# **User Manual**

# MH12 HDMI Audio Return Channel MediaHub





### Introduction

The MH12 Intelligent Audio MediaHub uses ARC (audio return channel) to demonstrate multiple sound bars. This device also features 4K video from its dedicated video output. The MH12 has 12 HDMI audio ports and 20 interface control ports for presentations of all sizes.

#### **Features**

- Switches HDMI-ARC audio signals across 12 outputs
- Produces video content with 4K video resolution\*
- One MH12 variant also offers optical digital outputs x12
- · Interface options include push-buttons and AirSelect proximity sensors, to control an interactive presentation
- · Customizes intuitively with the power of BrightAuthor firmware by BrightSign

\*Audio Authority/Ascentic Media products incorporating Brightsign SOM cores do not support metadata-centric content (HDR) Contact BrightSign support for further information.



\* Available on MH12-OPT-4K only.

#### What's New:

- CEC communication between one, many, or all HDMI-ARC positions
  - Initialize all HDMI-ARC positions simultaneously
  - Automatically manage HDMI-ARC device status
  - · Simultaneously increment/decrement HDMI-ARC volumes
  - Reduce output transition delays
- Improved HDMI-ARC audio drivers allow output to one, many, or all HDMI-ARC outputs
  - Playback HDMI-ARC audio to multiple devices simultaneously
  - Output audio signal enhanced to prevent interference
- Physical device connection notifications with query
- Custom EDIDs are easier to load and verify per position

#### **New Commands**

- ARC Query Reports if the ARC output is enabled
- ARC Set Controls the ARC output to HDMI-ARC device
- CECRAW Sends CEC command w/o modification or parsing
- Connection Query Reports if a physical connection is detected
- HPD Query Reports if the Hot Plug Detect pin is enabled
- HPD Set Sets Hot Plug Detect pin to HDMI-ARC device
- Mute Query Queries the audio system mute state for a position
- · Mute Set Sets the audio system mute state
- Present Query Queries whether the selected device ACK's via CEC
- Volume Query Queries the audio system volume for a position
- Volume Set Sets the audio system volume to the provided value or the next closest value if an exact match is unavailable.

#### **CEC** Communication

The MH12 series manages CEC (Consumer Electronics Control) communication between the BrightSign host and any of the 12 HDMI outputs. The MediaHub employs a separate micro-controller to manage CEC and correct discrepencies between the protocol of different connected devices.

#### HDMI-ARC

HDMI Audio Return Channels (ARC), controlled by the MH12, support from 2.0 up to 5.1 channel PCM. The number of PCM channels is decided during programming. Control your presentation via the media microSD card. Content played via PCM can be played in conjunction with embedded audio on the video output port.

HDMI-ARC audio is driven by the optical/SPDIF output of the BrightSign device.

### Commands

The MH12 Intelligent Audio MediaHub has the default device ID 913,253. It can send and receive serial commands via RS-485 at 57600 Baud, 8-N-1, and half-duplex; and via RS-232 at 115200 Baud, 8-N-1, and full-duplex. Both configuration ports utilize a modular RJ45 jack with the following pinouts:

#### **RS-485 Pinout:**

Pin	Function	Pin	Function	Pin	Function	Pin	Function
P1	Orange White (ground)	P5	Blue White (+12V power)	P1	Orange White (ground)	P5	not connected
P2	Orange (ground)	P6	Green (data B-)	P2	Orange (ground)	P6	Green White (RX/TX)
P3	Green White (data A+)	P7	Brown White (ground)	P3	Green White (TX/RX)	P7	Brown White (ground)
P4	Blue (+12V power)	P8	Brown (ground)	P4	not connected	P8	Brown (ground)

**RS-232** Pinout:

#### **Command List:**

Commands	Format	Response
ARC Query	[DEV=913,253;HDMI=1;ARC?]	(DEV=913,253;HDMI=1;ARC=ON)**
ARC Set	SINGLE: [DEV=913,253;HDMI=1;ARC=ON]	(DEV=913,253;HDMI=1;ARC=ON)**
	FEW: [DEV=913,253;HDMI=1,2,3;ARC=ON]	
	ALL: [DEV=913,253;HDMI=*;ARC=ON]	
CECRAW	SINGLE: [DEV=913,253;HDMI=1;CECRAW=05:C3]	(DEV=913,253;HDMI=1;CECRAW=05:C0)**
	FEW: [DEV=913,253;HDMI=1,2,3;CECRAW=05:C3]	
	ALL: [DEV=913,253;HDMI=*;CECRAW=05:C3]	
Connection Query	[DEV=913,253;HDMI=1;DEV=5;CONN?]	(DEV=913,253;HDMI=1;DEV=5;CONN=YES)**
HPD Query	[DEV=913,253;HDMI=1;HPD?]	(DEV=913,253;HDMI=1;HPD=ON)**
HPD Set	SINGLE: [DEV=913,253;HDMI=1;HPD=ON]	(DEV=913,253;HDMI=1;HPD=ON)***
	FEW: [DEV=913,253;HDMI=1,2,3;HPD=ON]	
	ALL: [DEV=913,253;HDMI=*;HPD=ON]	
Mute Query	[DEV=913,253;HDMI=1;DEV=5;MUTE?]	(DEV=913,253;HDMI=1;DEV=5;MUTE=ON)**
Mute Set	SINGLE: [DEV=913,253;HDMI=1;DEV=5;MUTE=ON]	(DEV=913,253;HDMI=1;DEV=5;MUTE=ON)***
	FEW: [DEV=913,253;HDMI=1,2,3;DEV=5;MUTE=ON]	
	ALL: [DEV=913,253;HDMI=*;DEV=5;MUTE=ON]	
Present Query	[DEV=913,253;HDMI=1;DEV=5;PRESENT?]	(DEV=913,253;HDMI=1;DEV=5;PRESENT=YES)**
Volume Query	[DEV=913,253;HDMI=1;DEV=5;VOLUME?]	(DEV=913,253;HDMI=1;DEV=5;VOLUME=15)**
Volume Set	SINGLE: [DEV=913,253;HDMI=1;DEV=5;VOLUME=22]	(DEV=913,253;HDMI=1;DEV=5;VOLUME=22)***
	FEW: [DEV=913,253;HDMI=1,2,3;DEV=5;VOLUME=22]	
	ALL: [DEV=913,253;HDMI=*;DEV=5;VOLUME=22]	
Reboot	[DEV=253;REBOOT]	
Reset Defaults	[DEV=253;RESET;DEFAULT]	
Button Led On	[DEV=913,253;BTN=#;LED=ON]	
Button Led Off	[DEV=913,253;BTN=#;LED=OFF]	
Button Led Blink	BLINK: [DEV=913,253;BTN=#;LED=BLINK]	
	SLOW: [DEV=913,253;BTN=#;LED=SLOW]	
	FAST: [DEV=913,253;BTN=#;LED=FAST]	
Pressed Button Led On	[DEV=913,253;BTN=#;PRLED=ON]	
Pressed Button Led Off	[DEV=913,253;BTN=#;PRLED=OFF]	
Pressed Button Led Blink	BLINK: [DEV=913,253;BTN=#;PRLED=BLINK]	
	SLOW: [DEV=913,253;BTN=#;PRLED=SLOW]	
	FAST: [DEV=913,253;BTN=#;PRLED=FAST]	
Button Press		(DEV=913,253;BTN=#;PRESS)
Button Release		(DEV=913,253;BTN=#;RELEASE)
App Version	[DEV=253;APP;VERSION?]	(DEV=253;APP;VERSION=\$)
Bootloader Ver	[DEV=253;BOOT;VERSION?]	(DEV=253;BOOT;VERSION=\$)

\*\* Responses will be received per individual position

\*\*\* Acknowledgments will be received per position

State options available for each command:

- ARC Set = ON/OFF
- CECRAW = Hex byte pairs separated by colons (e.g., 05:44:43)
- Mute Set = ON/OFF
- Volume Set = 0 100
- LEDs = See Pushbutton LED Commands

Pushbutton LED Commands:

The structure is "[DEV=#;BTN=\$;LED=%]"

- # is the device ID (913,253)
- \$ is the single, multiple, or all button positions
  - Single = single integer, 1-20
  - Multiple = comma separated integers, 1-20
  - All = \*
- % sets the LED state
  - OFF
  - ON
  - BLINK (NORMAL SPEED)
  - SLOW
  - FAST

#### **Hot-Pluging**

"Hot-Pluging" via HPD commands is no longer required between output switching; Use only for initialization and device recovery.

#### Keep-Awake and Always-Ready

Run HDMI-ARC initialization for all audio devices at application load for the fastest in-demo audio switching.

HDMI-ARC system audio mode can time out after 15 minutes of no audio on some devices. Consider configuring CEC listeners in your application to ensure that the HDMI-ARC device is always ready to playback audio

Quickly reset volume levels at demo timeout by using the VOLUME SET command. If discrete volume levels are required per position for mixed-manufacturer demonstrations, send VOLUME SET commands for each bar individually in rapid succession.

To further ensure devices stay ready during the "attract" mode of your demo, enable the ARC output to all devices and have a low volume, high-pitched "keep awake" tone playing.

Pair the MH12 with the SR-PA1 Audio and Presence sensor and an Access Connected World subscription to remotely and automatically validate audio output by position to ensure a completely-functioning experience.

#### **CEC** Tips

HTML-based BrightSign applications appear better suited to handle the high volume of CEC messages generated by multiple HDMI-ARC devices. For the best results, ensure your application is non-blocking and utilizes queues.

Some soundbar manufacturers provide "Vendor-Specific" commands that will enable additional features. Contact manufacturers for more information.

Some soundbars will attempt to initiate HDMI-ARC handshaking by sending a "50:C0" command at "Hot-Plug". The MH12 will automatically respond with a "05:C1" (report ARC initiated) acknowledgment, regardless of what prompted the "50:C0" command, removing this demand of the application.

Use the HDMI Connection notifications to automatically initialize new HDMI-ARC devices during SKU changes without restarting the application.

PRESENT, CEC, ARC, and EDID commands DO NOT need to be routed in a prior message.

# **Quick Start Instructions**

- 1. Create a new BrightAuthor experience for the HS123/124/144/145 (depending on the module installed in the MediaHub).
- 2. In BrightAuthor's presentation properties on the interactive tab, ensure "port 0" is configured to a baud rate 115200 8-N-1, ASCII, with "CR" for send and receive EOL.
- 3. Create your presentation. Note that any built-in serial or GPIO port is treated as a serial device, following the applicable MediaHub serial protocol.
- 4. Important: HDMI-ARC audio is driven by the optical/SPDIF output of the BrightSign device.
- 5. Export your presentation to a microSD card and insert it into the Media SD port.
- 6. Connect any peripheral devices, followed by the power supply. Note that HDMI port 1 will set the EDID information for all other connected HDMI devices.

# Example System

#### MH12-S5-X-A with 12 Sound Bars, Touch Screen Interface and Push-buttons

This configuration uses HDMI audio return channel to demonstrate sound bars. 12 audio outputs can play either HDMI-ARC, or optical digital and analog audio, depending on the requirements of the device. It leverages the MH12's dedicated 4K display output to invite and attract customers. The Ethernet port interfaces with the network to receive commands and output analytics; with the added capability to control and monitor the system remotely. The SR-PA1 audio and presence sensor enables sound checks to make sure the sound bars are playing, and allows

the system to report human presence statistics. See SR-PA1 manual for details.



# **Power Specification**

Power Bus Port: 2x barrel jack connectors (5.5 x 2.1mm)

Voltage: +12V DC

No-Load Current: PCAs Only: TBD MH12: TBD

Maximum Load Current: MH12: TBD

Maximum Current Output: RS-485 Bus: 1.5A @ +12.0V DC USB A: 500mA @ +5.0V DC

# Troubleshooting

#### No Ethernet connectivity, check the following:

- Connections are fully seated
- The correct position is selected via software
- Audio is playing from source device

# No RS-232 communication, check the following:

- · Connections are fully seated
- · Devices are using the correct protocol settings
- The null/straight selector is set correctly

#### No audio, check the following:

- · Connections are fully seated
- The correct position is selected via software
- · Audio is playing from source device
- Switched audio type is connected

## **Mechanical Details**

Case Type: Custom metal enclosure - full surround

Case Dimensions: W x L x H 13.7" x 6.2" x 1.5" 348mm x 158mm x 38mm

Mounting Locations: Metal flanges Centerline Holes: 2x 0.165" (4.5mm) diameter Slots: 4x 0.165" x 0.28" (4.5mm x 7mm) 1.0" (25.4mm) above/below center line holes

#### No HDMI-ARC audio, check the following:

- The HDMI HPD is enabled for the position (toggle if necessary)
- CEC is routed, and applicable ARC initiation commands are sent
- ARC audio is routed to the position
- BrightSign experience is sending compatible audio via the SPDIF interface
- HDMI-ARC device is turned on and connected to the appropriate port





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