

Application Guide

DC10-H Digital Cinema I/O

Processing Multi-Channel Audio from HDMI and from Stereo Analog Sources



THE DCIO-H CAN PROCESS HDMI DIGITAL AUDIO AND UP-MIX STEREO ANALOG AUDIO.

Blu-ray/media players, satellite/cable boxes, and other AV sources typically provide multi-channel audio in a compressed digital format such as DTS-HD® or Dolby Audio™. The HDMI section of the DCIO-H Digital Cinema I/O automatically identifies the audio formats in the content and de-compresses the data. Some cinema sources have only analog stereo audio outputs. The DCIO-H can handle these as well, including upmixing them to produce full surround audio.

The DCIO-H presents these channels as streaming audio data on the Q-LAN network within the Q-SYS Ecosystem, where they can be processed and routed the same as other audio sources.

This application guide describes how the DCIO-H HDMI processing handles these different compressed digital audio formats, as well as how to upmix analog stereo audio into a full surround system. This versatility is useful for presenting alternate content from sources other than a Digital Cinema Package (DCP) in cinema auditoriums or other presentation venues with surround speaker systems.

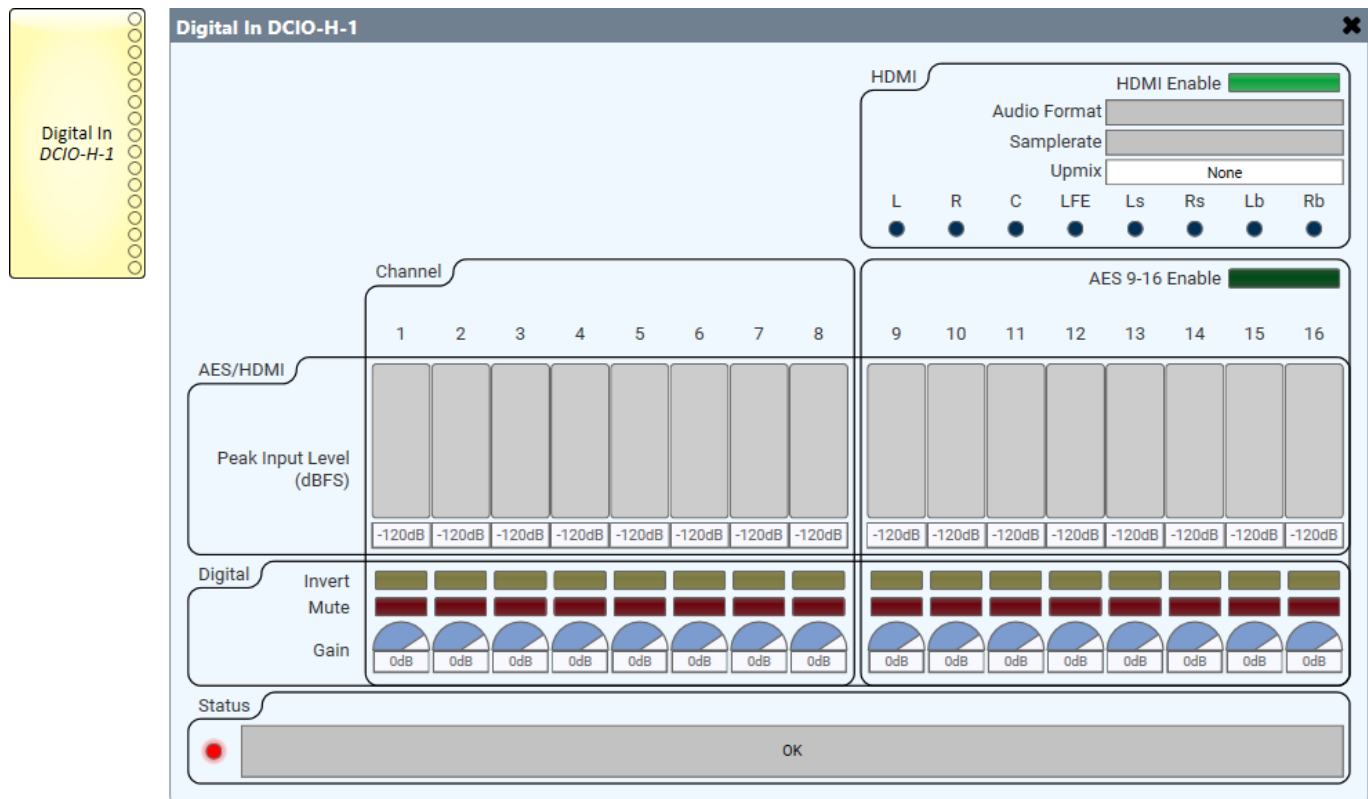


Figure 1 — When enabled, the eight available HDMI audio channels replace AES3 channels 9 through 16.

1. CONNECTIONS

Connect an HDMI cable from a media source (for example, a Blu-ray player) to the HDMI IN port of the DCIO-H. Connect the HDMI OUT port to an HDMI input on the digital cinema projector or Q-SYS NV-32-H Network Video Endpoint.

The DCIO-H can decode the most common formats of compressed multi-channel digital audio: DTS-HD® (common in Blu-ray and many other media players) and Dolby Audio™ (common in satellite and cable TV transmission), which includes Dolby Digital Plus™ and Dolby® Surround 7.1. See Table 1 for a list of supported formats.

Format	Decoding support
Dolby Digital 5.1 AC-3	Yes
Dolby Digital Plus™	Yes
Dolby Surround 7.1	Yes
DTS® 5.1	Yes
DTS-HD	Yes
DTS-HD MA	Yes
DTS:X	Pass-thru only
Dolby Atmos®	Pass-thru only

2. SETUP IN Q-SYS DESIGNER SOFTWARE

To use the HDMI input of the DCIO-H, toggle the **HDMI Enable** control in the **Digital In** block control panel at runtime (Figure 1).

Enabling the HDMI input replaces AES3 channels 9 through 16 with the eight channels available in the HDMI, which are assigned in the order shown in Table 2. Outputs 1 through 8 always contain AES3 channels 1 through 8.

The HDMI / AES9–16 selection button can be included in a User Control Interface (UCI) for use on a touchscreen panel. See Section 4 for tips.

DCIO-H Digital In	HDMI Channel
9	Left
10	Right
11	Center
12	LFE (Subwoofer)
13	Left surround
14	Right surround
15	Left back
16	Right back

3. AUDIO UPMIXING

The digital audio conveyed via HDMI accommodates up to a 7.1 surround system. The number of channels required may vary among installations, and similarly, some program material may support only a subset of these channels.

Format of input audio	Upmix Control Selection		
	None	5.1	7.1
Stereo	Stereo	7.0	7.0
Lt/Rt (Surround-encoded stereo)	5.0 / 7.0	5.0 / 7.0	5.0 / 7.0
5.1	5.1	5.1	7.1
7.1	7.1	7.1	7.1

In Q-SYS version 8.4 and later, any HDMI stereo audio content can be upmixed to synthesize a center channel, as well as side and rear surround channels. The amount of upmixing is selectable in the HDMI settings (Table 3).

4. CREATING A UCI FOR HDMI SELECTION

Selection of HDMI inputs or AES3 inputs is an ideal function to include in a touchscreen UCI panel for projection booths, control rooms, etc.

First, open the **Digital In** control panel of the DCIO-H, as in Figure 1. Copy the **HDMI Enable** and **AES 9–16 Enable** buttons to the design page. Make another copy of the **HDMI Enable** button and make sure its **Push Action** is set to **Toggle** (Figure 2).

For the **HDMI Enable** and **AES 9–16 Enable** buttons, change their **Presentation** to **LED**. Copy all of them into the UCI.

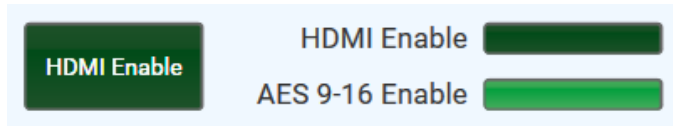


Figure 2 — The copied HDMI Enable and AES 9–16 Enable buttons plus an additional copy of the HDMI Enable button.

Customize the UCI by resizing and arranging the controls, modifying their properties, and adding text. You can also add graphics to the UCI, including a background. Figure 3 shows a basic idea of the UCI for a TSC-7w touchscreen. Touch the “Press to change selection” button to switch between the HDMI and AES3 inputs. The LEDs indicate which set of inputs are currently enabled.

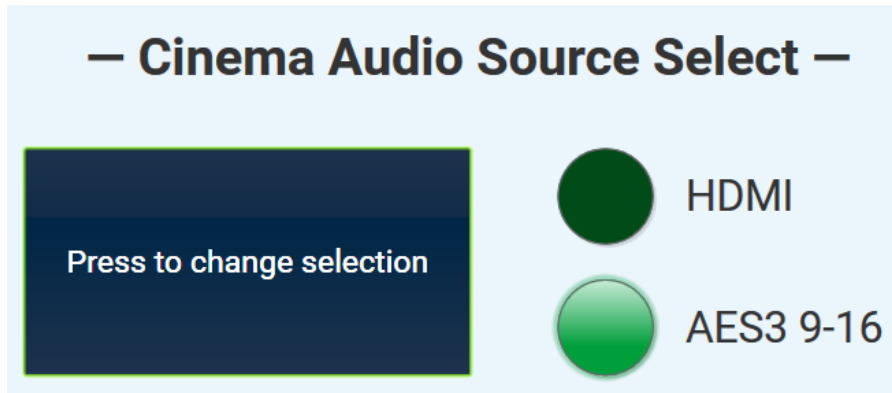


Figure 3 — Buttons copied into a UCI and customized with text.

5. CREATING SURROUND AUDIO CHANNELS FROM A STEREO SOURCE

Some AV content might have only two channels of audio with no center screen channel. Stereo sound that uses only the left and right front loudspeakers may sound hollow and inadequate in a cinema or other large auditorium that has a multi-channel surround audio playback system. A common technique to create audio for a center channel is to mix the left and right channels into a mono signal and feed it into the center channel. The stereo channels can also be used to synthesize side surround channels.

You can do this automatically in your Q-SYS design (Figure 4). The Active Matrix Surround Decoder is an audio component in the cinema library of Q-SYS Designer Software. (To enable the cinema library, right-click on the **Q-SYS Designer Software** shortcut, select **Properties**, append **/cinema** to the **Target**, and then click **OK**. See Figure 5.) It will convert stereo audio into a multi-channel sound field by creating an artificial center channel and a surround channel. Adding a stereo crossover and summing the low-frequency outputs lets you create an LFE channel. Used together, these components will greatly improve the audio quality in a cinema auditorium when the source has only stereo audio.

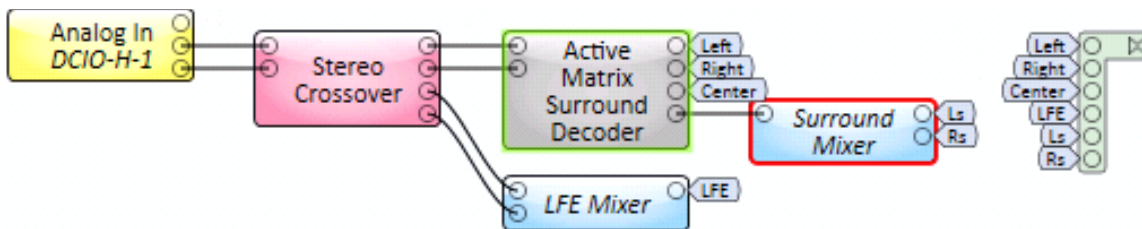


Figure 4 — Using a Q-SYS Active Matrix Surround Decoder.

In this example, the stereo audio channels are from an analog source. The high-frequency outputs of the stereo crossover feed the Active Matrix Surround Decoder, which produces the center channel with filtered audio content that is common to the left and right channels. The left and right channel outputs are the left and right channels with the center channel content removed. The surround channel output feeds the Surround Mixer, which creates the left and right surround channels in a 5.1 audio field but can also be configured to produce the left, right, left back, and right back surround channels in a 7.1 audio field.

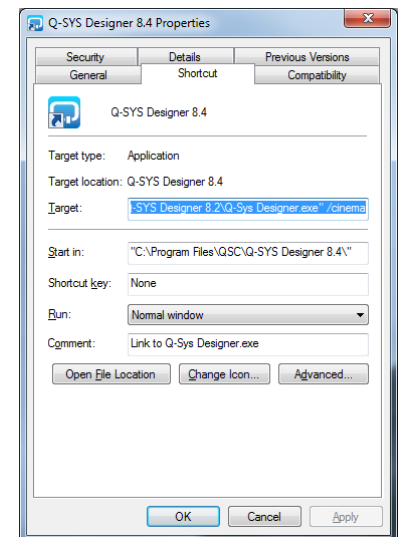


Figure 5 — Append **/cinema** to the shortcut **Target**.



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