



Model 5304 Intercom Station

STUDIO
TECHNOLOGIES
INC.

Key Features

- Dante audio-over-Ethernet technology
- Four independent talk and listen channels
- Supports dynamic and electret microphones
- 5-pin female XLR headset connector
- Uses STcontroller for configuration
- Two remote control inputs
- Call send and receive functions
- Excellent audio quality
- AES67 and Dante Domain Manager support
- Power-over-Ethernet (PoE) powered

Overview

The Model 5304 Intercom Station provides four independent talk and listen channels that are compatible with Dante® audio-over-Ethernet networks. An extensive range of configurable parameters allow the performance to be optimized for numerous intercom applications. The unit is designed to serve as a user station for production and support personnel in applications including on-air television broadcasting, live events, theater, industrial, aerospace, house of worship, and corporate AV. The Model 5304's four channels can be part of a virtual "party-line" intercom system created with other compatible devices. The unit's lightweight aluminum enclosure is intended for desktop or tabletop use. Optional mounting kits allow one or two Model 5304 units to be mounted in one space (1U) of a standard 19-inch rack enclosure.

Over a standard IP network, multiple Model 5304 units can become part of a party-line (PL) intercom application with help from an external Dante-enabled audio device such

as the Studio Technologies' Model 5421 or Model 5422A Dante Intercom Audio Engine unit. Model 5304 units can also be deployed in conjunction with Dante-compliant matrix interface systems. The Model 5304's range of resources makes it possible to use units locally or as part of a REMI or "At-Home" implementation.

Only a headset and a Power-over-Ethernet (PoE) connection are required for operation. Key user features can be easily configured using the STcontroller software application. Configurable parameters include electret microphone powering, microphone preamplifier gain, talk and auxiliary button operation, call signal support, headphone channel assignment, and remote control inputs. Specific user features include integrated sidetone operation, remote mic kill ("talk off"), LED display intensity, and microphone audio level display. The wide range of capabilities, along with the excellent audio quality provided by the digital audio signal path, offers a unique and highly effective user experience.



Model 5304 Intercom Station Front and Rear Views

Set up and configuration of the Model 5304 is simple. An RJ45 jack is used to interconnect with a standard twist-pair Ethernet port associated with a local-area network (LAN). This connection provides both power and bidirectional digital audio. Two LEDs provide an indication of the Ethernet connection's status. A broadcast or intercom-style stereo or monaural headset with a dynamic or electret (DC-powered) microphone interfaces with the unit using a 5-pin XLR connector. A 3-conductor 3.5 mm jack allows connection of two external switches or contact closures to activate two selected talk channels.

The STcontroller software application is used to select the unit's operating parameters. STcontroller is available, free of charge, from the Studio Technologies' website. Versions are available that are compatible with the Windows® and macOS® operating systems. STcontroller is a fast and simple means of configuring, revising, saving, and loading a unit's operating parameters.

Dante Audio-over-Ethernet

Audio data is sent to and received from the Model 5304 using the Dante audio-over-Ethernet media networking technology. As a Dante-compliant device, the Model 5304's four Dante transmitter (output) and four Dante receiver (input) audio channels can be assigned (routed or "subscribed") with other devices using the Dante Controller software application. The Dante transmitter (output) and receiver (input) channels are limited to supporting four Dante flows, two in each direction. The Dante digital audio's bit depth is up to 24 with a sample rate of 48 kHz.

The Model 5304 is compliant with the AES67 interoperability standard. In addition, the unit is compatible with the Dante Domain Manager™ (DDM) software application.

Audio Quality

The Model 5304's audio quality is completely "pro." A low-noise, wide dynamic-range microphone preamplifier and associated analog dynamics controller (compressor) circuit ensures that microphone audio quality is preserved and minimizes the chance of signal overload. If desired, DC power can be enabled to support electret microphones. The output of the microphone preamp and compressor is

routed to an analog-to-digital conversion (ADC) section that supports a sample rate of 48 kHz with a bit depth of up to 24. The audio signal, now in the digital domain, travels through the unit's 32-bit microcontroller integrated circuit and on to the Dante interface section where it is packetized and prepared for transport over Ethernet.

The microphone audio signal can also be routed to the headphone output whenever one or more of the "talk" channels are active. This "sidetone" function supports the user by allowing them to monitor the audio associated with their own microphone. The level of the sidetone signal can be configured from among five choices as well as being disabled.

Audio signals arrive in the Model 5304 by way of four Dante receiver (input) channels. These audio signals pass into the Model 5304's microcontroller integrated circuit where channel routing, headphone level control, and sidetone functionality are performed within the digital domain. Five rotary encoders allow the level of each input channel, and the overall level, to be adjusted. The mix of audio signals destined for the 2-channel headphone output is sent to a high-performance digital-to-analog converter (DAC) integrated circuit and then on to robust driver circuitry. High signal levels can be provided to a variety of headsets, headphones, and earpieces.

User Controls and Indicators

The Model 5304's front panel includes five rotary controls (multi-step "encoders"), five pushbutton switches, and an 8-segment multipurpose display. Four of the encoders are used to adjust the listen level of the four Dante receiver (input) audio channels. They are also used to fully mute an input as well as activating a channel "solo" listen function. Using RGB (red-green-blue) LEDs, the knob associated with each encoder can illuminate, displaying three colors to represent the approximate level of the audio input signal, lighting purple if the channel is fully muted, or flashing or lighting orange when an in-band (20 kHz tone) call signal is detected. An additional rotary encoder is used to control the overall audio level of the signals being sent to the headset outputs. It can also be used to fully mute the headphone output channels.

The four pushbutton switches are used to enable the routing of microphone audio to the Dante transmitter (output) "talk" audio channels. Configuration choices allow the operation of the four talk buttons to be optimized to meet an application's needs. Their action can be independently configured, as well as selected to send only voice audio, or to send both voice audio and an 18 kHz sine wave tone. This latter capability is specifically provided for supporting REMI/AT-Home or other specialized applications. A fifth pushbutton switch, labeled AUX, can be configured to provide either an "all talk" function or to serve as a call enable button.

The multipurpose display utilizes eight bi-color LEDs to provide a range of Model 5304 performance indications. It can serve as an audio level meter, providing a real-time indication of the microphone signal as it is sent to one or more of the active "talk" channels. It will also provide an indication of the setting of the rotary encoders. The multipurpose display will also indicate when a configuration choice has been made or when the Dante identification function has been received.

Call Signaling Support

Call functions allow Model 5304 users to send and receive channel-specific visual alert signals. Using 20 kHz tones, the call signals are sent as part of the audio channels ("in band") allowing interoperability between multiple Model 5304 units and other products from Studio Technologies. This call signaling method is also compatible with analog legacy party-line intercom systems. Call signals can be useful to indicate to users that they are needed "on headset" or that they should be actively listening to an intercom channel. The call function can also be used to provide real-time cues to production personnel during the running of live events.

The auxiliary pushbutton switch, located on the right side of the Model 5304's front panel, can be configured to serve as a call button. In this way, any active talk channel will include a 20 kHz call tone when the auxiliary button is pressed. A call signal present on any of the four Dante receiver (input) channels can be detected and displayed. To optimize call operation for specific applications, a configuration choice

allows the way in which the Model 5304 will light its LED indicators when call signals are received.

Configuration Flexibility

A highlight of the Model 5304 is its ability to be easily configured to meet the needs of specific users and applications. All configuration choices are made using the STcontroller software application that communicates with the Model 5304 by way of the unit's Ethernet network connection. Configurable parameters include microphone power and preamplifier gain, sidetone audio operation, signal present indication, microphone level display, talk button operation, call indication, remote control inputs, and headphone monitoring.

The microphone input can be selected for compatibility with dynamic or electret microphones. The gain of the microphone preamplifier can be selected from among five choices. These selections allow compatibility with a variety of microphones that are part of broadcast and intercom headsets.

A unique Model 5304 feature is the ability to individually configure the way that each of the four talk pushbutton switches function; four choices are available. For standard intercom user station operation, Push to Talk, Tap to Latch, or Push to Talk/Tap to Latch operation can be selected. For situations where only monitoring of an intercom channel is desired the Disabled mode is available. Configuration choices allow the two remote control inputs to be individually assigned to mimic the action of any one of the four intercom talk buttons or the auxiliary button.

Four audio channels arrive via Dante and are destined for the 2-channel headphone output. Each input source can be independently routed to the left headphone channel, right headphone channel, or both the left and right headphone channels. This flexibility allows a variety of listening environments to be created, including stereo, single-channel monaural, and dual-channel monaural. As previously described, a rotary encoder is used to control the audio level associated with each Dante receiver (input) channel. In addition, a fifth rotary encoder allows the overall headphone level to be controlled.

Ethernet Data and PoE

The Model 5304 connects to a Ethernet local-area network (LAN) using a standard 100 Mb/s twisted-pair Ethernet interface. The physical interconnection is made by way of an RJ45 jack. Two LEDs display the status of the network connection.

The Model 5304's operating power is provided by way of the Ethernet interface using the 802.3af Power-over-Ethernet (PoE) standard. This allows fast and efficient interconnection with the associated data network. To support PoE power management, the Model 5304's PoE interface reports to the power sourcing equipment (PSE) that it's a class 2 (low power) device.

Future Capabilities and Firmware Updating

The Model 5304 was designed such that its capabilities and performance can be easily enhanced in the future. A USB connector, located on the unit's back panel, allows the application firmware (embedded software) to be updated using a standard USB flash drive. The Model 5304 uses an

UltimoX4™ integrated circuit from Audinate to implement its Dante interface. The firmware in this integrated circuit can be updated via the Ethernet connection, helping to ensure that its capabilities remain up to date.

Deployment

The Model 5304 is ready, "out of the box," for deployment on a desk, table, or other flat surface. Its compact enclosure is essentially "½-rack" wide and one rack space high. The RMBK-10 installation kit, purchased as an option, allows one unit to be mounted in a panel cutout or on a wall surface. Three other installation kits, also purchased as options, allow one or two Model 5304 units to be mounted in one space (1U) of a standard 19-inch rack. The RMBK-11 allows one Model 5304 unit to be mounted on the left or right side of a single rack space. The RMBK-12 allows two Model 5304 units to be mounted in a single rack space. The RMBK-12 also allows a Model 5304 to be mounted with any other compatible Studio Technologies' unit, including the popular Model 5421 Dante Intercom Engine. Finally, the RMBK-13 allows one Model 5304 to be mounted in the center of a single rack space.

Model 5304 Specifications

Power Source:

Power-over-Ethernet (PoE): class 2 (low power, ≤ 6.49 watts) per IEEE® 802.3af

Network Audio Technology:

Type: Dante audio-over-Ethernet
AES67-2018 Support: yes, selectable on/off
Dante Domain Manager (DDM) Support: yes
Bit Depth: up to 24
Sample Rate: 48 kHz
Pull-Up/Down Support: no
Dante Transmitter (Output) Channels: 4
Dante Receiver (Input) Channels: 4
Dante Audio Flows: 4; 2 transmitter, 2 receiver
Transmitter (Output) and Receiver (Input) Nominal Level: -20 dBFS

Audio Channels: 4 talk, 4 listen

Network Interface:

Type: 100BASE-TX, Fast Ethernet per IEEE 802.3u (10BASE-T and 1000BASE-T (GigE) not supported)
Power-over-Ethernet (PoE): per IEEE 802.3af
Data Rate: 100 Mb/s (10 Mb/s and 1000 Mb/s not supported)

Microphone Input:

Compatibility: analog dynamic or electret microphones
Type: unbalanced
Electret Microphone Power: 3.3 volts DC via 2 k (2000) ohms series resistance, selectable on/off
Gain: 24, 30, 36, 42, or 48 dB, selectable
Frequency Response: 42 Hz to 18 kHz, -3 dB, nominal
Distortion (THD+N): $<0.03\%$, 1 kHz, 24 dB gain
Noise Floor: -94 dBFS (A-weighted)

Compressor:

Threshold: 1.5 dB above nominal level (-18.5 dBFS)
Slope: 2:1

Headphone Output:

Type: 2-channel
Compatibility: intended for connection to stereo (dual-channel) or monaural (single-channel) headsets with nominal impedance of 50 ohms or greater
Maximum Output Voltage: 2.9 Vrms, 1 kHz, with 150 ohm load
Frequency Response: 7 Hz to 9.8 kHz, -3 dB
Distortion (THD+N): $<0.02\%$
Dynamic Range: >100 dB

Call Send Function:

Signaling Method: 20 kHz, within selected Dante transmitter (output) audio channels
Send Level: -20 dBFS

Call Receive Function:

Sources: Dante receiver (input) channels 1-4
Signaling Method: 20 kHz ± 800 Hz, nominal, within audio channels
Receive Level: -27 dBFS minimum
Detect Time: 10 milliseconds, minimum

Remote Control Inputs: 2

Function: configurable, can mimic the action of any of the five button functions
Type: active low, 1 mA maximum, inputs pulled up to 3.3 volts DC via 3.4 k (3400) ohm resistors

Connectors:

Headset: 5-pin female XLR
Ethernet: RJ45 jack
Remote Control Inputs: 3-conductor (TRS) 3.5 mm jack
USB: type A receptacle (used only for updating application firmware)

Configuration: requires Studio Technologies' STcontroller software application

Software Updating: USB flash drive used for updating application firmware; Dante Updater application for updating Dante interface firmware

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):

8.70 inches wide (22.1 cm)
1.72 inches high (4.4 cm)
4.45 inches deep (11.3 cm)

Weight: 0.95 pounds (0.42 kg); rack-mounting installation kits add approximately 0.2 pounds (0.09 kg)

Deployment: intended for tabletop applications. Four optional mounting kits are also available:

RMBK-10 allows one unit to be mounted in a panel cutout or on a flat surface
RMBK-11 allows one unit to be mounted in the left- or right-side of one space (1U) of a standard 19-inch rack
RMBK-12 allows two units to be mounted in one space (1U) of a standard 19-inch rack
RMBK-13 allows one unit to be mounted in the center of one space (1U) of a standard 19-inch rack

Specifications subject to change without notice.

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