select the MCX Controller firmware update file (APZ).
  - a. Select update file from the drop-down box, located in the Device Management tab beside the heading Firmware File.  
Example: MCX\_Controller\_rx\_taizi\_evaluation\_build\_3.6.apz

6. From the MCX Management Console right-click over the tile that represents the MCX device that is to be updated.

If a device is selected to be programmed that is not compatible with the version selected, an error will be returned and device will fail to be programmed. See the figure shown next for an example.



FIGURE 4-40. EXAMPLE OF PROGRAMMING STATUS OF MCX CONTROLLER DEVICES (IN PROGRESS AND FAILED)

7. Begin the device update:
  - a. To trigger an upgrade of an individual device, right-click over its associated device tile and select Update Device.
  - b. To update all devices, right-click over the blue tile labeled All Devices and select Update Device.

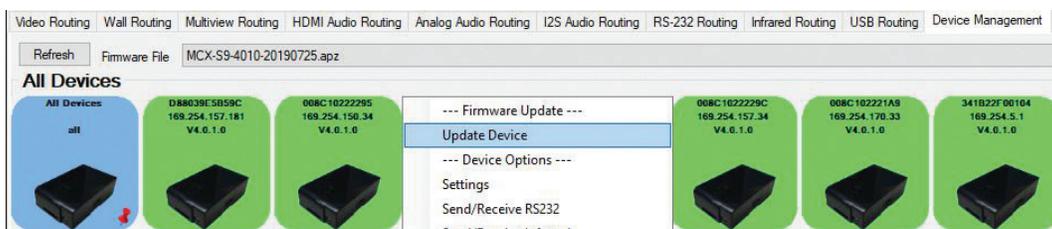


FIGURE 4-41. UPDATE DEVICE MENU OPTION

TIP: If the error “Unable to connect to MCX Controller External Component Updater” is received, click Yes to proceed with the update. For more information on updating hardware third-party components, contact Black Box Technical Support at 877-877-2269 or info@blackbox.com

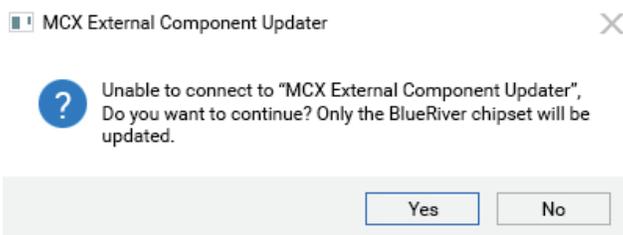


FIGURE 4-42. EXTERNAL COMPONENT UPDATER ERROR

## CHAPTER 4: USING THE MCX MANAGEMENT CONSOLE

8. Selected device(s) will immediately begin to update their firmware.
9. The device tiles will show the progress of the update.
10. When the firmware update completes, the devices will provide a message to automatically initiate a reboot of all updated units.
11. Click on the Reboot button to initiate the reboot and apply the new firmware.
12. Once back online, verify the firmware version shown on the tile is the correct version.

### 4.10.2.1 MANAGING THE UPDATE FOLDER

---

If the “update” folder is not named this default name but was created with a different name, it is necessary to change the file’s name in the MCX Controller Control Server configuration file.

To specify a different name for the update folder, complete the following steps:

1. Go to the file folder where the MCX Controller Server (API) is installed and open the file labeled MCX Controller.conf with Notepad+ or another text editor.
2. Search for “firmware\_path”.
3. Replace the update with the new folder name, for example mettre\_a\_jour.

#### WARNINGS!

- i. Do not remove the ./ parameters.
- ii. Also spaces are not supported.

For above example, the firmware path would be modified as follows:

```
firmware_path = ./mettre_a_jour
```

Important! If the ‘update’ folder does not exist, create it with the name specified in the MCX Controller configuration file.

MCX Controller Configuration file (MCX Controller.conf) example in relation to the firmware path:

```
#####
# Firmware Update
#####
# The path must be Unix/Linux-style, even on Windows, where Cygwin is #used.
# (e.g. C:\temp\update becomes /cygdrive/c/temp/update on Windows).
# Make sure the folder already exists. (it will not be created)
#
# Limitation: it is not possible to specify a relative path that goes #up by
# more than one directory level (i.e. .././update is not supported).
firmware_path = ./update
#
# Maximum number of devices that can have their firmware updated at #the same time. Other
# devices will wait for their turn.
max_concurrent_updates = 64
```



## CHAPTER 4: USING THE MCX MANAGEMENT CONSOLE

### 4.11 GLOBAL COMMAND OPTIONS AND SETTINGS

#### 4.11.1 DEVICE OPTIONS

To access an MCX device's options, right-mouse-click over any device.

Available options include:

- ◆ Update Device
- ◆ Settings
- ◆ Send/Receive RS-232
- ◆ Send/Receive Infrared
- ◆ Reboot Device
- ◆ Enable Bitmap Overlay/Disable Bitmap Overlay
- ◆ Pin to Position

NOTE: Device options are available only for detected devices (green tiles) from any of the MCX Management Console tabs, Video Routing, HDMI Audio, etc.

Since some of the above have previously been covered, this section will cover only the options not yet fully reviewed. This includes Settings, Reboot Device, Bitmap Overlay (enable/disable) and Pin to Position.

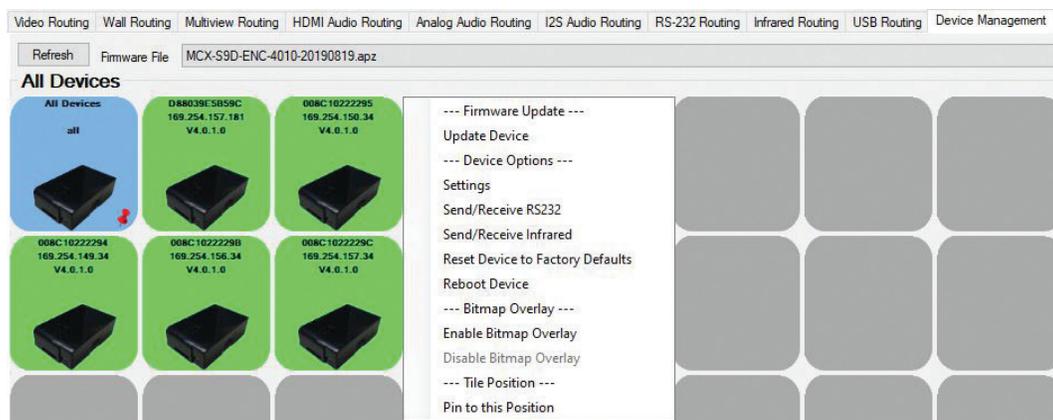


FIGURE 4-43. RIGHT MENU OF THE DEVICE MANAGEMENT TAB

#### 4.11.2 LAUNCHING THE SETTINGS OPTIONS

To launch the device Settings window:

1. Right-click over the desired MCX Controller device tile, and from the menu that appears, select Settings. These options are accessible from any of the Routing tabs.
2. The Settings option launches the Configuration window for the selected MCX device.
3. The Configuration window presents access to the selected device's settings.

NOTE: The settings provided for Decoders (RX) and Encoders (TX) are different. In the following sub-sections the decoder and encoder setting options are reviewed separately.

## CHAPTER 4: USING THE MCX MANAGEMENT CONSOLE

### 4.11.3 DECODER (RX) SETTINGS OPTIONS

In this section, the decoder (RX) device settings are reviewed in detail.

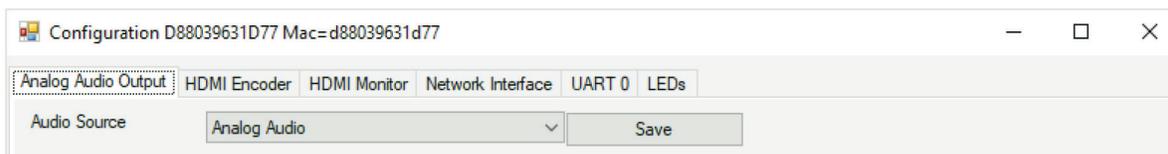


FIGURE 4-44. EXAMPLE OF SETTINGS MENU FOR A DECODER

#### 4.11.3.1 ANALOG AUDIO OUTPUT SETTINGS

This tab is used to manage the Audio source for the Analog Audio Output port.

There are three source options:

- ♦ Analog audio: Analog stream coming from an encoder
- ♦ HDMI Audio: 2-channel downmixed version of the original HDMI audio from an encoder
- ♦ I2S Audio: I2S injected audio coming from an encoder

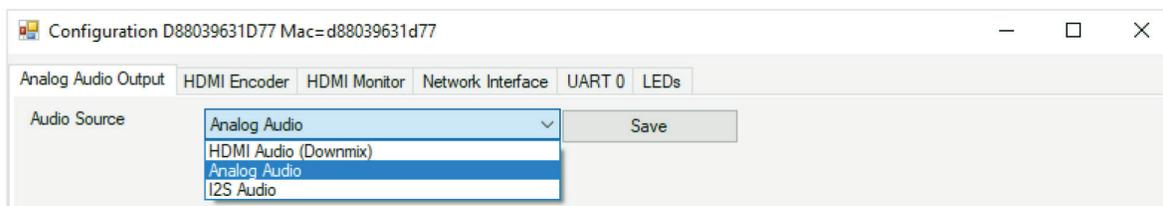


FIGURE 4-45. ANALOG AUDIO OUTPUT TAB – DECODER (RX)

NOTE: Refer to the Audio Routing section of interest (HDMI Audio, Analog Audio or I2S Audio) for details on managing the Analog Audio Output.

## CHAPTER 4: USING THE MCX MANAGEMENT CONSOLE

### 4.11.3.2 HDMI ENCODER SETTINGS

The HDMI Encoder tab is used to control the audio source that will be fed out to the HDMI port.

The following options are available:

- ◆ HDMI Audio (HDMI Video in Genlock Mode): The original HDMI audio stream is received with the video from an encoder if the decoder is in Genlock mode. If the decoder is in any other video mode, then the HDMI audio is sent separately.
- ◆ Analog Audio: The analog audio stream received from an encoder is embedded in the HDMI output.
- ◆ HDMI Audio (Stereo Downmix): The audio is embedded into the HDMI output signal. It is received as a separate HDMI audio stream from the encoder.
- ◆ HDMI Audio (All Available Channels): The multichannel audio (up to 8-channels) is embedded into the HDMI output signal. It is received as a separate HDMI audio stream from the encoder.
- ◆ I2S Audio: Single I2S audio is injected into the HDMI output signal from the encoder.

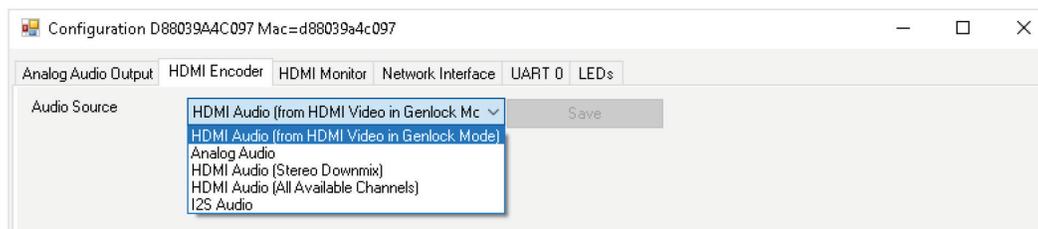


FIGURE 4-46. HDMI ENCODER TAB – DECODER (RX)

### 4.11.3.3 HDMI MONITOR SETTINGS

The HDMI Monitor tab provides the EDID information from the display that is connected to the decoder (RX).

You can also save this information to a file.

- ◆ Use the Save to File button to save the EDID data to a file.
- ◆ Also, you can select and copy the EDID Hex values directly (right click and select Copy) and paste this data into a text editor, such as Notepad or WordPad.

**NOTE:** When no display is connected to the Decoder, the EDID view will be blank.

## CHAPTER 4: USING THE MCX MANAGEMENT CONSOLE

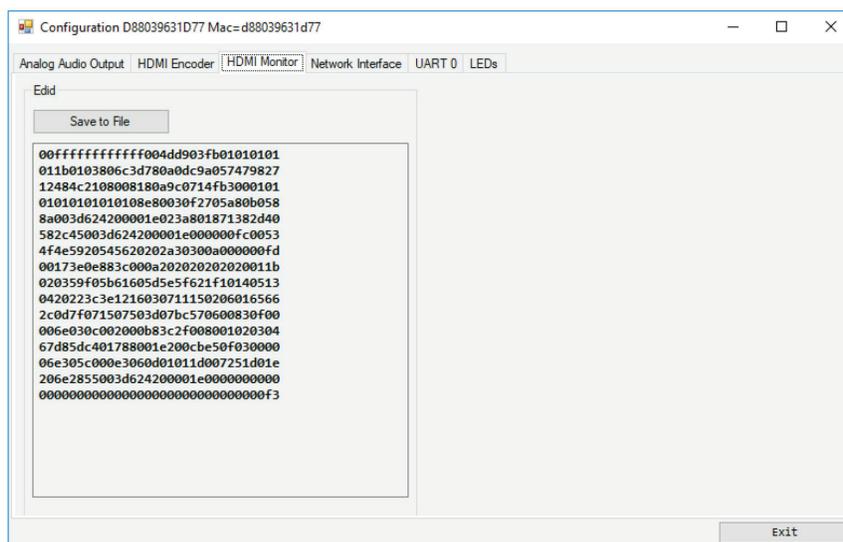


FIGURE 4-47. HDMI MONITOR TAB WITH EDID DATA PRESENT – DECODER (RX)

### 4.11.3.4 DECODER NETWORK INTERFACE SETTINGS

The Network Interface tab is used to manage the device's network settings, including its hostname and IP address settings.

#### Device Host Name

By default, the device hostname equals the device's MCX chipset MAC address.

NOTE: The MCX Controller Server API commands use the MCX chipset MAC address as the device ID.

1. To rename a device, in the Hostname field enter the desired name. Example: Decoder\_room1.
2. Then click the Save button to apply the new host name.

NOTE: The host name is persistent if an MCX device is repowered. It is however, erased and set back to the MAC address if a device is forced back to factory default settings.

#### Device IP Address

Two options are supported for the IP address:

- ◆ DHCP
- ◆ Manual

NOTE: For the MCX devices, DHCP is the factory default mode.

To set an MCX device in DHCP:

1. From the Configuration window, select the Network Interface tab.
2. Then beside the heading IP Mode, select DHCP from the drop-down list provided.
3. The MCX Controller Server will search for DHCP server.
4. If there is no DHCP server present, the IP will be assigned an Auto-IP address in the 169.254.X.X range. This is the default IP address range assigned by the MCX Controller Server.
5. Click Save to apply the setting.

To set a static/manual IP address (IPV4 address, subnet mask and gateway address):

1. From the Network Interface tab, IP Mode drop-down list, select Manual.

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2. Then enter the desired IP information (IP Address/Mask/Gateway) and click Save to apply the change.

**NOTE:** IP settings are persistent if an MCX device is repowered. However, if a device is forced back to factory default settings, the IP settings are erased and the default factory setting of DHCP is applied.

**WARNING!** Special attention is required when assigning a Manual IP address. The address must be both unique and reachable. Any mistake when entering the IP address, Subnet Mask or Gateway address can result in the device being unreachable.

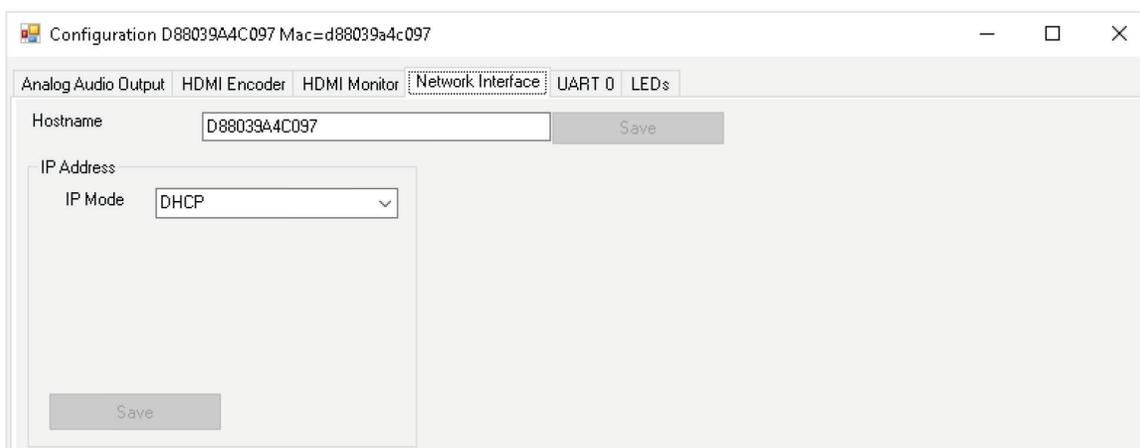


FIGURE 4-48. NETWORK INTERFACE TAB DHCP MODE – DECODER (RX)

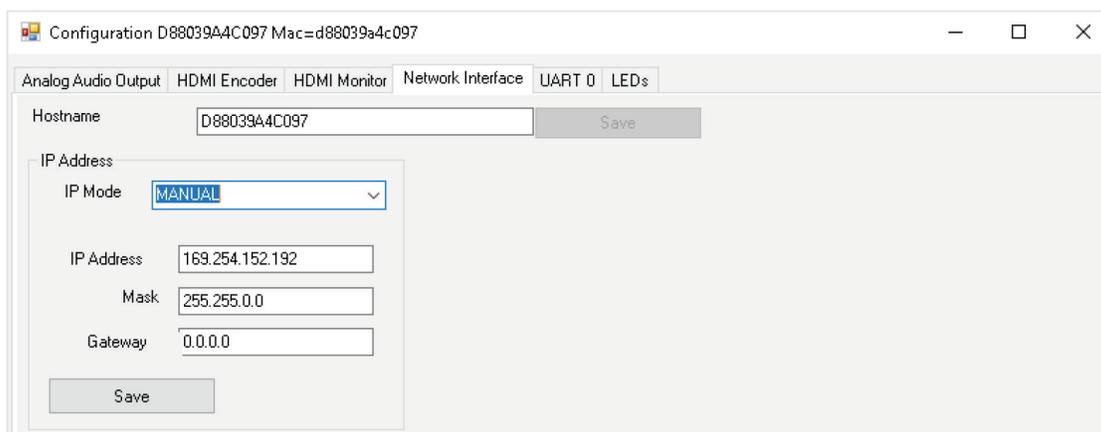


FIGURE 4-49. NETWORK INTERFACE TAB MANUAL MODE – DECODER (RX)

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### 4.11.3.5 UART SETTINGS

The UART tab is used to manage the UART and RS-232 settings.

1. From the Configuration window, select the appropriate UART tab.

NOTE: Based on the hardware design of the decoder or encoder, it is possible to have up to four UART ports present. A separate tab is shown for each, UART 0-3.

2. Under the Parameters settings, select the appropriate port settings for each:

- ◆ Baud Rate
- ◆ Data Bit
- ◆ Stop Bit
- ◆ Parity

Click the Save button to apply the updated RS-232 configuration.

NOTE: The UART settings are persistent if a device is repowered. However, they are reset back to default settings if a factory reset is performed.

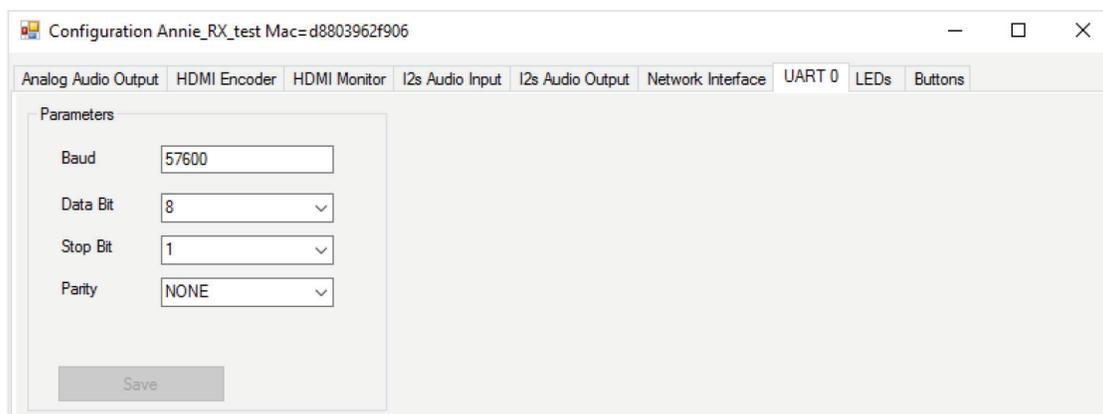


FIGURE 4-50. UART 0 TAB – DECODER (RX)

### 4.11.3.6 LEDS SETTINGS

The LEDs tab is used to manage and control the state of external LEDs. Each LED has a specific function by default, such as Power On, Video Indicator or 10GbE activity.

It is possible to overwrite the default LED function; it can be turned permanently ON, OFF or set to BLINK. The latter is often useful to identify a specific physical unit located in a rack.

1. From the Configuration window, select the LEDs tab.
2. From the drop-down list provided, select the desired LED behavior.

Two options are provided:

- ◆ Default mode: LED behavior specified in the firmware configuration for the product will be applied.
- ◆ Locate mode: All LEDs will blink allow the device to be easily located. This is useful when devices are mounted in racks and not easily identifiable.

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3. Click the Save button next to the LED to apply the changes.

NOTE: The LEDs settings are persistent if a unit is repowered. They will be erased if a device is forced back to factory default settings.

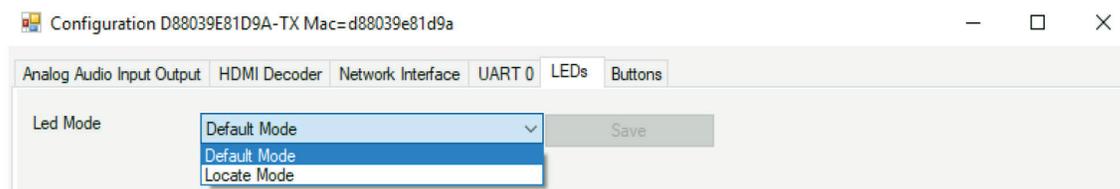


FIGURE 4-51. LEDS TAB – ENCODER (TX)

### 4.11.4 ENCODER (TX) SETTINGS OPTIONS

The following section describes the encoder (TX) device settings dialog box.

#### 4.11.4.1 ANALOG AUDIO INPUT OUTPUT SETTINGS

This tab is used to manage the Audio direction for the Analog Audio Output port. The direction can set to either Audio In or Audio Out.

1. Select the Analog Audio Input Output tab.
2. Beside the heading Direction, select from the drop-down list provided the Analog Audio direction, either INPUT or OUTPUT.
3. Once the direction is selected click the Save button located next to the direction drop-down list to apply the change.

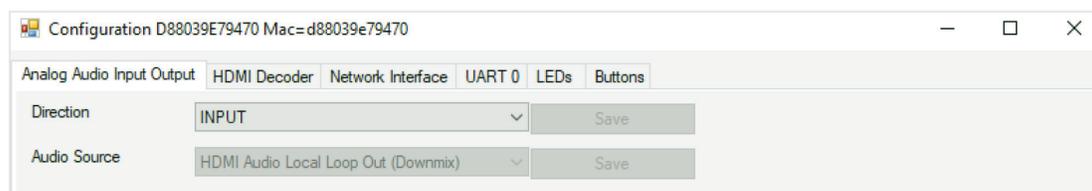


FIGURE 4-52. ANALOG AUDIO OUTPUT TAB – ENCODER (TX)

#### NOTES:

- i. When configured as an Input, an Analog audio source can be connected to the encoder (TX) and the audio then routed to one or more decoders (RX).
- ii. When configured as an output, the encoder (TX) breaks out the 2-channel downmixed version (NT2000 chipset only) of the HDMI audio coming into the encoder (TX). It can then be sent out through the local Analog Audio port or I2S Audio (Audio return channel).
- iii. For the Audio Output to function, the initial HDMI audio must be uncompressed LPCM audio. MCX NT2000 downmix does not support any Dolby, DTS or compressed audio.

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### 4.11.4.2 HDMI DECODER SETTINGS

The HDMI Decoder tab is used to access and manipulate the encoder (TX) EDID display data; it reveals to the source MCX devices the ability to change, save or load EDID data from a file.

1. Select the HDMI Decoder tab.
2. If prompted, select the input port is available from the drop-down list provided and then click the Save button.
  - ♦ HDMI Input 1
  - ♦ Display Port Input
  - ♦ Automatic Selection: If both the HDMI and Display Port are connected, the HDMI input will take precedence.
3. If it is desired that the encoder (TX) not support HDCP 2.2 then select the checkbox labeled Disable HDCP 2.2. Support.

#### NOTES:

- i. If HDCP support is disabled, streaming video from a HDCP source to a display will result in a black image being displayed on the screen.
- ii. It is possible to enable only HDCP 1.4 by checking the Disable HDCP 2.2 Support.

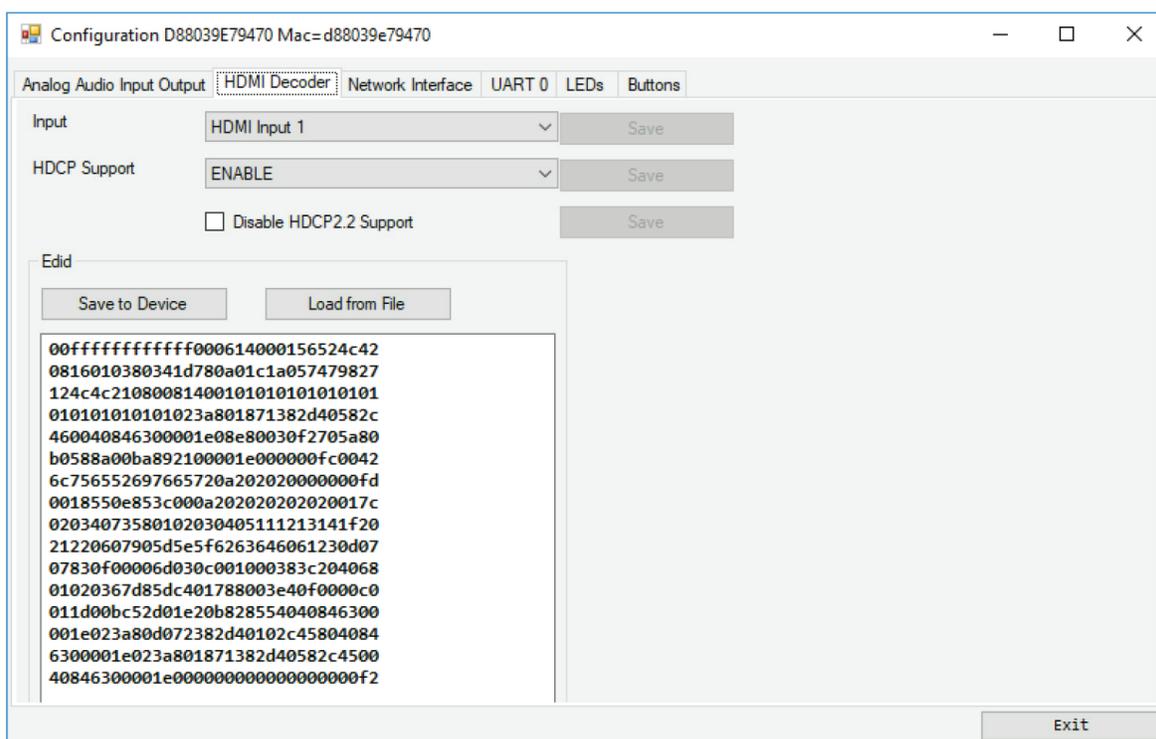


FIGURE 4-53. HDMI DECODER TAB – ENCODER (TX)

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### 4.11.4.3 ENCODER NETWORK INTERFACE SETTINGS

---

The Network Interface tab is used to manage the device's network settings, including its hostname and IP address settings.

#### Device Host Name

By default, the device hostname equals the device's MCX Controller chipset MAC address.

NOTE: The MCX Controller Control Server API commands use the MCX Controller device MAC address as the device ID.

1. To rename a device, in the Hostname field enter the desired name. Example: Encoder\_room1.
2. Then click the Save button to apply the new host name.

NOTE: The host name is persistent if an MCX device is repowered. It is however, erased and set back to the MAC address if a device is forced back to factory default settings.

#### Device IP Address

Two options are supported for the IP address:

- ◆ DHCP
- ◆ Manual

NOTE: DHCP is the factory default mode.

To set an MCX Controller device in DHCP:

1. From the Configuration window, select the Network Interface tab.
2. Then beside the heading IP Mode, select DHCP from the drop-down list provided.
3. The MCX Controller Server will search for a DHCP server.
4. If there is no DHCP server present, the IP will be assigned an Auto-IP address in the 169.254.X.X range. This is the default IP address range assigned by the MCX Controller Server.
5. Click Save to apply the setting.

To set a static/manual IP address (IPV4 address, subnet mask and gateway address):

1. From the Network Interface tab, IP Mode drop-down list, select Manual.
2. Enter the IP information (IP Address/Mask/Gateway) and click Save to apply the change.

NOTE: IP settings are persistent if an MCX device is repowered. However, if a device is forced back to factory default settings, the IP settings are erased and the default factory setting of DHCP is applied.

**WARNING!** Special attention is required when assigning a Manual IP address. The address must be both unique and reachable. Any mistake when entering the IP address, Subnet Mask or Gateway address can result in the device being unreachable.

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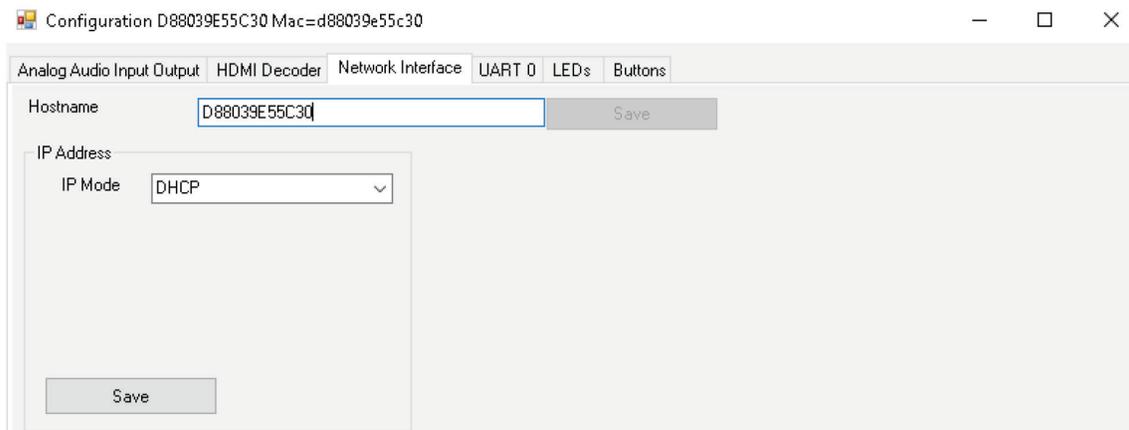


FIGURE 4-54. NETWORK INTERFACE TAB – ENCODER (TX)

### 4.11.4.4 UART SETTINGS

The UART tab is used to manage the UART and RS-232 settings.

1. From the Configuration window, select the UART 0 tab.

NOTE: Based on the hardware design of the decoder or encoder, you can have up to four UART ports present. A separate tab is shown for each, UART 0-3.

2. Under the Parameters settings, select the appropriate port settings for each:

- ◆ Baud Rate
- ◆ Data Bit
- ◆ Stop Bit
- ◆ Parity

3. Click the Save button to apply the updated RS-232 configuration.

NOTE: The UART settings are persistent if a device is repowered. However, they are reset back to default settings if a factory reset is performed.

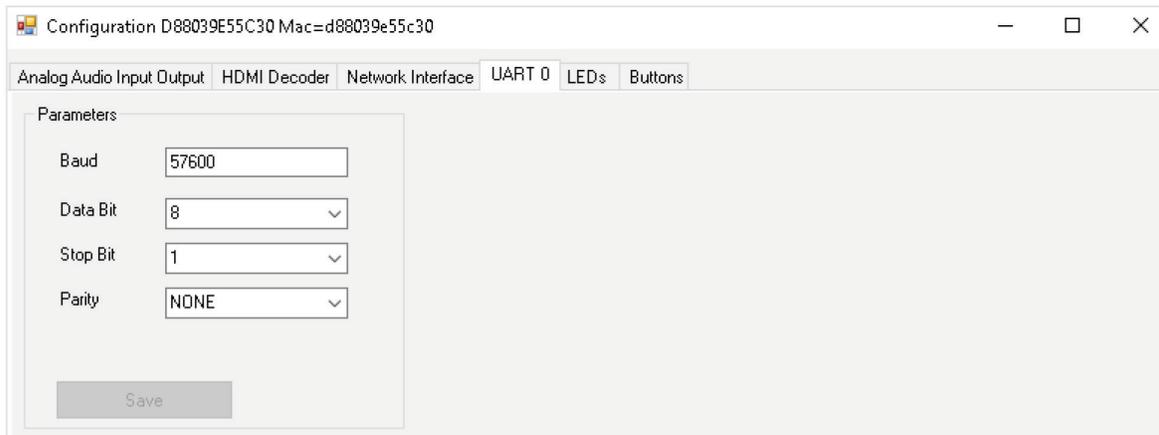


FIGURE 4-55. UART 0 TAB – ENCODER (TX)

## 4.11.4.5 LEDES SETTINGS

The LEDs tab is used to manage and control the state of the external LEDs. Each LED has a specific function by default, such as Power On, Video Indicator or 10G activity.

You can overwrite the default LED function, it can be turned permanently ON, OFF or set to BLINK. The latter is often useful to identify a specific physical unit located in a rack.

1. From the Configuration window, select the LEDs tab.
2. From the drop-down list provided, select the desired LED state beside each LED provided, potentially there is three options available:
  - a. Unknown
  - b. Blink LED
  - c. Default functionality

3. Then click the Save button next to the LED to apply the changes.

**NOTE:** The LEDs settings are persistent if a unit is repowered. They will however, be erased if a device is forced back to factory default settings.

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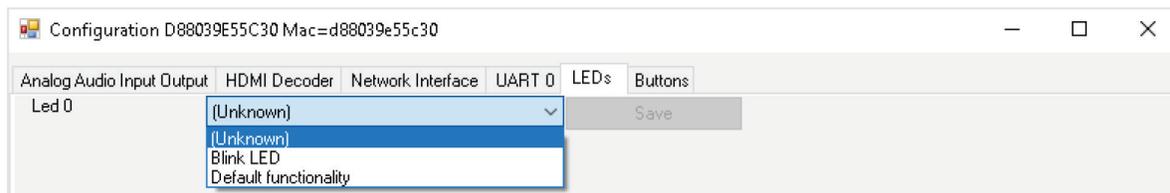


FIGURE 4-56. LEDS TAB – ENCODER (TX)

### 4.11.5 DEVICE OPTIONS AVAILABLE TO DECODERS AND ENCODERS

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The following options are available from the MCX Management Console device menu of both decoders and encoders.

#### 4.11.5.1 SEND/RECEIVE RS-232

---

For details of sending and viewing RS-232 data, refer to Section 4.7.2, Sending RS-232 data.

#### 4.11.5.2 SEND/RECEIVE INFRARED

---

For details of sending and viewing IR data, refer to Section 4.8.2, Sending Infrared data.

#### 4.11.5.3 RESET DEVICE TO FACTORY DEFAULTS

---

This option allows for a device to be rebooted easily from the MCX Management Console.

1. Right-mouse-click over the MCX device to be restored to factory settings.
2. Select Reset to Factory Defaults from the menu options listed in the device menu.
3. Device will be restored to the factory default settings that were stored in the firmware file it was programmed with. If these settings are customer specific, they will be reset successfully.
4. Once you receive notice that the device is restored to factory defaults, reboot the device.
  - a. Right-mouse-click over the MCX device that was restored to factory settings and select Reboot Device from the menu.

NOTE: The tile representing the device will disappear from the GUI and then re-appear once the reset is complete.

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### 4.11.5.4 REBOOT DEVICE

This option allows for a device to be rebooted easily from the MCX Management Console.

1. Right-mouse-click over the MCX device to be rebooted.
2. Select Reboot from the menu options listed in the device menu.

NOTE: The tile representing the device will disappear from the GUI and then re-appear once the reboot has been completed.

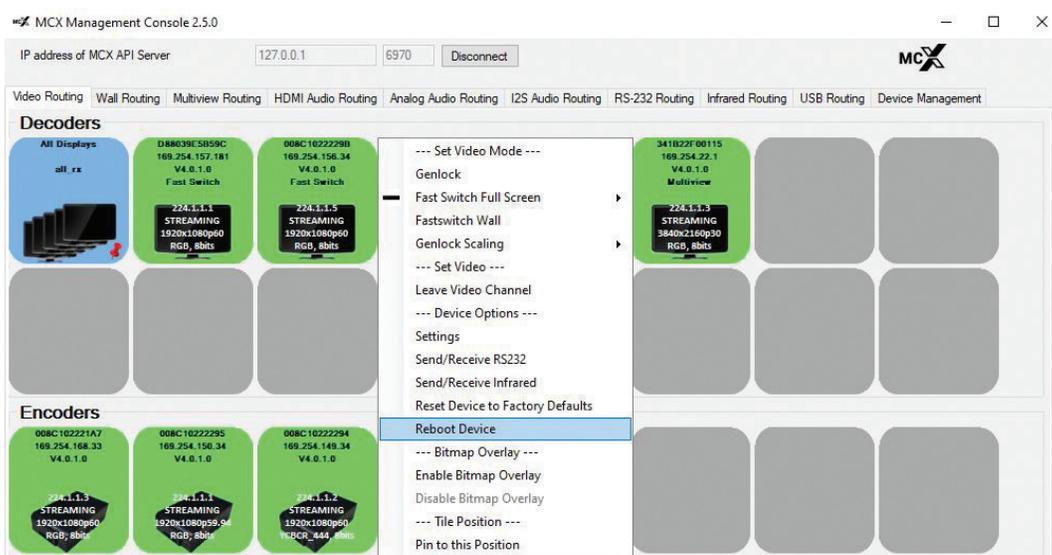


FIGURE 4-57. REBOOT OPTION FOR DECODER (RX)

### 4.11.5.5 BITMAP OVERLAY

The MCX Management Console software includes support for new the Bitmap Overlay feature.

The bitmap overlay is enabled or disabled by selecting the appropriate items in a device's popup menu.

To enable the bitmap overlay feature:

1. Right-click over the appropriate encoder or decoder device.
2. From the menu that appears select "Enable Bitmap Overlay".
3. A file chooser dialog box opens.
4. Browse to select the bitmap file (i.e. monochrome BMP file) that is to be loaded.
5. Then in the file chooser window, click Open.
6. The bitmap proceeds to load being positioned at the bottom right of the picture with the colors set to white (foreground) and black (background) and with default transparency levels (foreground opaque, background 70% transparency).

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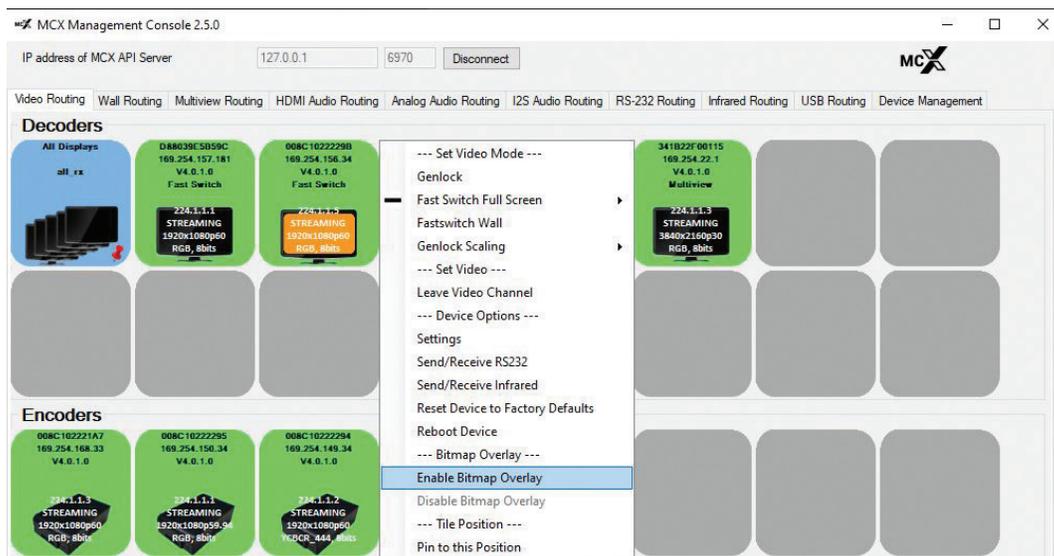


FIGURE 4-58. BITMAP OVERLAY ENABLE/DISABLE OPTIONS

### 4.11.5.6 TILE POSITION

When the MCX Management Console is resized, the device tiles will potentially change their current position and move elsewhere. To prevent a tile from changing its position, you can “pin” a device tile to a location.

To pin a tile’s position:

1. From the MCX Management Console, right-click over the tile that is to have its position pinned.
2. In the menu that appears, select the option Pin to this position.
3. An image of a pin will occur in the bottom right corner of the tile, indicating it has been pinned to the current position.

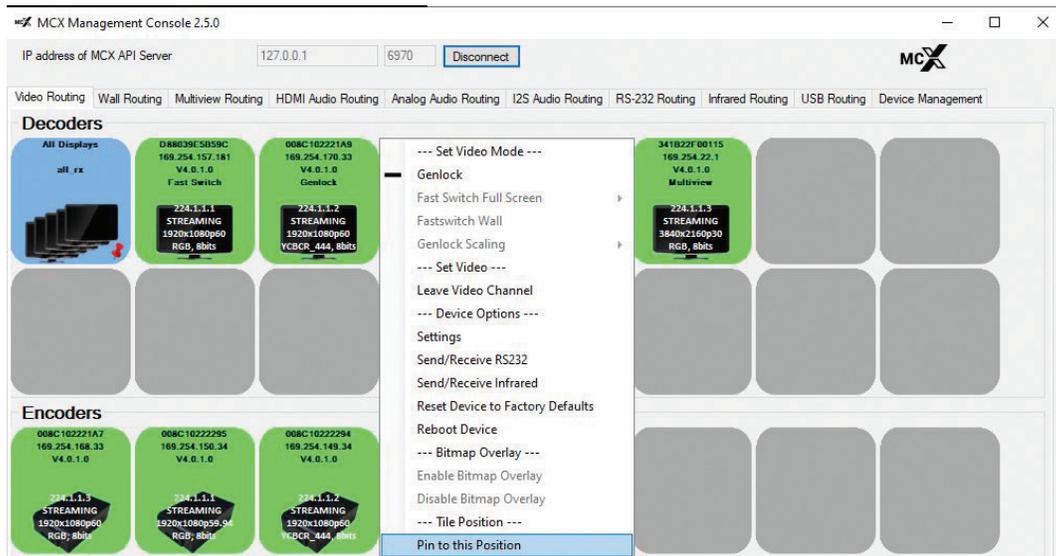


FIGURE 4-59. PIN TO THIS POSITION OPTION OF MCX DEVICE MENU



FIGURE 4-60. EXAMPLE SHOWING A PINNED DECODER TILE

4. To unpin a tile, repeat the above process. The pin will be removed indicating the tile is no longer pinned to the location.

NOTE: The MCX Management Console version loses the pin position when devices are disconnected from the network and then reconnected or when a device disconnects from the MCX Controller Server (API).

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### 4.11.6 ALL DEVICES TILE

The MCX Management Console supports issuing commands to all decoders or all devices simultaneously. The menu presented is relevant to the selected tab.

The command issued performs as described for the command elsewhere in this document, but is applied to all currently active MCX devices (green tiles).

For example, if Update Device is selected, all highlighted tiles will have the selected update file applied.

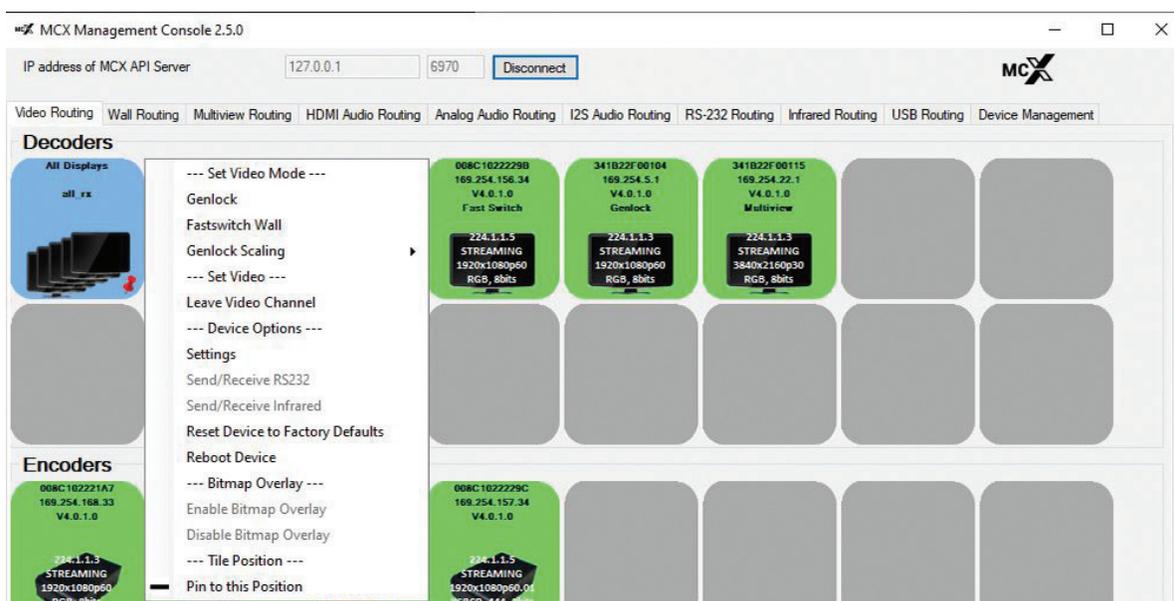


FIGURE 4-61. EXAMPLE OF ALL DEVICE TILE OF THE DEVICE MANAGEMENT TAB

## 4.12 THUMBNAIL PREVIEW OPTION

The MCX Management Console provides the ability to stream an unencrypted source as a thumbnail from a MCX encoder device (TX) to a computer.

For details on setup of this feature, refer to Section 4.12.2 MCX thumbnail preview. This section reviews setting up GStreamer, which is required to demonstrate this feature through the MCX Management Console. This section also reviews launching a thumbnail preview if the MCX Thumbnail executable was not installed using the MCX Controller software installer.

The thumbnail streams through the 10GbE port and therefore requires the encoder (TX) and decoder (RX) devices to be connected through a 10GbE network switch. If it is desired to complete a proof of concept of the feature in a point-to-point setup, refer to Section 4.12.1, Using Thumbnail preview in Point-to-Point mode.

To start a video thumbnail:

1. If not currently running, launch the MCX Management Console.
2. Right click over the Encoder (TX) that has the source that the thumbnail preview is to be generated for.
3. Select the option, Start Thumbnail Stream (External Tool) from the menu that appears.

NOTE: By clicking on "Start Thumbnail Stream (External Tool)", the MCX Controller thumbnail script will automatically be started and a new window will open with the video content. See figures below.

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If the menu option to start a thumbnail stream is not available (grayed out), ensure that these following conditions are met:

- ◆ The Thumbnail option is enabled in the firmware product configuration settings. These settings are managed through the MCX Controller Production Assistant; contact technical support for more information on the firmware default settings.
- ◆ The latest version of firmware is installed on the MCX Controller devices. This version must be 4.0.0.0 or higher and the MCX Controller API must be 2.18.0.0 or higher.

### TIPS:

i. The Thumbnail executable is installed at this location folder:

C:\Program Files (x86)\BlackBox\MCX Controller\

ii. If the Thumbnail executable is installed at an alternate location than the directory and path shown above, the “MCX Controller\_THUMBNAIL” Windows Environment Variable must be set to the custom folder location including the “MCX Controller\_thumbnail.exe”. If the executable is installed in C:\Thumbnail\ folder, the “MCX Controller\_THUMBNAIL” Windows Environment Variable should be set with this value: “C:\Thumbnail\MCX Controller\_thumbnail.exe”

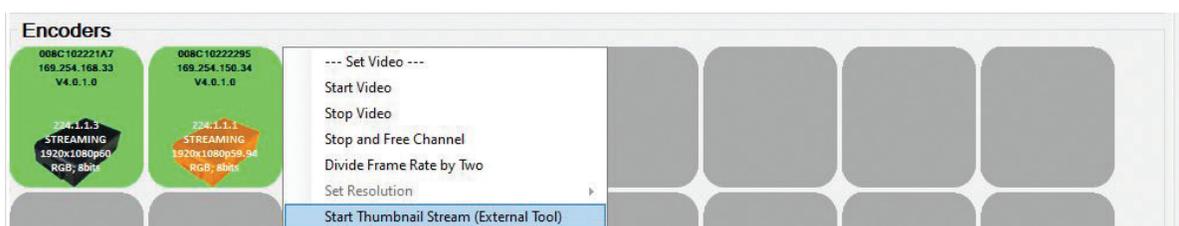


FIGURE 4-62. STARTING THUMBNAIL PREVIEW STREAM

### IMPORTANT CUSTOMER NOTICE

It is your responsibility to comply with all laws, rules, and regulations applicable to the operation of this product, including the processing and distribution of electronic content and, if you use the thumbnail preview feature, the display of such content in a thumbnail format viewable on a monitor.

You are responsible for entering into, performing, and obtaining any necessary authorizations with content providers whose electronic content you opt to process, distribute or display. All interaction between you and third parties providing electronic content or other third-party products or services is between you and the third party. Black Box assumes no liability for any of your activities involving your use of this product for the processing, distribution or display of third-party electronic content. IN NO EVENT SHALL BLACK BOX BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH OR ARISING OUT OF THE USE OF THIS PRODUCT REGARDLESS OF WHETHER BLACK BOX WAS ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Rev. 042019

### 4.12.1 USING THUMBNAIL PREVIEW IN POINT-TO-POINT MODE

If you want to view a thumbnail for an Encoder (TX) that is setup in a Point-to-Point mode with a Decoder (RX), this is possible using the 1GbE network interface of the Decoder and then running the MCX Controller thumbnail script through a command prompt specifying a Unicast IP address.

Through the command prompt, run the MCX Controller Thumbnail executable specifying the device ID, SSRC\*\*, desired framerate (FPS) and IP Address of the machine hosting the MCX Controller\_thumbnail.exe.

\*\* SSRC is a 32-bit integer (range 0-4294967295) that represents the RTP synchronization source (SSRC) identifier.

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Example of command entered at a command prompt and the scripts return:

Command:

```
C:\Program Files (x86)\BlackBox\MCX Controller>MCX Controller_thumbnail.exe D88039E53786 100 5 -ip 169.254.1.17
```

Return of script:

Thumbnail configurations:

IP Address: 169.254.1.17

UDP Port: 6972

SSRC: 100

width: 320

height: 180

fps: 5

colorimetry:BT709

Setting pipeline to PAUSED ...

Pipeline is live and does not need PREROLL ...

Setting pipeline to PLAYING ...

New clock: GstSystemClock

```
/GstPipeline:pipeline0/GstCapsFilter:capsfilter0.GstPad:src: caps = application/x-rtp, media=(string)video, clock-rate=(int)90000, encoding-name=(string)RAW, sampling=(string)YCbCr-4:2:2, depth=(string)8, width=(string)320, height=(string)180, ssrc=(uint)100, payload=(int)112
```

```
/GstPipeline:pipeline0/GstRtpJitterBuffer:rtpjitterbuffer0.GstPad:sink: caps = application/x-rtp, media=(string)video, clock-rate=(int)90000, encoding-name=(string)RAW, sampling=(string)YCbCr-4:2:2, depth=(string)8, width=(string)320, height=(string)180, ssrc=(uint)100, payload=(int)112
```

```
/GstPipeline:pipeline0/GstRtpJitterBuffer:rtpjitterbuffer0.GstPad:sink: caps = application/x-rtp, media=(string)video, clock-rate=(int)90000, encoding-name=(string)RAW, sampling=(string)YCbCr-4:2:2, depth=(string)8, width=(string)320, height=(string)180, ssrc=(uint)100, payload=(int)112
```

```
/GstPipeline:pipeline0/GstRtpVRawDepay:rtpvrawdepay0.GstPad:src: caps = video/x-raw, format=(string)UYVY, width=(int)320, height=(int)180, interlace-mode=(string)progressive, pixel-aspect-ratio=(fraction)1/1, chroma-site=(string)jpeg, colorimetry=(string)bt601, framerate=(fraction)0/1
```

```
/GstPipeline:pipeline0/GstVideoConvert:videoconvert0.GstPad:src: caps = video/x-raw, width=(int)320, height=(int)180, interlace-mode=(string)progressive, pixel-aspect-ratio=(fraction)1/1, framerate=(fraction)0/1, format=(string)UYVY, colorimetry=(string)bt709
```

```
/GstPipeline:pipeline0/GstQueue:queue0.GstPad:sink: caps = video/x-raw, width=(int)320, height=(int)180, interlace-mode=(string)progressive, pixel-aspect-ratio=(fraction)1/1, framerate=(fraction)0/1, format=(string)UYVY, colorimetry=(string)bt709
```

```
/GstPipeline:pipeline0/GstQueue:queue0.GstPad:src: caps = video/x-raw, width=(int)320, height=(int)180, interlace-mode=(string)progressive, pixel-aspect-ratio=(fraction)1/1, framerate=(fraction)0/1, format=(string)UYVY, colorimetry=(string)bt709
```

```
/GstPipeline:pipeline0/GstCapsFilter:capsfilter1.GstPad:src: caps = video/x-raw, width=(int)320, height=(int)180, interlace-mode=(string)progressive, pixel-aspect-ratio=(fraction)1/1, framerate=(fraction)0/1, format=(string)UYVY, colorimetry=(string)bt709
```

```
/GstPipeline:pipeline0/GstAutoVideoSink:autovideosink0.GstGhostPad:sink.GstProxyPad:proxypad0: caps = video/x-raw, width=(int)320, height=(int)180, interlace-mode=(string)progressive, pixel-aspect-ratio=(fraction)1/1, framerate=(fraction)0/1, format=(string)UYVY, colorimetry=(string)bt709
```

```
/GstPipeline:pipeline0/GstAutoVideoSink:autovideosink0/GstD3DVideoSink:autovideosink0-actual-sink-d3dvideo.GstPad:sink: caps = video/x-raw, width=(int)320, height=(int)180, interlace-mode=(string)progressive, pixel-aspect-ratio=(fraction)1/1, framerate=(fraction)0/1, format=(string)UYVY, colorimetry=(string)bt709
```



## CHAPTER 4: USING THE MCX MANAGEMENT CONSOLE

```
/GstPipeline:pipeline0/GstAutoVideoSink:autovideosink0.GstGhostPad:sink: caps = video/x-raw, width=(int)320, height=(int)180, interlace-mode=(string)progressive, pixel-aspect-ratio=(fraction)1/1, framerate=(fraction)0/1, format=(string)UYVY, colorimetry=(string)bt709
```

```
/GstPipeline:pipeline0/GstCapsFilter:capsfilter1.GstPad:sink: caps = video/x-raw, width=(int)320, height=(int)180, interlace-mode=(string)progressive, pixel-aspect-ratio=(fraction)1/1, framerate=(fraction)0/1, format=(string)UYVY, colorimetry=(string)bt709  
/GstPipeline:pipeline0/GstVideoConvert:videoconvert0.GstPad:sink: caps = video/x-raw, format=(string)UYVY, width=(int)320, height=(int)180, interlace-mode=(string)progressive, pixel-aspect-ratio=(fraction)1/1, chroma-site=(string)jpeg, colorimetry=(string)bt601, framerate=(fraction)0/1
```

```
/GstPipeline:pipeline0/GstRtpVRawDepay:rtpvrawdepay0.GstPad:sink: caps = application/x-rtp, media=(string)video, clock-rate=(int)90000, encoding-name=(string)RAW, sampling=(string)YCbCr-4:2:2, depth=(string)8, width=(string)320, height=(string)180, ssrc=(uint)100, payload=(int)112
```

### 4.12.2 MCX CONTROLLER THUMBNAIL PREVIEW CONFIGURATION AND SETUP

---

This section reviews the installation and demonstration of the new MCX Controller thumbnail preview feature added in MCX Controller firmware release 4.0.0.0 and MCX Controller API version 2.18.0.0.

For the MCX Controller, each individual thumbnail is launched independently to the upper left corner of the left display of the computer monitor that is being streamed, meaning a tile layout of multiple thumbnail streams is not provided.

The following characteristics apply to the MCX Controller thumbnail preview feature:

- ◆ Up to 320-pixel width
- ◆ Frame rate per second (fps) control
  - FPS is controllable and can range from 0.5 fps to full source frame rate.
  - The maximum frame rate of the thumbnail stream is the original frame rate of the video source.
- ◆ Thumbnail streams:
  - Are an RTP stream that can be received using open source multimedia frameworks, such as GStreamer.
- ◆ The RTP payload type is fixed to 112 uncompressed video.
- ◆ The RTP synchronization source (SSRC) identifier is configurable and must be provided by the user.
  - Are always YCbCr 4:2:2 8-bit uncompressed video.
  - Are always started through the MCX Controller Server (API).
  - Contain video only.
  - Are not encrypted.

**NOTE:** If the original video source is HDCP-encrypted, a thumbnail stream of the video source is available. However, to enable this type of source, a special API command is required.

- ◆ Thumbnail streams can be sent to a unicast IP address. The UDP port is configurable.
  - If left unspecified, the default port applied is 6972.
- ◆ For thumbnail streams sent to a multicast IP address, the UDP port is also configurable.
  - If left unspecified, the default port applied is 6972.

## CHAPTER 4: USING THE MCX MANAGEMENT CONSOLE

### 4.12.3 GSTREAMER INSTALLATION AND CONFIGURATION

This section reviews the configuration of GStreamer in relation to demonstrating the thumbnail preview streams. This document is using Windows based installation as its example.

NOTE: GStreamer is a pipeline-based multimedia framework that links together a wide variety of media processing systems to complete complex workflows.

Download and install GStreamer to the client computer that will be outputting the thumbnails. Select the typical installation:

- ◆ 32 bits: gstreamer-1.0-mingw-x86-XXX.msi
- ◆ 64 bits: gstreamer-1.0-mingw-x86\_64-XXX.msi

GStreamer can be downloaded from the following link:

<https://gstreamer.freedesktop.org/data/pkg/windows/>

1. Install GStreamer as Typical installation, default settings are acceptable for purpose of demonstrating thumbnail previews.
2. Once the installation is complete, it is necessary to add GStreamer executable binaries directory to the System variables "Path" in Environment Variables of the host Windows computer:

C:\gstreamer\1.0\x86\_64\bin\

Refer to figure shown next for example.

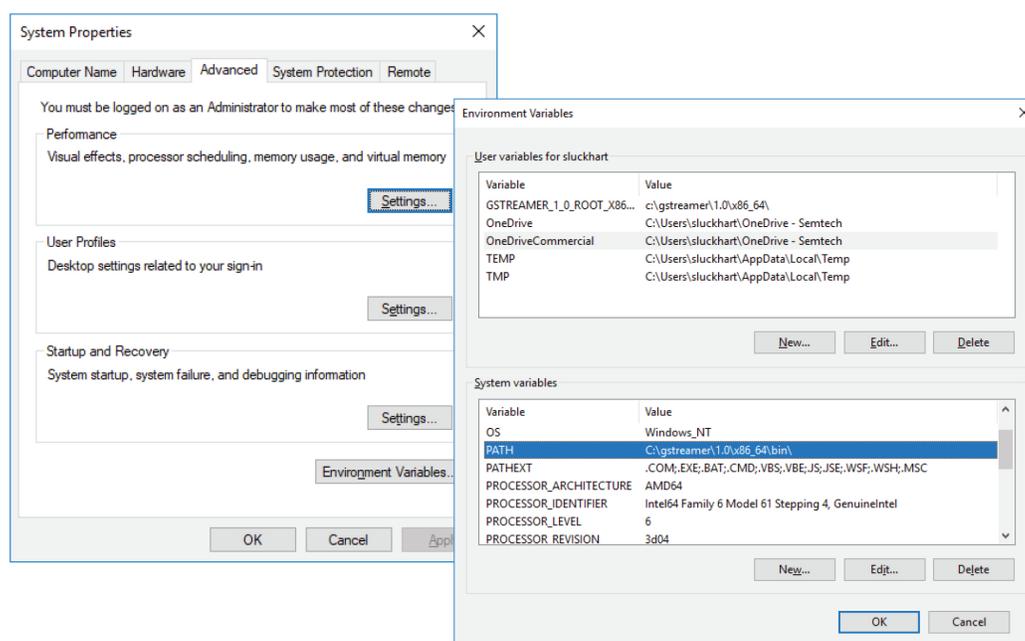


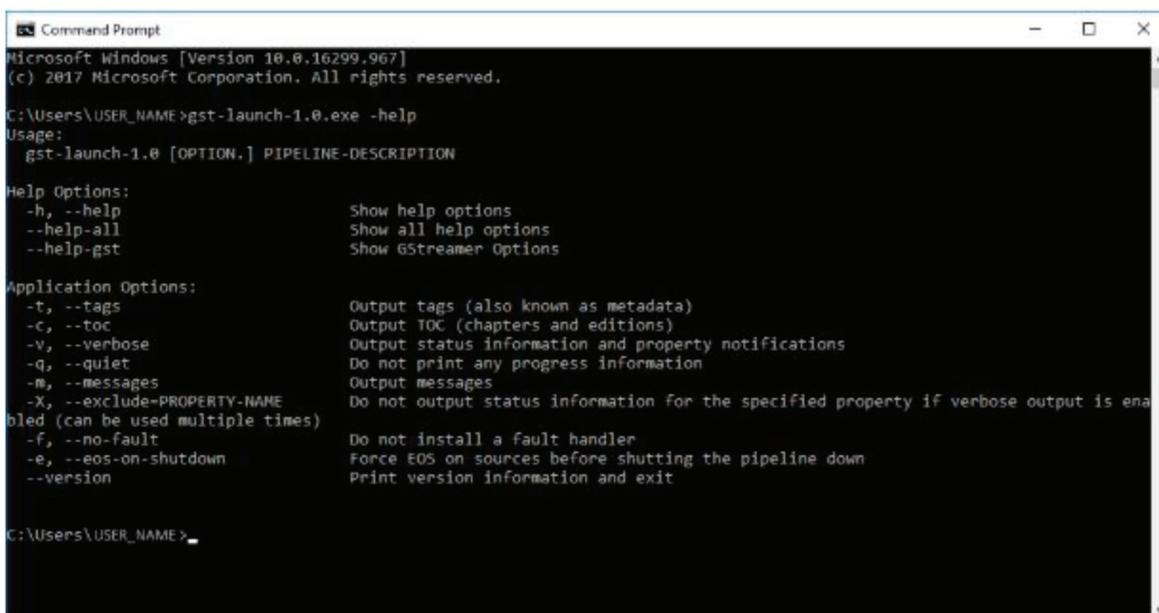
FIGURE 4-64. GSTREAMER SYSTEM VARIABLE

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3. Once the installation is completed and the variable is configured, verify that the `gst-launch-1.0.exe` executable is able to launch from any directory location using a Windows command line.

To verify the installation:

- a. Open a Windows command line.
- b. At the prompt type:  
`gst-launch-1.0.exe -help`
- c. The gstreamer help should then be displayed.



```
Command Prompt
Microsoft Windows [Version 10.0.16299.907]
(c) 2017 Microsoft Corporation. All rights reserved.

C:\Users\USER_NAME>gst-launch-1.0.exe -help
Usage:
  gst-launch-1.0 [OPTION.] PIPELINE-DESCRIPTION

Help Options:
  -h, --help                Show help options
  --help-all               Show all help options
  --help-gst                Show GStreamer Options

Application Options:
  -t, --tags                 Output tags (also known as metadata)
  -c, --toc                  Output TOC (chapters and editions)
  -v, --verbose              Output status information and property notifications
  -q, --quiet                Do not print any progress information
  -m, --messages            Output messages
  -X, --exclude-PROPERTY-NAME
  Do not output status information for the specified property if verbose output is enabled (can be used multiple times)
  -f, --no-fault             Do not install a fault handler
  -e, --eos-on-shutdown     Force EOS on sources before shutting the pipeline down
  --version                  Print version information and exit

C:\Users\USER_NAME>
```

FIGURE 4-65. EXAMPLE OF VERIFYING GSTREAMER

TIP: For information on installing GStreamer on an alternate Operating System than Windows, refer to the web page provided below to be directed to the GStreamer official web site:

<https://gstreamer.freedesktop.org/documentation/installing/index.html>

## CHAPTER 4: USING THE MCX MANAGEMENT CONSOLE

### 4.12.4 THUMBNAIL STREAM VIDEO RESOLUTIONS

The maximum image width size of 320 pixels is used to determine the thumbnail image size. The Video Aspect ratio is always respected. The table below shows supported stream resolutions and the output size for the MCX Controller thumbnail streams.

Table 4-1. Thumbnail stream resolutions and thumbnail resolution output

**TABLE 4-1. THUMBNAIL STREAM RESOLUTIONS AND THUMBNAIL RESOLUTION OUTPUT**

VIDEO WIDTH	VIDEO HEIGHT	INTERLACED	OUTPUT H SIZE	OUTPUT V SIZE
SD				
1440	480	X	180	120
720	480		240	160
1440	576	X	180	144
720	576		240	192
HD				
1280	720		320	180
1920	1080	X	320	180
1920	1080		320	180
4K				
3840	2160		320	180
4096	2160		292	154
OTHER				
640	480		320	240
800	600		266	200
1024	768		256	192
1280	800		320	200
1280	960		320	240
1280	1024		320	256
1360	768		272	153
1366	768		273	153
1400	1050		280	210
1440	900		288	180
1600	900		320	180
1600	1200		320	240
1680	1050		280	175
1920	1200		320	200

## CHAPTER 4: USING THE MCX MANAGEMENT CONSOLE

### 4.12.5 SET UP MCX CONTROLLER FOR THUMBNAIL PREVIEW

---

#### 4.12.5.1 REQUIREMENTS

---

- ◆ MCX Controller API version 2.18.0 or higher
- ◆ MCX Controller 4.0.0.0 package installed on the encoder (TX) device

The thumbnail must be enabled in the firmware hardware configuration.

NOTE: This is done through the Production Assistant when a Release package is generated.

#### 4.12.5.2 MCX MANAGEMENT CONSOLE THUMBNAIL INSTALLATION

---

If the MCX Controller windows installer provided by MCX Controller support with the release package was used to install the MCX Controller evaluation software package, the thumbnail option was installed automatically as part of the installation.

It is automatically started when the desktop MCX Controller Launcher shortcut is selected.

However, it is possible to manually start the thumbnail executable:

1. Browse to the folder where the MCX Controller Server executable resides.

The default installation directory is:

C:\Program Files (x86)\BlackBox\MCX Controller

2. Open the subfolder labeled MCX Controller.
3. In this folder there is an executable named MCX Controller\_thumbnail.exe.
4. Double-click on this executable to launch it.
5. Return to the MCX Management Console and select the thumbnail preview option. Refer to Section 4.12, Thumbnail preview, for an example of the menu option and use of the thumbnail preview feature.

### 4.12.6 THUMBNAIL SCRIPT AND EXECUTABLE DEMO

---

For demonstration purposes, MCX Controller support has provided an executable to make it easy to start a thumbnail stream. The following section provides instructions and guidelines on its use.

NOTE: GStreamer needs to be properly installed before using this demo code. Refer to Section 4.12.3, GStreamer installation and configuration for more information.

#### 4.12.6.1 HOW TO USE THE THUMBNAIL EXECUTABLE

---

If you want to run the thumbnail executable with a different frame rate or as a unicast stream, this can be done by running the thumbnail executable provided by Black Box at a line command prompt. Here running this executable manually is reviewed.

Command syntax:

```
thumbnail.exe DEVICE SSRC FPS [-udp_port UDP_PORT] [-api API] [-ip_address IP_ADDRESS] [-text TEXT] [-interface INTERFACE] [-hdc]
```

## CHAPTER 4: USING THE MCX MANAGEMENT CONSOLE

### Arguments

The DEVICE argument (required) must be the device ID of a single transmitter device.

The SSRC argument (required) is a 32-bit integer (range 0-4294967295) that represents the RTP synchronization source (SSRC) identifier. This value must be unique within an RTP session. Refer to RFC-3550 section 8 for details.

The FPS argument (required) specifies the maximum frame rate of the thumbnail stream in frames per second.

The UDP\_PORT argument (optional) is the destination UDP port number. If this argument is omitted, the default port number 6972 is used.

The API argument (optional) is the IP address of the machine hosting the MCX Controller Server (API). If this address is not specified, the loopback IP address 127.0.0.1 is used.

The IP\_ADDRESS argument (optional) is used to specify a destination IP address to the thumbnail stream. This can be a unicast IP address or an unused multicast address within the range managed by the MCX Controller Server (API).

The TEXT argument (optional) is used to add a text overlay on the GStreamer window.

The INTERFACE argument (optional) can be used to specify the Ethernet interface where the IGMP request will be sent. If this argument is not set, IGMP requests will be sent to all available Ethernet ports of the client computer.

The HDCP argument (optional) must be used to enable a thumbnail from HDCP video. If it is not specified, then a thumbnail is only sent if the video source is not using HDCP encryption.

### 4.12.6.2 GUIDELINES AND LIMITATIONS

---

The main purpose of this demo script is to start Thumbnail viewing on an encoder (TX) device and client computer. Below outlines the guidelines and limitations to keep in mind when using the demo script:

- ◆ No video encryption or compression is done.
- ◆ Video needs to be present and valid on the encoder (TX) device before executing the demo script. The script needs to retrieve the thumbnail stream video dimensions before being able to start the GStreamer with the proper window size.
- ◆ Once the stream is started, there is no dynamic management of this stream. The script does not monitor for changes in the Thumbnail stream.
- ◆ The GStreamer window is kept opened with the same size even if the stream is stopped on the encoder (TX) device.
- ◆ The GStreamer window needs to be manually closed. Once the window is closed, the demo script will automatically send the IGMP leave message in case a multicast address was used as a destination address of the thumbnail script.
- ◆ The GStreamer window size will remain the same even if the input video size on the encoder (TX) device is changed.
  - In the case of a smaller image size being implemented, a "ghost" image could be present if extra pixels are displayed.
  - For a larger image size, some pixels could be missing, resulting in only a portion of the stream be shown in the GStreamer window.
- ◆ Not able to be shown by VLC. The library version used by VLC to read streaming video does not support RTP RAW videos data.



## APPENDIX: DISCLAIMER/TRADEMARKS

### A.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.

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