



# Model 5414 Mic/Line Input & Line Output Interface

## Key Features

- Dante audio-over-Ethernet technology
- Four mic/line inputs to Dante outputs
- Four Dante inputs to balanced line-level outputs
- Audio monitoring with meters and headphone output
- Excellent audio quality
- 100-240 V, 50/60 Hz mains powered
- Standard connectors, lightweight, 1U rack mounting

## Introduction

The Model 5414 Mic/Line Input & Line Output Interface provides a simple-to-use yet high-performance means of interfacing analog signals with applications that utilize Dante® audio-over-Ethernet media networking technology. Four microphone or level-level sources can be connected to the unit and then, after conversion to digital, output by way of a Dante interface. Four signals arriving by way of Dante can be converted to analog and then output as balanced line-level signals. A monitor section allows the input and output signals to be selectively observed using meters and a headphone output.

The Model 5414 is a fully professional product that offers the audio quality, features, and reliability required by 24-hour on-air and commercial applications. The four mic/line audio inputs use standard 3-pin female XLR connectors for easy interfacing with balanced and unbalanced sources. The input circuitry features adjustable gain, P48 microphone power, and high-pass filter functions. Configuration of the inputs can be made locally by using pushbutton switches or remotely using the STcontroller application. The input audio signals are converted to 24-bit digital and then transported via the Dante interface.

Four digital audio signals can be routed to the Model 5414 via the Dante interface and are then converted to analog. Four

3-pin male XLR connectors on the unit's back panel provide access to the balanced line-level outputs. The monitor section provides the user with the ability to select any input or output signal, or signal pair, and then observe their level via LEDs meters and aurally monitor them by way of a 2-channel (stereo) headphone output.

Configuration choices allow selection of the unit's input and output nominal operating levels. Independent selections are provided for the input (analog-to-digital) and output (digital-to-analog) conversion processes. This capability ensures that the Model 5414 will integrate smoothly into Dante applications that utilize SMPTE®, EBU, and other industry-standard nominal levels.

An Ethernet connection is all that's required to make the Model 5414 part of a sophisticated networked audio system. 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 5414 can serve as an "edge" device for a Dante network implementation, providing high-performance input, output, and monitor resources for applications that need a limited number of channels. It can also serve as a general-purpose "tool" to help expand Dante capabilities to facilities and applications that were initially implemented to support signals in the analog domain.

For powering, the unit can be directly connected to an AC mains source. A true "universal input" design that's intended for worldwide use, the input voltage can range from 100 to 240 volts, 50/60 Hz. A source of 10 to 18 volts DC can also be connected to power the Model 5414. If both AC and DC sources are connected, the AC source will power the unit while the DC source will serve as a backup. In this way a battery can be connected, ready to serve in a standby capacity.

Standard connectors are used for the audio input and output, Ethernet, DC input, and AC mains interconnections. The unit's





enclosure mounts in one space (1U) of a standard 19-inch rack enclosure and weighs less than four pounds (2 Kg).

## Dante Audio-over-Ethernet

Digital audio data associated with the Model 5414 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 to transport professional audio signals is its compatibility with standard Ethernet network implementations, including switches and routers. The Model 5414 supports digital audio signals with a sampling rate of 48 kHz and a bit depth of up to 24. This sampling rate was selected for optimal support of broadcast, production, industrial, and commercial applications.

The signals associated with the four mic/line input channels are converted to digital and then routed to transmitter (output) channels on the Dante interface. Four transmitter (output) channels from one or more associated Dante-enabled devices can be assigned to the Model 5414's receiver (input) channels using the Dante Controller application. These input signals are converted into analog and then sent to the line output circuitry.

The Model 5414 is compatible with the AES67 interoperability standard. In addition, the unit is compatible with the Dante Domain Manager™ (DDM) software application.

## Applications

The Model 5414 is a general-purpose mic/line input, line output, and monitoring device intended for a variety of audio and audio-for-picture applications that utilize Dante. It's suitable for use in demanding on-air broadcast and live-event applications that require both excellent audio performance and reliable operation. The rack-mounted unit is appropriate for installation in fixed locations, serving the needs of systems associated with stadium, worship, education, commercial, and government facilities. Its lightweight enclosure also makes it suitable for mobile and field uses.

The Model 5414 features an optimized set of controls and indicators that makes it simple and intuitive to use. With the unit's metering and monitoring resources it's easy for operators to obtain optimal performance. And by providing standard connectors for all inputs and outputs, along with powering from AC mains or 10-18 volts DC, setup can be completed in just a few minutes.

## Mic/Line Inputs

The Model 5414 provides four analog inputs that are compatible with microphone and line-level signals. The mic/line input circuitry allows the level of the connected sources to be boosted as required, converted to digital, and then output to an Ethernet network by way of Dante. Each mic/line input can be individually adjusted to meet the requirements posed by a wide range of sources. The choices can be selected either locally or by way of the STcontroller remote control software application.

Using two DIP switches, located on the unit's back panel, the relationship between the analog input level and the digital audio output level can be configured. Three choices are available which allow compatibility with SMPTE and EBU standards as well as another commonly utilized setting.

The preamplifier gain of each channel can be selected from among 20 values: 0 dB (line), 10 dB, and 19 through 70 dB in 3-dB steps. A source of P48 phantom power can be enabled to power condenser microphones. In addition, a high-pass filter (HPF) function can be enabled as required to reduce the presence of unwanted low-frequency content typically associated with hum, rumble, or wind noise.

Compatible signal sources include dynamic, ribbon, and phantom-powered condenser (capacitor) microphones. The extended gain range, up to 70 dB, allows microphones with low-sensitivity to perform correctly. The preamplifier gain settings of 0 dB and 10 dB were specifically included to support connection of balanced and unbalanced line-level signals that are commonly provided by professional and

semi-professional audio equipment. Typical nominal levels for these sources would be +4 dBu and -10 dBV, respectively. Devices providing these analog signal sources could include audio consoles, wireless microphone receivers, and broadcast playback equipment.

An 8-segment LED meter is associated with each of the four mic/line input channels. The meters are calibrated in dBFS which can assist users in optimizing the preamplifier gain settings so as to provide the best possible conversion from the analog to the digital domain. LEDs display the on/off status of the P48 and high-pass filter (HPF) functions. For front-panel space efficiency the four mic/line input channels share a common configuration section which includes a 2-digit LED display and four pushbutton switches. The LED display allows the selected preamplifier gain of the mic/line input channels to be observed. The buttons allow rapid selection of the preamplifier gain as well as controlling the on/off status of the P48 phantom power and high-pass filter (HPF) functions.

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

The four 3-pin female XLR connectors associated with the Model 5414's mic/line inputs were specifically located on the front panel. This can eliminate the need for an external I/O or "patch" panel, allowing signal sources and their associated interconnecting cables to be rapidly connected as required. Rather than being "buried" in the back of a rack enclosure the Model 5414 provides convenient access to the mic/line input connectors and their associated configuration buttons, indicators, and displays. "Latchless" 3-pin female XLR connectors from Neutrik® are utilized to improve long-term reliability. Using friction, rather than a mechanical lock, to secure the mating connector helps to ensure reliable electrical connections while minimizing the chance of connector failure.

The audio performance of the Model 5414's mic/line inputs is very good. Low-noise, wide dynamic-range microphone preamplifier circuits ensure that input audio quality is preserved. The P48 phantom power source is extremely low noise, allowing optimal microphone operation and imparting little signal degradation. The outputs of the preamplifiers are routed to high-performance analog-to-digital conversion (ADC) sections that support a sampling rate of 48 kHz and a bit depth of 24. A precision voltage-reference integrated circuit helps the ADC circuitry perform highly accurate signal conversion. The audio signals, now in the digital domain, are connected to the Dante interface section where they are packetized and prepared for transport over Ethernet.

## Line Outputs

The Model 5414 provides four general-purpose analog line-level output channels. Four receiver (input) channels associated with the unit's Dante interface serve as the audio sources. The Dante Controller application software will typically be used to select the sources which are provided by transmitter (output) channels on associated equipment.

Using two DIP switches, located on the unit's back panel, the relationship between the digital audio input level and the analog output level can be configured. Three choices are available which allow compatibility with SMPTE and EBU standards as well as another commonly utilized setting.

The line 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 line outputs are compatible with virtually all balanced and unbalanced loads with an impedance of 2 k ohms or greater.

## Input and Output Monitoring

A flexible yet easy-to-use monitor section offers the ability to listen to and visually observe the level of the audio signals that are associated with the four mic/line input channels and the four line output channels. A mode configuration choice allows

monitoring of either a single audio channel or a pair of audio channels. This can be valuable when monitoring monaural or stereo (dual-channel) signals. A 2-channel analog output supports the connection of a pair of stereo headphones. For application flexibility the headphone output can also be interfaced with inputs on amplified loudspeakers or a power amplifier associated with monitor loudspeakers. A rotary control allows the level of the headphone output to be adjusted.

For convenience, two ¼-inch 3-conductor (stereo) phone jacks, one located on the front panel and one on the back panel, are provided. The same 2-channel signal is routed to both the front and the back headphone output jacks. However, whenever the front jack is utilized the jack on the back panel will automatically mute. This mute function can be useful when the jack on the back panel is being used to interface with inputs on loudspeaker systems. Automatic muting of the loudspeakers will occur whenever a pair of headphones is plugged into the jack on the front panel, a feature especially important for on-air applications.

Two 8-segment LED meters display the level of the signal or signals that are selected for monitoring. The meters are calibrated relative to the digital domain (dBFS), directly reflecting the signal level in the Dante transmitter (output) and receiver (input) paths.

## Simple Installation

The Model 5414 uses standard connectors to allow fast and convenient interconnections. 3-conductor male and female XLR connectors and 3-conductor ¼-inch jacks are used to interface with the analog input, analog output, and headphone output audio signals. The unit connects to a local area network (LAN) using a standard 100 Mb/s twisted-pair Ethernet interface. The physical interconnection is made by way of a Neutrik® etherCON RJ45 connector. While compatible with standard RJ45 plugs and patch cables, etherCON allows a ruggedized and locking interconnection method that's suitable for harsh or high-reliability environments. Three LEDs on the back panel display the status of the network connection and Dante interface.

AC mains power can be connected directly to the Model 5414 by way of a standard 3-pin detachable IEC C13 cord set; no external power supply is used. Having a "universal input," the AC mains power source can range from 100 to 240 volts, 50/60 Hz. A source of 10 to 18 volts DC can also be connected to power the Model 5414. This allows the unit to operate from a variety of battery and external DC power supply sources. The power input circuitry was carefully designed to allow simultaneous connection of both AC mains and DC power sources. In this scenario the AC mains source will power the Model 5414 while only an extremely small amount of current will be drawn from the DC source. Upon loss of AC mains power the DC source will, without interruption, begin to power the unit. Far from a simple diode "OR" circuit, this is a true "hot-swap" type design.

The light-weight aluminum enclosure mounts in one space (1U) of a standard 19-inch rack enclosure. The rack-mounting brackets ("ears"), located on the sides of the Model 5414's enclosure can be removed to assist in achieving special mounting or installation requirements.

## Future Capabilities and Firmware Updating

The Model 5414 was designed so that its capabilities can be enhanced in the future. For example, at the time of the Model 5414's initial release the ability to remotely control operating parameters related to the mic/line input channels is not offered. But the unit's internal architecture is such that adding these capabilities in the future should be possible.

A USB connector, located on the unit's back panel, allows the application firmware (embedded software) to be updated using a USB flash drive.

To implement the Dante interface the Model 5414 uses Audinate's Ultimo 4-in/4-out integrated circuit. The firmware in this integrated circuit can be updated via the unit's Ethernet connection, helping to ensure that its capabilities remain up to date.

---

## Specifications

### Network Audio Technology:

Type: Dante audio-over-Ethernet  
AES67-2018 Support: yes  
Dante Domain Manager (DDM) Support: yes  
Bit Depth: up to 24  
Sample Rates: 48 kHz  
Number of Transmitter (Output) Channels: 4  
Number of Receiver (Input) Channels: 4  
Dante Audio Flows: 4; 2 transmitter, 2 receiver

### Network Interface:

Type: 100BASE-TX, twisted-pair Ethernet  
Data Rate: 100 Mb/s (10 Mb/s and 1000 Mb/s "GigE" Ethernet not supported)

### Mic/Line Inputs: 4

Compatibility: dynamic, ribbon, or phantom-powered mics; line-level sources  
Type: analog, electronically balanced, capacitor coupled  
Impedance: 4 k ohms, nominal  
Gain: 0 dB (line), 10 dB, 19-70 dB in 3-dB steps (total 20 choices)  
Maximum Level: +18, +20, or +24 dBu, configurable, 0 dB gain selected, results in Dante digital output level of 0 dBFS  
EIN: -123 dBu, 22 kHz bandwidth, 70 dB gain, 150 ohm source resistance  
Dynamic Range: >116 dB, 0 dB gain, A-weighted  
Distortion (THD+N): <0.001% (-101 dB) at -1 dBFS, 40 dB gain, 22 kHz bandwidth  
Frequency Response: +0.0/-0.5 dB, 22 Hz to 22 kHz, HPF off  
High-Pass Filter (HPF): -6 dB at 75 Hz, 18 dB per octave, on/off selectable per channel  
Phantom Power: P48 per IEC 61938:2013 standard, +46 volts DC nominal, on/off selectable per channel  
Meters: 4, one 8-segment LED per input  
Status LEDs: 3, P48, HPF, input channel selected

**Remote Configuration Capability:** preamplifier gain, P48 phantom power on/off status, and high-pass filter (HPF) on/off status (uses STcontroller application)

### Line Outputs: 4

Type: analog, electronically balanced, capacitor coupled, intended to drive balanced or unbalanced loads of 2 k ohms or greater  
Source Impedance: 200 ohms  
Nominal Level: +4, 0, or -2 dBu, selectable, reference -20 dBFS  
Maximum Level: +18, +20, or +24 dBu, configurable, with 0 dBFS on Dante input  
Dynamic Range: >119 dB, A-weighted  
Distortion (THD+N): 0.0012% (-99 dB), measured at -1 dBFS, 22 kHz bandwidth  
Frequency Response:  $\pm 0.1$  dB, 20 Hz to 20 kHz

### Audio Monitor:

Source: mic/line inputs or line outputs, selectable as monaural or stereo  
Meters: 2, 8-segment LED

### Headphone Output:

Type: stereo (dual-channel), when jack on front panel is used jack on back panel automatically disconnects  
Compatibility: intended for connection to stereo headphones with nominal impedance of 100 ohms or greater  
Maximum Output Voltage: 4.9 volts RMS, 1 kHz, 150 ohm load  
Frequency Response: +0/-1.4 dB, 20 Hz to 20 kHz  
Distortion (THD+N): 0.005%  
Dynamic Range: >100 dB

### Connectors:

Mic/Line Inputs: 3-pin female XLR  
Line Outputs: 3-pin male XLR  
Ethernet: Neutrik etherCON RJ45  
Headphone Outputs: 3-conductor ¼-inch jack  
USB: type A receptacle (used only for application firmware updates)  
AC Mains: 3-blade, IEC 320 C14-compatible (mates with IEC 320 C13)  
DC Input: 4-pin male XLR

### Power Source:

AC Mains: 100 to 240 volts, +10/-15%, 50/60 Hz, 15 watt maximum  
DC Input: 10-18 volts DC, 1.1 A maximum @ 10 volts; current draw when AC present is less than 100 uA

### Dimensions – Overall:

19.0 inches wide (48.3 cm)  
1.72 inches high (4.4 cm)  
8.4 inches deep (21.3 cm)

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

**Weight:** 3.5 pounds (1.6 kg)

Specifications subject to change without notice.

---

**Studio Technologies, Inc.**

Skokie, Illinois USA

© by Studio Technologies, Inc., June 2019

**studio-tech.com**