

PRELIMINARY

# LC16D NETWORK AUDIO CONVERTER



- MADI & AES/EBU to Network audio interface
- Embedded web interface for setup and supervision
- Innovative power redundancy implementation
- Comprehensive clocking options
- Dynamic channel mapping
- Save, load and manage configurations



LC16D is a multichannel converter that bridges MADI and AES/EBU legacy digital formats bidirectionally with a Milan-AVB network. Supporting up to 128 Milan-AVB inputs and outputs simultaneously, LC16D offers dynamic mapping of channels, and comprehensive synchronization options, with remote control via a simple to use embedded web interface. Flexible power options and seamless Milan-AVB network audio connections deliver robust redundancy features as standard, all housed in a compact and rugged 1RU chassis.

Legacy audio protocols, such as MADI and AES/EBU, continue to be used extensively across the professional audio industry. LC16D enables interfacing and conversion between these formats and a deterministic, redundant Milan-AVB network. Up to 16 AES/EBU inputs and outputs can be connected, with asynchronous sample rate converters (ASRC) available on each input pair, enabling sources from multiple clock domains to be accommodated. The ASRCs can also be disabled as required. MADI offers a high-density connection which is widely supported by most digital mixing platforms and playback devices. At 96 kHz sampling rate, 32 input and 32 output channels are available, and at 48 kHz, 64 inputs and outputs are supported.

LC16D features an alternative network mode, allowing it to receive up to 16 streams of AES67 network audio, of up to eight channels each at 48 kHz, and convert them to AES/EBU and MADI format outputs. Similar to Milan-AVB, the AES67 input mode also provides seamless redundancy for further peace of mind. This expanded functionality significantly enhances LC16D's usability across a wide range of applications.

LC16D is designed as a plug-and-play device: out of the box all legacy digital inputs and outputs are presented to the Milan-AVB streams with a one-to-one channel mapping, AES/EBU first and then MADI. Only the required clock reference needs to be selected and LC16D is ready to pass audio. While providing this straightforward conversion the freedom to dynamically map channels is also available. Collectively, up to 80 legacy digital input sources and 80 output destinations can be connected to and from the Milan-AVB network. The remaining Milan-AVB channels, from the available 128 outputs, can be utilized to combine selections of AES/EBU and MADI input channels, creating custom Milan-AVB streams for optimized distribution to multiple network destinations. The dynamic mapping function also allows diverse network audio sources across multiple streams to be routed to the MADI and AES/EBU outputs from the network, bringing additional flexibility and versatility.

With LC16D no additional remote-control software is needed, the comprehensive embedded web interface is simple and intuitive to use. Any device with a web browser and IP connection can be used to control, configure, and manage the LC16D, including basic settings, channel mapping, and setup of the GPIOs. Additionally, ten onboard user memories are available to store and load configurations. These can also be saved to a remote device, to build a library of configurations for backup or transferring between multiple LC16D.

## I/O

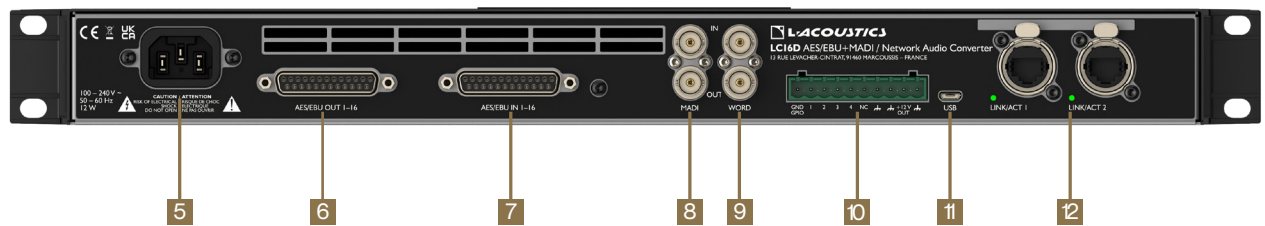
For the AES/EBU inputs and outputs, two 25-pin D-sub connectors (DB25) are available, which comply with the AES59 annex C 8-way pinout standard. MADI in and out and the word clock in and out use industry standard BNC connectors. Two etherCON™ ports provide audio network and control connections and LC16D offers seamless audio network redundancy as standard. If the non-redundant network mode is selected the two network ports can be used to daisy-chain units, reducing the need for additional switches.

The internal universal power supply is connected via a V-lock compatible IEC connector and both etherCON™ ports support Power over Ethernet, allowing up to three levels of seamless power redundancy to be connected simultaneously. Four configurable GPIO connections and a 12V DC output are available via a 10-point terminal block connector. Configured as a general-purpose input, they can be used to trigger actions such as configuration recalls; configured as an output, they can be used to report the status of various user-selected functions within the device.

## USER INTERFACE



- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>1 Mains, PoE, Control and Status LEDs</li> <li>2 Clock Reference LEDs</li> </ul> | <ul style="list-style-type: none"> <li>3 AES/EBU input / output Status, Signal, and Clip LEDs</li> <li>4 MADI input / output Status, Signal, and Clip LEDs</li> </ul> |
|---|---|



- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>5 IEC V-Lock™ compatible power supply inlet</li> <li>6 AES/EBU outputs (25-pin D-SUB connector, AES59 8-way compatible)</li> <li>7 AES/EBU inputs (25-pin D-SUB connector, AES59 8-way compatible)</li> <li>8 MADI input and output (BNC connectors)</li> </ul> | <ul style="list-style-type: none"> <li>9 Word clock input and output (BNC connectors)</li> <li>10 10-point terminal block connector (with General Purpose I/O)</li> <li>11 USB port for IP address configuration and initial setup</li> <li>12 etherCON™ 1 Gb/s Ethernet connectors (with PoE)</li> </ul> |
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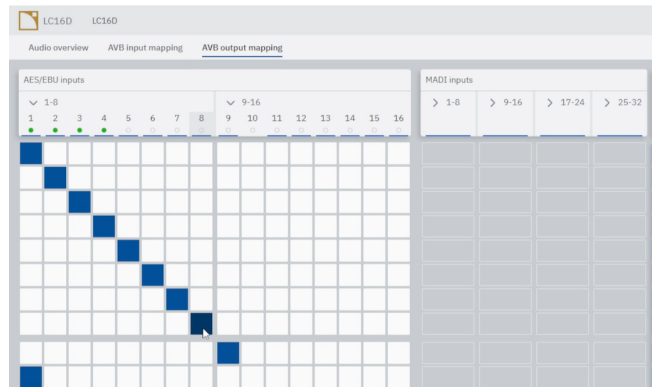
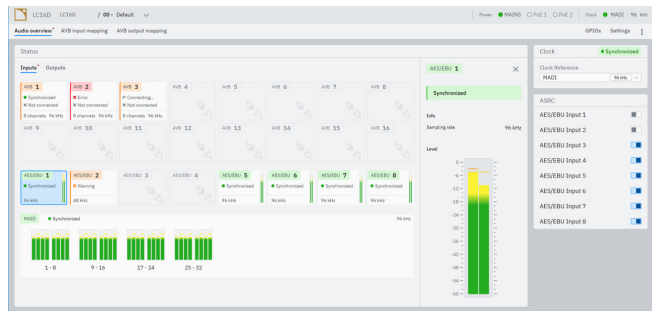
# SOFTWARE AND NETWORK

Configured, controlled, and monitored through an embedded web server, LC16D is accessible from any device with a web browser and an Ethernet network connection by simply typing the IP address of the unit into the search bar.

The web server's intuitive user interface enables the configuration of general settings, selection of the clock reference, channel mapping management, and setup of GPIOs. The status of AES/EBU, MADi, and clock source connections can be monitored in real-time.

Configurations can be stored in one of 10 internal memory positions and loaded when required. These can also be saved to the control device for backup and transfer to other LC16D units.

AVDECC control software, such as Milan Manager, can be used to create and configure streams between LC16D and other devices on the Milan-AVB network.

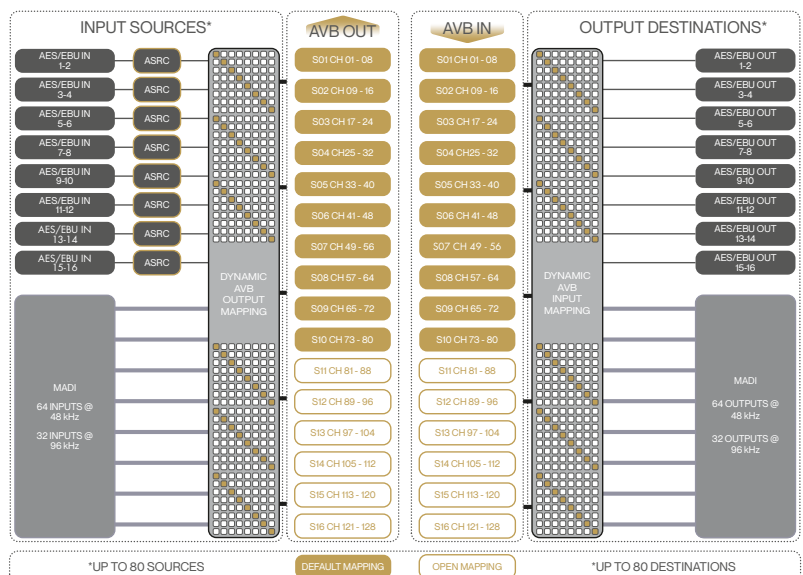


A separate Windows and macOS software utility, LA Device Scanner, is available to facilitate the discovery of and connection to LC16D with a single click through the computer's default web browser. However, this practical utility is not exclusively for use with LC16D; LS10, P1, and all amplified controllers can benefit from its extended feature set. These include the scanning and identification of individual units on the network, the naming of devices, and the management of IP addresses, including the resolution of IP conflicts. MAC addresses and serial numbers are also displayed and a table of information from the discovered devices can be exported as a CSV file. This can all be achieved remotely, helping to streamline the setup and configuration of any L-Acoustics system.

## Dynamic Mapping

Out of the box, the default channel mapping of LC16D uses a logical one-to-one layout, allowing devices to be connected and used immediately in most situations. This mapping positions the AES/EBU channels on the first two Milan-AVB streams and MADi is mapped from the third Milan-AVB stream, up to stream 10, if operating at a 48 kHz sampling rate, using 80 channels in total for the legacy ins and outs. The remaining Milan-AVB inputs and outputs are open for added routing flexibility.

Dynamic mapping is accessed through a practical crosshair matrix layout, making the process of creating complex routing schemes and tracing channel sources and destinations straightforward. The mapping view can conveniently be expanded or condensed, accommodating diverse screen resolutions and display needs.



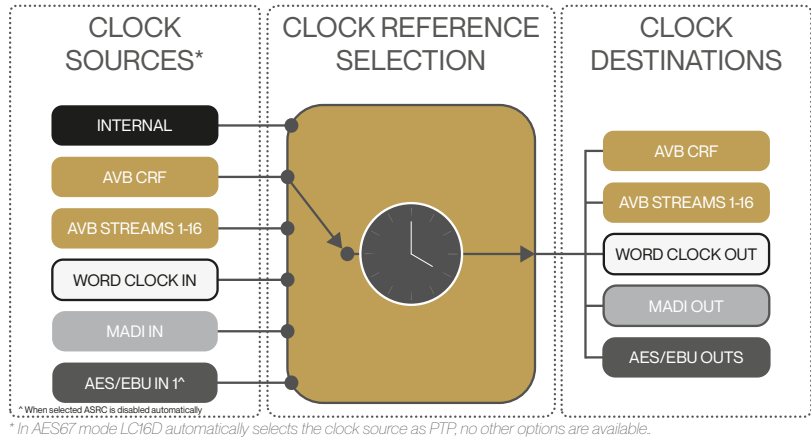
\* In AES67 mode LC16D acts only as a receiver/listener, converting AES67 inputs to output destinations. Conversion of input sources to AES67 is disabled.

# CLOCKING ARCHITECTURE

The internal clock of LC16D can act as the system reference for any connected devices. Alternatively, an input source connection can be selected as the clock reference for all output destinations, enabling LC16D to act as a distribution point for system synchronization. Should the selected clock source be temporarily lost, LC16D will 'freewheel' allowing audio to continue passing, until the clock connection is re-established.

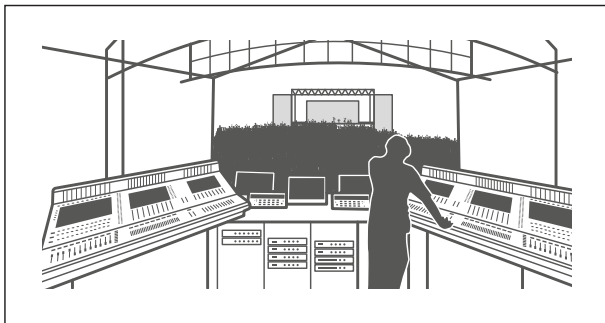
Internally LC16D is a single clock domain device and operates at a base sampling rate of either 96 kHz or 48 kHz.

The AES/EBU inputs each offer an asynchronous sample rate converter (ASRC), which can be enabled or disabled on a per-pair basis. The ASRCs facilitate sources using multiple clock domains to be accommodated and interfaced with the Milan-AVB network. If AES/EBU input 1 is selected as the clock reference its ASRC will be disabled automatically.

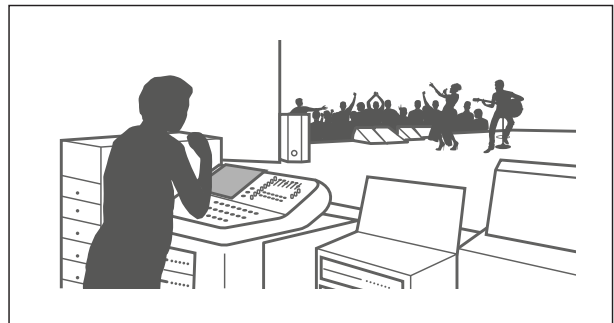


# APPLICATIONS

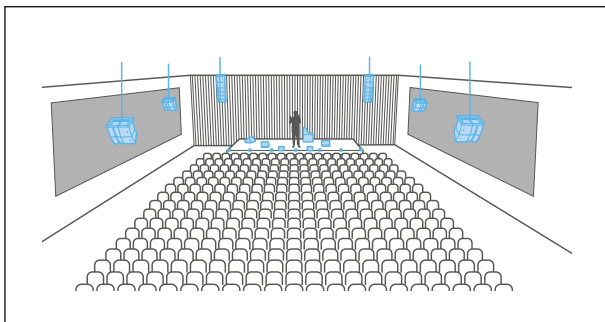
By acting as an on-ramp and off-ramp for a redundant Milan-AVB network, LC16D can be deployed as part of any system where the audio network needs to be interfaced with AES/EBU and MADI formats. The extensive feature set makes it the perfect tool for rental, fixed installation, broadcast, corporate, yachts, home cinemas, and recording studio applications. Whether at the Front-of-House position, interfacing multiple digital consoles and devices, or at the monitor position, enabling connection to amplified controllers and IEM systems, the ease of configuration, dynamic mapping, and clocking options make it a flexible addition to any system.



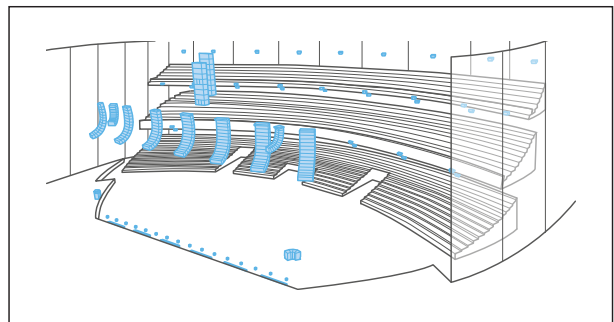
FOH: Simplify multi-console interfacing



Monitors: Easily connect with amplified controllers and IEM systems



Broadcast and Corporate Events: Format conversion and signal distribution



Venues and Fixed Installations: Milan-AVB network break-in and break-out

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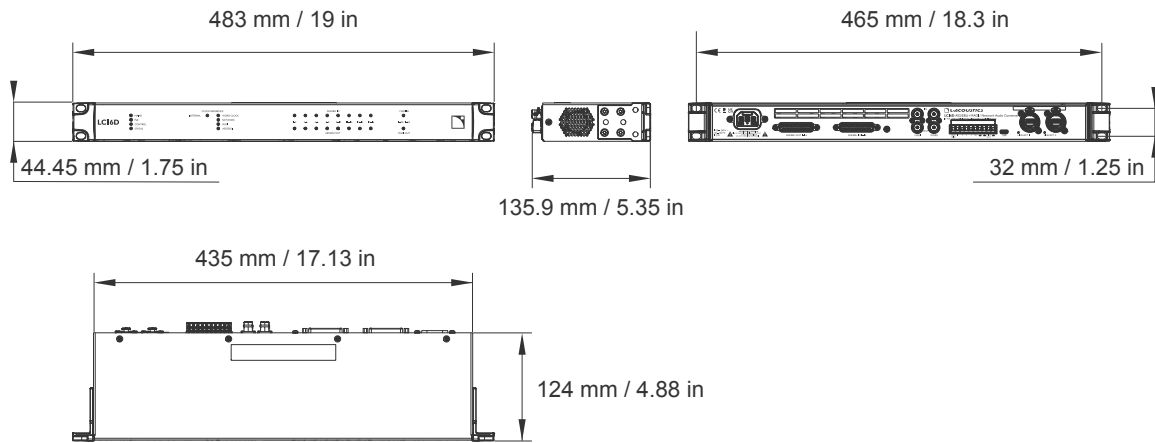
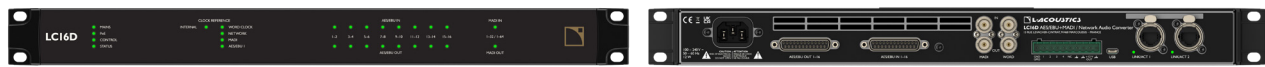
channels, and comprehensive synchronization options, with remote control via a simple to use embedded web interface. Flexible power options and seamless Milan-AVB network audio connections deliver robust redundancy features as standard, all housed in a compact and rugged 1RU chassis.

Up to 16 AES/EBU inputs and outputs can be connected using standard DB25 connectors. Asynchronous sample rate converters (ASRC) are implemented on each AES/EBU input. A pair of BNC connectors provide access to MADI. At a sampling rate of 96 kHz, 32 input and 32 output channels are supported, and up to 64 at 48 kHz. Used together, up to 80 input sources and 80 output destinations can be connected and dynamically mapped to and from a redundant Milan-AVB network. The comprehensive clocking options facilitate the selection of a reference from any of six different sources, which is then presented to all outputs, enabling clock distribution across a system. An alternative network mode is also supported, enabling AES67 streams to be converted to AES/EBU and MADI outputs. Up to three levels of power redundancy are available using a combination of the internal PSU and the dual, PoE-supporting, Ethernet ports.

## SPECIFICATIONS

<b>General</b>	
Mains rating	100 V - 240 V ( ±10%), 50-60 Hz
Power redundancy	1 x AC mains PSU 2 x Power over Ethernet (class 3 PD, compatible with IEEE802.3at-2009 PSE)
Power consumption	8W (typical/idle), 12 W (max)
Operating temperature	-5 °C / 23 °F to 50 °C / 122 °F
<b>Network audio I/O</b>	
Standards	Milan-AVB (IEEE 1722) or AES67: AES67-2023 (Receiver only)
Number of input/output streams	16/16 Milan-AVB mode or 16/0 AES67 mode
Supported channel counts (input stream or output stream)	1 to 8
Channels per Stream	Up to 8
Supported stream formats	Milan Base Format (IEEE 1722 AAF PCM32), or AES67 mode (L16 or L24, 48 kHz)
Supported sampling frequencies	48 or 96 kHz (48 kHz only in AES67 mode)
Media Clock in/out in Milan-AVB mode	1 Milan CRF Media Clock stream
Media Clock in AES67 mode	Derived from the network grandmaster clock elected according to PTPv2
<b>AES/EBU inputs</b>	
Number of inputs (in Milan-AVB mode only)	8 (16 audio channels)
Standard	AES/EBU (AES3) or electrical S/PDIF (IEC 6095 Type II)
Asynchronous Sample Rate Converters (ASRC)	8 (can be disabled individually)
Supported sampling frequencies (fx) and word length	44.1 to 192 kHz at 16, 18, 20, or 24 bits
Default AVB output mapping	Streams 1-2
<b>AES/EBU outputs</b>	
Number of outputs	8 (16 audio channels)
Standard	AES/EBU (AES3) or electrical S/PDIF (IEC 60958 Type II)
Sampling frequency (Fs) and word length	48 kHz or 96 kHz at 24 bits
Default audio network input mapping	Streams 1-2
<b>MADI inputs</b>	
Number of inputs (in Milan-AVB mode only)	64 channels at 48 kHz 32 channels at 96 kHz
Default AVB output mapping	Streams 3-10 (48 kHz) or Streams 3-6
<b>MADI outputs</b>	
Number of outputs	64 channels at 48 kHz 32 channels at 96 kHz
Default audio network input mapping	Streams 3-10 (48 kHz) or Streams 3-6 (96 kHz)
<b>Word clock</b>	
Input Frequency	48 kHz or 96 kHz
Output Frequency	48 kHz or 96 kHz

<b>Audio clock sources</b>	
Clock Reference Sources	Internal, Milan-AVB (CRF media clock or input stream), Word clock In, MADI In, AES/EBU Input 1
Supported operating frequencies	48 kHz or 96 kHz (Only IEEE 1588-2028, PTP v2 supported in AES67 input mode)
<b>Control and monitoring</b>	
Network connection	Dual-port Ethernet Gigabit interface
L-Acoustics remote control software	Embedded Web Server, LA Device Scanner
General Purpose Inputs / Outputs (GPIO)	4 GPIO, isolated optocoupler input, isolated relay contacts
Third-party control solutions	HTTP API
<b>Connectors</b>	
AES/EBU inputs / outputs	2 x DB25 (AES59, annex C 8-way pinout)
MADI input / output	2 x BNC (75 Ω terminated)
Word clock input / output	2 x BNC (75 Ω terminated)
Milan-AVB / PoE	2 x 1Gb/s etherCON™
GPIO	1 x 10-pin terminal block
Mains power	1 x IEV C13 V-Lock™ compatible socket
<b>Physical data</b>	
Height	1U
Weight	2 kg / 4.41 lb
Protection rating	IP3x



## CONNECTION EXAMPLES

