Model 5412 Audio Interface

Key Features

- Two versions available: 8 or 16 input and output channels

- Analog line-level inputs to Dante® outputs

- Dante inputs to analog line-level outputs

- Three Gigabit Ethernet interfaces

- Standard connectors

- Excellent audio quality

- AC mains and 12 volt DC powering

- Lightweight enclosure, single rack-space (1U) mounting

Introduction

The Model 5412 Audio Interface provides a simple yet high-performance means of interfacing line-level analog signals with applications that utilize Dante® audio-over-Ethernet media networking technology.

Analog sources can be connected to the unit and then output in the digital domain by way of a Dante interface. Digital audio signals, which also arrive by way of Dante, are converted to analog and then output as balanced line-level signals. For application flexibility and troubleshooting a configuration choice allows other audio signals to be selected as the sources for the analog output channels. The Model 5412 is available in two versions – one with 8 input and 8 output channels and the other with 16 input and 16 output channels.

The Model 5412 is a fully professional product that offers the audio quality, features, and reliability required by 24-hour on-air and commercial applications. The analog inputs and analog outputs use 25-pin D-subminiature connectors for easy interfacing with balanced and unbalanced sources and destinations.

The line-level analog audio input signals are converted to 24-bit PCM digital and then transported via a Dante interface. Using the Dante Controller software application, digital audio signals can be routed (subscribed) to the Model 5412 via the Dante interface.

The Model 5412 provides three Gigabit Ethernet ("GigE") network interfaces, two to support redundant Dante operation and the third for accessing the management menu system. To meet the latest interoperability standard the Model 5412's Dante implementation supports AES67-2018. The unit also supports the Dante Domain Manager™ (DDM) software application. An integrated web server allows fast and flexible monitoring and configuration of the unit's networking and audio performance. Front-panel indicators, a backlit LCD display, and pushbutton switches provide users with direct access to key operating parameters.

The Model 5412 can be powered by 100-240 V, 50/60 Hz mains or a source of 12 volts DC. Both can be simultaneously connected to provide redundant operation. The unit's lightweight enclosure mounts in one space (1U) of a standard 19-inch rack. Industry-standard connectors are used for the analog input, analog output, Ethernet, DC power, and AC mains interconnections.

Model 5412 Front View (top) and Model 5512-01 Rear View (bottom)

Dante audio-over-Ethernet has found wide acceptance as an audio "backbone" due to its ease of use, interoperability, excellent audio quality, and wide adoption by a large number of equipment manufacturers. The Model 5412 can serve as an "edge" device for Dante network implementations, providing high-performance line-level analog input and output resources in a compact, cost-effective package. The unit can also serve as a general-purpose audio "tool" to help extend Dante capabilities to facilities and applications that were initially implemented to support signals in the analog domain.

Dante Audio-over-Ethernet

Digital audio data associated with the Model 5412 is interfaced with a local area network (LAN) using Dante audio-over-Ethernet media networking technology. Status LEDs provide a real-time indication of Dante and LAN performance. A major benefit of using Dante is its ability to use any standard Ethernet network implementation, including switches, to directly transport professional audio signals. The Model 5412 supports digital audio signals with a sampling rate of 44.1, 48, and 96 kHz and a bit depth of up to 24. These sampling rates were selected for optimal support of broadcast, production, industrial, and commercial applications. The signals associated with the analog input channels are converted to digital and then routed to transmitter (output) channels on the Dante interface. Eight transmitter (output) channels from one or more associated Dante-enabled devices can be assigned to the Model 5412's receiver (input) channels using the Dante Controller software application. These input signals are converted into analog and then, depending on the unit's configuration, sent to the analog output circuitry.

Network Ports

Using the Dante Controller software application, the Model 5412's two Dante Ethernet ports can be selected to operate in either the switched or redundant modes. In the switched mode a single Ethernet connection is used for interconnection with other Dante-compliant devices. The second Model 5412 Dante Ethernet port can be used to interface with another piece of network equipment. In the redundant mode independent Ethernet connections would be made to the unit's two Ethernet ports implementing Dante's redundant network capability.

The Model 5412's third Ethernet port will always be used to access the management web pages. This port can be connected to an independent network that some facilities implement for equipment monitoring and maintenance purposes. The unit's management port can also be connected to the network that is being used for Dante. It would have a unique IP address and not interact with the Dante audio data.

Applications

Two versions of the Model 5412 are available. The Model 5412-01 provides 8 line-level analog inputs and 8 line-level analog outputs. The Model 5412-02 provides 16 line-level analog inputs and 16 line-level analog outputs. Both units are general-purpose interface devices intended for a variety of audio and audio-for-picture applications that utilize Dante. Each is suitable for use in demanding on-air broadcast and live-event applications that require both solid audio performance and reliable operation. Model 5412 units feature an optimized set of controls and indicators that make it simple and intuitive to use. Rack-mounted in "1U" the unit is appropriate for installation in fixed locations, serving the needs of systems associated with post-production, content distribution, education, commercial, and government facilities. The lightweight enclosure also makes it suitable for mobile and field uses.

Analog Inputs

Depending on the version selected, the Model 5412 will provide either 8 or 16 analog inputs that are compatible with balanced or unbalanced line-level sources. The input signals are converted to digital and then output to an Ethernet network via Dante. Compatible signal sources include audio consoles, wireless microphone receivers, broadcast playback equipment, and output ports on matrix intercom systems.

The analog inputs are electronically balanced (differential), capacitor-coupled, and ESD (static) protected for reliable operation in demanding applications. Extensive filtering minimizes the chance that radio frequency (RF) energy will cause interference. The analog inputs are protected from damage should a moderate DC voltage be accidentally connected. These characteristics make the analog inputs suitable for use in studio and mobile facilities as well as field-deployed environments.

The audio performance of the Model 5412's analog inputs is very good. Low-noise, wide dynamic-range circuitry ensures that audio quality is preserved. The audio signals are routed to high-performance analog-to-digital conversion (ADC) sections that support a range of sampling rates and a bit depth of 24.

A precision voltage-reference circuit helps the ADC circuitry perform highly accurate signal conversion. The audio signals, now in the digital domain, are packetized and prepared for transport over Ethernet networking.

Analog Outputs

The selected Model 5412 version will provide either 8 or 16 line-level analog output channels. Each channel can be individually configured to use as its input source a Dante input (receiver) channel, one of the analog input channels, or a 1 kHz sine-wave tone. In most applications an input (receiver) channel associated with the unit's Dante interface will serve as the audio source. The Dante Controller software application would be used to select the source which originates from an output (transmitter) channel on an associated piece of Dante equipment.

Another configuration choice allows a signal associated with the analog inputs to serve as the source for an analog output channel. Useful for troubleshooting purposes, the selected signal would provide an active "loop through" version of its associated analog input signal. Also for troubleshooting purposes, a 1 kHz sine-wave tone can be assigned as the source for any analog output channel. The resulting analog output signal will have a nominal level of +4 dBu.

The Model 5412's analog outputs have a maximum level of +24 dBu. This allows both compatibility and sufficient headroom in applications where digital audio signals with a nominal level of −20 dBFS need to translate into analog signals that have a nominal level of +4 dBu. For flexibility a configuration menu choice allows the level of each analog output channel to be individually adjusted ("trimmed") over a range of ±20 dB in 1-dB steps.

The analog outputs are electronically balanced, capacitor-coupled, and ESD (static) protected. High-quality components, including the important digital-to-analog converters, are used to provide low-distortion, low-noise, and sonically-excellent performance. Robust circuitry provides protection from damage should a moderate DC voltage be accidentally connected,

something especially useful in broadcast applications. The analog outputs are compatible with virtually all balanced and unbalanced loads with an impedance of 2 k ohms or greater.

Simple Installation

The Model 5412 uses standard connectors to allow fast and convenient interconnections. Multiple 25-pin female D-sub-miniature connectors are used to interface with the analog input and analog output signals. The unit connects to local area networks (LANs) using three RJ45 connectors. Multiple LEDs on the unit's back panel display the status of the network connections. A detachable power cord can be used to connect a source of mains power. Alternately, a DC power source can be connected using a 4-pin XLR connector. The lightweight aluminum enclosure mounts in one space (1U) of a standard 19-inch rack enclosure.

Operating Power

The Model 5412 allows an AC mains source of 100-240 V, 50/60 Hz to be connected by way of a standard detachable mains power cord. It can also be DC powered using a 10-18 volt source that is connected via a broadcast-standard 4-pin XLR connector. If both AC and DC power sources are connected the unit will be powered by the AC mains supply. Only if the AC mains source fails will a load be placed on the DC source. This allows a source of DC, such as a battery pack, to serve in a backup capacity. With this arrangement normal operation can continue even if AC mains power is lost.

Future Capabilities and Firmware Updating

The Model 5412 was designed so that its capabilities can be enhanced in the future. A USB connector, located on the unit's back panel, allows the application and FPGA firmware (embedded software) to be updated using a USB flash drive. The Model 5412 uses Audinate's Brooklyn II interface module to implement Dante. The firmware in this module can be updated via the unit's Ethernet connections, helping to ensure that the Dante capabilities remain up to date. All software files and configuration parameters are stored in non-volatile memory.

Model 5512-02 Rear View

Specifications

Versions Available:
Model 5412-01: 8 line-level analog inputs and 8 line-level analog outputs
Model 5412-02: 16 line-level analog inputs and 16 line-level analog outputs

Network Audio Technology:
Type: Dante audio-over-Ethernet
AES67-2018 Support: yes, selectable on/off
Dante Domain Manager (DDM) Support: yes
Ethernet Interface Configuration: switched or redundant
Sampling Rates: 44.1, 48, and 96 kHz, selectable
Bit Depth: up to 24
Number of Transmitter (Output) Channels: 8 (Model 5412-01) or 16 (Model 5412-02)
Number of Receiver (Input) Channels: 8 (Model 5412-01) or 16 (Model 5412-02)
Dante Audio Flows: 32 transmitter, 32 receiver

Network Interfaces:
 Qty: 3; Dante primary, Dante secondary, and management
 Type: 1000BASE-T (Gigabit Ethernet ("GigE")) per IEEE 802.3ab (100 Mb/s also supported but not recommended for optimal performance)
NIC Status LEDs: one link and one activity for each Ethernet interface

Remote Configuration Capability: web pages provided by internal web server and/or Studio Technologies STcontroller software application

Analog Inputs:
Type: electronically balanced, capacitor coupled, intended for connection to balanced (differential) or unbalanced signal sources
Impedance: 20 k ohms
Nominal Level: +4 dBu, reference −20 dBFS, adjustable ±20 dB in 1-dB steps
Maximum Level: +24 dBu, results in digital output level of 0 dBFS
Dynamic Range: 120 dB, A-weighted
Distortion (THD+N): <0.0005% (−105 dB), ref 1 kHz, +23 dBu input/−1 dBFS output
Frequency Response: ±0.2 dB, 14 Hz to 20 kHz

Analog Outputs:
Type: electronically balanced, capacitor coupled, intended to drive balanced or unbalanced loads of 2 k ohms or greater
Source Impedance: 200 ohms
Nominal Level: +4 dBu, reference −20 dBFS, adjustable ±20 dB in 1-dB steps
Maximum Level: +24 dBu
Dynamic Range: >119 dB, A-weighted
Distortion (THD+N): <0.001% (−101 dB), reference 1 kHz, −1 dBFS input/+23 dBu output
Frequency Response: ±0.1 dB, 6 Hz to 20 kHz

Front-Panel Display: backlit LCD

Software Updating: USB flash drive supports updating of application and FPGA firmware (embedded software); Dante interface updated via Ethernet interface

Power Sources:
AC Mains: 100 to 240 V, 50/60 Hz, 20 W maximum
DC: 10 to 18 V, 1.5 A maximum

Connectors:
Analog Inputs and Analog Outputs: 25-pin female D-subminiature (DB-25F), AES59-2012-compliant
Ethernet: RJ45
USB: type A receptacle (used only for firmware updates)
DC Input: 4-pin male XLR (pin 1 negative, pin 4 positive)
AC Mains Input: 3-blade, IEC 320 C14-compatible (mates with IEC 320 C13)

Environmental:
Operating Temperature: 0 to 50 degrees C (32 to 122 degrees F)
Storage Temperature: −40 to 70 degrees C (−40 to 158 degrees F)
Humidity: 5 to 95%, non-condensing
Altitude: not characterized

Dimensions – Overall:
19.0 inches wide (48.3 cm)
1.72 inches high (4.4 cm)
7.8 inches deep (19.8 cm); 8.3 inches (21.1 cm) overall

Mounting: one space (1U) in a standard 19-inch rack

Weight: 3.2 pounds (1.5 kg)

Specifications subject to change without notice.