

Model 374A Intercom Beltpack

User Guide

Issue 4, February 2021

This User Guide is applicable for serial numbers
M374A-02501 to 04000 with application firmware 2.1 and later

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Revision History

Issue 4, February 2021:

1. Documents expansion of Call Indication function.

Issue 3, August 2019:

1. Documents revision to STcontroller (version 2.02.00 and later) which separates microphone power and microphone gain configuration.

Issue 2, April 2019:

1. Documents new receive and send call function.

Issue 1, June 2018:

1. Initial release.

Introduction

The Model 374A Intercom Beltpack begins with the features offered by traditional party-line intercom user devices and adds a range of new capabilities along with the advanced performance and flexibility that Dante® audio-over-Ethernet provides. With four independent talk and listen channels the Model 374A bridges the gap between typical single- and dual-channel party-line devices and permanently installed multi-channel intercom panels. Imagine the possibilities—four channels of high-quality party-line intercom in a compact, user-worn package.

Over a standard IP network, multiple Model 374A units can be used in party-line (PL) intercom applications with help from an external Dante-enabled audio matrix such as the Studio Technologies' Model 5421 or Model 5422A Dante Intercom Audio Engine units. Or, units can be used “point-to-point” or interfaced with Dante-compatible matrix intercom systems.

Only a single Power-over-Ethernet (PoE) connection is required for operation. Key user features can be easily configured using the STcontroller software application. Configurable parameters include electret microphone powering, microphone pre-amplifier gain, talk button operation, call

receive indication, and headphone channel assignment. User features include integrated sidetone, remote mic kill (“talk off”), call receive and send, and audio monitor-only modes. The wide range of capabilities, along with the excellent audio quality provided by the digital audio signal path, offers a unique and powerful user experience.

Set up and configuration of the Model 374A is simple. An etherCON® RJ45 receptacle is used to interconnect with a standard twisted-pair Ethernet port associated with a local-area network (LAN). This connection provides both power and bidirectional digital audio. 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.

The STcontroller software application is used to select the unit's operating parameters. Four talk pushbutton switches can be configured for optimal operation. Four push-in/push-out (“pop out”) rotary controls make it easy to set and maintain the desired headphone output level. The Model 374A's enclosure is made from an aluminum alloy which offers both light weight and ruggedness. A stainless steel “belt clip,” located on the back of the unit, allows direct attachment to a user's clothing.



Figure 1. Model 374A Intercom Beltpack top and bottom views

The audio quality of the Model 374A's four audio channels is excellent, with low distortion, low noise, and high headroom. Careful circuit design and rugged components ensure long, reliable operation. A wide range of applications can be supported, including sports and entertainment TV and radio events, streaming broadcasts, corporate and government AV installations, and post-production facilities.

Dante Audio-over-Ethernet

Audio data is sent to and received from the Model 374A using the Dante audio-over-Ethernet media networking technology. As a Dante-compliant device, the Model 374A's four audio output (Dante transmitter) and four audio input (Dante receiver) channels can be interconnected (routed) with other devices using the Dante Controller software application. The Dante transmitter and receiver channels are limited to supporting four Dante flows, two in each direction. The digital audio's bit depth is up to 24 with a sampling rate of 48 kHz. The Model 374A is AES67 compatible and compliant with the Dante Domain Manager™ software application.

Two bi-color LEDs provide an indication of the Dante connection status. The Dante Controller's *Identify* command takes on a unique role with the Model 374A. Not only will it cause the talk button LEDs to light in a unique highly visible sequence, it can also be configured to turn off any active talk channels.

Audio Quality

The Model 374A's completely "pro" performance is counter to the less-than-stellar reputation of typical party-line (PL) intercom audio. A low-noise, wide dynamic-range microphone preamplifier

and associated voltage-controlled-amplifier (VCA) dynamics controller (compressor) ensures that microphone audio quality is preserved while minimizing the chance of signal overload. DC power to support electret microphones can be enabled if necessary. The output of the microphone preamp and compressor is routed to an analog-to-digital converter (ADC) section that supports a sampling rate of 48 kHz with a bit depth of up to 24. The audio signal, now in the digital domain, travels through the processor and on to the Dante interface section where it is packetized and prepared for transport over Ethernet.

Audio input signals arrive via four Dante receiver channels. The supported sampling rate is 48 kHz with a bit depth of up to 24. The audio signals pass into the Model 374A's processor where channel routing, headphone level control, and sidetone creation are performed within the digital domain. This provides flexibility, allowing for precise control of the audio signals and eliminates the need for the four rotary level controls from having to directly handle analog audio signals. The audio signals destined for the 2-channel headphone output are sent to a high-performance digital-to-analog converter and then on to robust driver circuitry. High signal levels can be provided to a variety of headsets, headphones, and earpieces.

Call Function

A call function allows Model 374A users to receive and send channel-specific visual alert signals. Using 20 kHz tones, the call signals are sent within the audio channels ("in band") allowing interoperability between multiple Model 374A units as well as being compatible with legacy party-line intercom systems. Call signals can be

useful to indicate to users that they are needed “on headset” or 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. Call signals present on the four audio input (Dante receiver) channels can be detected and displayed. To optimize for specific applications, a configuration choice allows the way in which the Model 374A will display Call when 20 kHz has been detected. Push-button 4, on the Model 374A’s top panel, can be configured to serve as a call button. This allows a call signal to be generated for talk channels 1, 2, and 3.

Configuration Flexibility

A highlight of the Model 374A 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 374A by way of an Ethernet network connection. Configurable parameters include microphone power and preamplifier gain, sidetone audio operation, talk button operation, call indication, and headphone monitoring.

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

A unique Model 374A feature is the ability to individually configure the way in which the four talk pushbutton switches function; four choices are available. For standard intercom beltpack operation either *Push*

to *Talk* or *Push to Talk/Tap to Latch* operation can be selected. For situations where only monitoring of an intercom channel is desired a *Talk Disabled* mode is available. And for advanced monitoring-only situations the *Talk Disabled/Phones Tap to Latch* mode can be selected such that a button will serve in an audio on/off role.

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.

Ethernet Data and PoE

The Model 374A connects to an Ethernet data network using a standard 100 Mb/s twisted-pair Ethernet interface. The physical interconnection is made by way of a Neutrik® etherCON RJ45 receptacle. While compatible with standard RJ45 plugs, etherCON allows a ruggedized and locking interconnection for harsh or high-reliability environments. An LED displays the status of the network connection.

The Model 374A’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 374A’s PoE interface reports to the power sourcing equipment (PSE) that it’s a class 1 (very low power) device.

Future Capabilities and Firmware Updating

The Model 374A was designed such that its capabilities and performance can be enhanced in the future. A USB connector, located on the unit's main circuit board (underneath the unit's cover), allows the application firmware (embedded software) to be updated using a USB flash drive.

The Model 374A uses Audinate's Ultimo™ integrated circuit to implement the 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.

Getting Started

What's Included

Included in the shipping carton are a Model 374A Intercom Beltpack and instructions on how to obtain an electronic copy of this guide. As a device that is Power-over-Ethernet (PoE) powered, no external power source is provided. In most applications an Ethernet switch with the required PoE capability will be utilized.

Connections

In this section signal interconnections will be made using the two connectors located on the bottom of the Model 374A's enclosure. An Ethernet data connection with Power-over-Ethernet (PoE) capability will be made using either a standard RJ45 patch cable or an etherCON protected RJ45 plug. A dual-channel or single-channel (dual- or single-ear) headset will be connected using a cable-mounted 5-pin male XLR connector.

Ethernet Connection with PoE

A 100BASE-TX Ethernet connection that supports Power-over-Ethernet (PoE) is required for Model 374A operation. This one connection will provide both the Ethernet data interface and power for the Model 374A's circuitry. A 10BASE-T connection is not sufficient and a 1000BASE-T (GigE) connection is not supported unless it can automatically "fall back" to 100BASE-TX operation. The Model 374A supports Ethernet switch power management, enumerating itself as a PoE class 1 device. Any source that is compliant with the IEEE® 802.3af standard will function correctly. Should the selected Ethernet switch port support Energy-Efficient Ethernet (EEE) it must be disabled to help ensure reliable Dante operation.

The Ethernet connection is made by way of a Neutrik etherCON protected RJ45 receptacle that is located on the bottom of the Model 374A's enclosure. This allows connection by way of a cable-mounted etherCON connector or a standard RJ45 plug. The Model 374A's Ethernet interface supports auto MDI/MDI-X so that a crossover cable will never be required.

Headset Connection

The Model 374A provides a 5-pin female XLR connector that interfaces with the microphone and headphone connections of an intercom or broadcast-style headset. Refer to Figure 2 for connection details. The microphone input connections are compatible with most unbalanced dynamic or electret (low-voltage DC-powered) microphones. A balanced dynamic microphone should, in most cases, also function correctly if the signal – (low) is connected to Model 374A's mic in –/shield

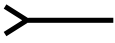

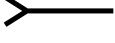


XLR5F		
1		MIC IN - / SHIELD
2		MIC IN +
3		PHONES COM
4		PHONES OUT LEFT / CH1
5		PHONES OUT RIGHT / CH2

Figure 2. Headset connection pinout chart

connection. No support is provided for microphones that require P12 or P48 phantom power.

To allow users of stereo (dual-earpiece or “double muff”) headsets to hear a monaural version of the two headphone output channels does not require special wiring of the 5-pin male XLR mating connector. The headset’s left headphone channel should always be wired to pin 4 and the right headphone channel to pin 5. Configuration choices, discussed later in this guide, can then be used to create the desired monaural output. It’s important not to connect together (short) pins 4 and 5 of the Model 374A’s headset connector as damage to the Model 374A’s output circuitry could result.

Monaural (single-earpiece or “single muff”) headsets should be wired such that its headphone is wired only to pin 4; pin 5 should be remain unused. Configuration choices, discussed later in this guide, can be used to create a monaural output.

It’s possible that some Beyerdynamic headset interconnecting cable assemblies terminate the earpiece’s left and right connections opposite from what the Model 374A and other broadcast equipment require. These cables may terminate the left earpiece to pin 5 of the XLR connector and

the right earpiece to pin 4. If this condition is present it will require reversing or “flipping” the two wires in a headset’s 5-pin male XLR connector such that the left earpiece connects to pin 4 and the right earpiece to pin 5.

Dante Configuration

For audio to pass to and from the Model 374A requires that several Dante-related parameters be configured. These configuration settings will be stored in non-volatile memory within the Model 374A’s circuitry. Configuration will typically be done with the Dante Controller software application which is available for download free of charge at audinate.com. Versions of Dante Controller are available to support Windows® and OS X® operating systems. The Model 374A uses the Ultimo 4-input/4-output integrated circuit to implement the Dante architecture.

The four Dante transmitter (Tx) channels associated with the Model 374A’s Dante interface must be assigned to the desired receiver (Rx) channels. This achieves routing the Model 374A’s four talk output audio channels to the device (or devices) that will be “listening” to them. Within Dante Controller a “subscription” is the term used for routing a transmitter flow (a group of output channels) to a receiver flow (a group of input channels). The number of transmitter flows associated with an Ultimo integrated circuit is limited to two. These can either be unicast, multicast, or a combination of the two. If the Model 374A’s transmitter channels need to be routed using more than two flows it’s possible that an intermediary device, such as the Studio Technologies’ Model 5422 Dante Intercom Audio Engine, can be used to “repeat” the signals.

The four Dante receiver (Rx) channels associated with the Model 374A's audio inputs also need to be routed to the desired Dante transmitter (Tx) channels. These four audio signals can be sent to the Model 374A's 2-channel headphone output.

The Model 374A supports an audio sample rate of 48 kHz with no pull-up/pull-down values available. The Model 374A can serve as the Leader clock for a Dante network but in most cases it will be configured to "sync" to another device.

The Model 374A has a default Dante device name of **ST-M374A-** followed by a unique suffix. The suffix identifies the specific Model 374A that is being configured. The suffix's actual alpha and/or numeric characters relate to the MAC address of the unit's Ultimo integrated circuit. The four Dante transmitter (Tx) channels have default names of **Ch1**, **Ch2**, **Ch3**, and **Ch4**. The four Dante receiver (Rx) channels have default names of **Ch1**, **Ch2**, **Ch3**, and **Ch4**. Using Dante Controller the default device name and channel names can be revised as appropriate for the specific application.

Model 374A Configuration

Many of the Model 374A's operating parameters can be configured to match the needs of specific applications. The STcontroller software application is used to observe a unit's current configuration and perform any changes that are required. No DIP switch settings or other local actions are used to configure the unit. This makes it imperative that STcontroller be available for convenient use in a personal computer that's connected to the related LAN.

Installing STcontroller

STcontroller is available free of charge on the Studio Technologies' website. If necessary, download and install STcontroller onto a designated personal computer. This personal computer must be on the same local area network (LAN) and subnet as the Model 374A unit or units that are to be configured.

Using STcontroller

Immediately after starting STcontroller the application will locate and display the devices that it can control. The one or more Model 374A units that are recognized will appear in the device list. Use the *Identify* command to allow easy recognition of a specific Model 374A unit. Double clicking on a device name will cause the associated configuration menu to appear. Review the current configuration and make changes as required.

Parameters

STcontroller allows observation and selection of functions that include:

- Microphone Input – Electret Power
- Microphone Input – Gain
- Headphone Output Channel Routing
- Sidetone – Level
- Button Operation
- System – Mic Kill
- System – Call Indication

Changes made using STcontroller will be immediately reflected in the unit's operation; no Model 374A "reboot" is required. Each time a change is made the four talk buttons on the top panel will momentarily flash orange in a distinctive pattern to indicate that a command from STcontroller has been received.

Microphone Input – Electret Power

Choices are *Enabled* or *Disabled*.

If the headset has an electret microphone that requires a source of low-voltage DC power for operation enable the Electret Power check box. If the associated headset has a dynamic (non-powered) microphone do not enable the Electret Power check box. Most broadcast headsets that terminate on a 5-pin male XLR connector will not require microphone power. The on/off status is displayed by way of a red LED, labeled MIC POWER, that is located adjacent to the headset connector.

Note that the Model 374A cannot supply P12 or P48 phantom power that may be required for balanced condenser (capacitor) microphones. This should not pose an issue as this type of microphone is essentially never associated with a headset that would be used for intercom applications.

Microphone Input – Gain

Choices are *22 dB*, *30 dB*, *42 dB*, and *48 dB*.

Dynamic microphones have an output level that is typically lower than that provided by electret microphones. As such, the 42 or 48 dB gain settings will probably be appropriate for them. Electret microphones often have internal circuitry which provides a relatively high output level. The 22 and 30 dB gain settings will typically be appropriate with this type of microphone.

When a dynamic microphone is connected to the Model 374A the 42 dB gain setting may be correct for many applications. Setting the gain for 48 dB may be helpful in some applications, such as with headsets that have a low microphone output level. The 48 dB gain setting may also be useful when the Model 374A is going

to be deployed at events where users are not able to speak at normal levels, e.g., sporting events such as golf tournaments where “whispering” may be necessary.

Electret microphones typically have a higher output level due to their internal preamplifier circuitry. As such, less preamplifier gain may be required. Selecting the 22 or 30 dB gain setting will probably be appropriate in these cases.

The compressor active LED, labeled COMP and visible adjacent to the headset connector, can act as a guide when setting the microphone preamplifier gain. During normal talk operation the compressor active LED should light intermittently. If, for example, with a dynamic microphone the LED rarely lights and the preamp gain is set to 42 dB it might be a good idea to change it to 48 dB. If the LED is lit fully during normal talking in a situation where the headset has an electret microphone and the gain is set for 30 dB, changing it to 22 dB might be warranted.

Headphone Output Channel Routing

Choices are *Left*, *Right*, and *Left and Right*.

Four audio input sources (Dante receiver channels) can be assigned to the headphone output channels using the Dante Controller application. How these four audio signals are routed to the Model 374A’s headphone output channels can be configured using this configuration choice. The three options provide flexibility in how the audio sources are presented to the user. When using a stereo (“double muff”) headset it’s common for the audio input sources to be routed to both the left and right channels. But the Model 374A’s flexibility allows each source to be independently configured for sending to

the left only, right only, or both left and right headphone channels.

When using a stereo headset sending all inputs to both channels is often referred to as a dual-channel mono output. If a monaural (“single muff”) headset is used the *Left* configuration option allows the four input channels to be combined to monaural so that the listener can simultaneously hear both sources.

Sidetone – Level

Choices are *Off*, *Low*, *Medium Low*, *Medium*, *Medium High*, and *High*.

The Model 374A includes a sidetone function that allows microphone audio coming from the microphone preamplifier to be sent to the both channels of the headphone output. This serves as a user confirmation that they are actively sending audio to one or more of the talk output channels. Sidetone audio will only be routed to the headphone output when at least one of the talk channels is active. The level of the sidetone audio can be selected from among five values. The correct value is simply the one that makes the user most comfortable. Sidetone audio can also be disabled by selecting *Off*. Selecting *Off* would be useful only in special applications such as during troubleshooting or where user talk audio is being returned as part of their listen audio signals. The four rotary level controls will not impact the sidetone level.

Button Operation

Choices are *Push to Talk*, *Push to Talk/Tap to Latch*, *Talk Disabled*, *Talk Disabled/Phones Tap to Latch*, and *Call* (button 4 only).

This configuration section allows independent selection of how the four buttons will function. When the *Push to Talk* mode is

selected the operation is self-explanatory. Only when a button is pressed and held will talk audio be sent out its associated Dante transmitter channel.

When the *Push to Talk/Tap to Latch* mode is selected a “hybrid” function of sorts is enabled. Pressing and holding the button will enable audio to be sent out its associated Dante transmitter channel. When the button is released audio will stop being sent out its associated transmitter channel. Tapping (momentarily pressing) the button will cause the function to “latch” into the talk active mode. Tapping the button again will cause the function to “unlatch” and talk will no longer be active.

Many applications are best served when the buttons are configured in the *Push to Talk* mode. This ensures that a channel can’t accidentally be left in its active mode. But there are certainly valid situations when the *Push to Talk/Tap to Latch* mode setting will prove to be very useful.

When the *Talk Disabled* mode is selected microphone audio will never be sent out the associated Dante transmitter channel. This can be useful when the audio input associated with this channel is going to be monitored but talk audio is not allowed to “join” this specific intercom channel.

When the *Talk Disabled/Phones Tap to Latch* mode is selected the associated button will not impact talk audio but will instead control the on/off state of the audio being sent to the headphone output. In this mode talk audio will never be sent out the associated Dante transmitter channel. This is an interesting mode, allowing one or more Model 374A audio channels to serve in a “monitor mixer” function. The button will allow quick on/off control while the rotary level control can remain in its desired position.

When button 4 has been selected to the *Call* mode it will serve as a call enable button for talk channels 1, 2, and 3; microphone audio will never be sent out Dante transmitter channel 4. In the *Call* mode button 4 will operate in a push-to-activate manner and whenever it is active and channels 1, 2, and/or 3 are active a 20 kHz tone (call signal) will be added to the active audio paths. It will not display a call signal that's present on audio input channel 4.

System – Mic Kill

Choices are *Off*, *Device ID*, *Global Kill Command*, and *Device ID/Global Kill Command*.

The mic kill function allows an enabled talk channel to be disabled by remote control. Specifically, it's possible to remotely change all active (on) talk channels to their off state. This function is sometimes referred to as a “talk off” function. There are two means available to remotely disable all active talk channels. The *Device ID* method uses the identification command generated by the Dante Controller or STcontroller applications as a “trigger” to disable any active talk channels. The *Global Kill Command* can be generated by applications that incorporate the Studio Technologies' proprietary method. This method utilizes sending a data command over the Ethernet connection. Select the desired mic kill configuration from the four choices. *Off* simply means that no remote talk control is supported.

System – Call Indication

Choices are *Off*, *Flash*, *Solid*, and *Flash then Solid*.

The call indication configuration allows the manner in which each of the four talkback

button LEDs will light when a call signal is detected on its respective Dante receiver (input) channel. Technically, call is detected as active when a 20 kHz nominal audio tone is present in an audio signal path. (It would typically be a sine- or square-wave signal that's combined with voice audio.) If *Off* is selected and a call signal is detected in a Dante receiver (input) channel then the associated button's LED will not light. If *Flash* is selected then a button's LED will flash orange if a call signal is detected and the channel's talk function is not active. If the channel's talk function is active when a call signal is detected then the button's LED will flash alternately green and orange. (Green indicates that the talk function is active and orange indicates that a call signal is detected.) If the configuration is selected for *Solid* then a button's LED will light orange when a call signal is detected; it will light orange whether or not the talk function associated with that button is active. If call indication is configured for *Flash then Solid* and a call signal is detected, then a button's LED will first flash orange (or green and orange) and then will light solid orange, remaining lit orange until the call signal is no longer present.

Operation

At this point everything should be ready and Model 374A operation can commence. An Ethernet connection with Power-over-Ethernet (PoE) capability should have been made. A headset terminated on a 5-pin male XLR connector should be plugged into the headset connector.

Using the Studio Technologies' STcontroller software application the unit's configuration should have been selected to meet the needs of the specific application. The

Model 374A's Dante configuration settings should have been selected using the Dante Controller software application. In this way the unit's four audio output channels (Dante transmitter channels) and four audio input channels (Dante receiver channels) should have been routed, by way of Dante "subscriptions," to the receiver and transmitter channels on associated Dante-enabled equipment.

Initial Operation

The Model 374A will start to function as soon as a Power-over-Ethernet (PoE) power source is connected. However, it may take 20 to 30 seconds for full operation to commence. Upon initial power up the three status LEDs located on the bottom panel below the etherCON RJ45 receptacle will begin to light as network and Dante connections are established. The green and orange LEDs that illuminate the four pushbutton switches on the top panel may initially light randomly and then will light in a test sequence to indicate that the application firmware (embedded software) has started. Once the entire sequence has completed and the Dante connection has been established full operation will begin.

Ethernet and Dante Status LEDs

Three status LEDs are located below the etherCON RJ45 receptacle on the Model 374A's bottom panel. The LINK ACT LED will light green whenever an active connection to a 100 Mb/s Ethernet network has been established. It will flash in response to Ethernet data packet activity. The SYS and SYNC LEDs display the operating status of the Dante interface and associated network. The SYS LED will light red upon

Model 374A power up to indicate that the Dante interface is not ready. After a short interval it will light green to indicate that it is ready to pass data with another Dante device. The SYNC LED will light red when the Model 374A is not synchronized with a Dante network. It will light solid green when the Model 374A is synchronized with a Dante network and an external clock source (timing reference) is being received. It will slowly flash green when this specific Model 374A is serving as the Leader clock for the network. It's possible that up to 30 seconds may be required for the SYNC LED to reach its final state.

Compressor Active LED

A yellow LED indicator is located on the bottom panel adjacent to the headset connector. Labeled COMP, the LED displays the status of the microphone audio compressor function. It will light whenever the input level from the microphone, along with the configured preamplifier gain, is such that the dynamic range of the talk signal is being controlled. It's perfectly acceptable for this LED to light intermittently whenever a user is talking at a normal voice level into the associated microphone. But if the COMP LED lights solid while a user is talking at a normal voice level this will typically indicate that the mic preamp gain setting should be reduced. Conversely, if the COMP LED almost never lights when normal talking is taking place, it's possible that changing the mic preamp gain to the higher setting would be beneficial. Note that due to the design of the circuitry the compressor active LED will function whether or not any of the four talk channels are active.

Headphone Output

Four rotary potentiometers (“pots”), located on the Model 374A’s top panel, allow individual adjustment of the level of the four audio input signals as they are sent to the 2-channel headphone output. Depending on the configuration of the unit, each audio input can be sent to the left channel, the right channel, or both the left and right channels of the headphone output. The pots are “push-in/push-out” type which allow their associated knobs to be in their “out” position to be adjusted and then moved to their “in” position when protection from an unwanted change is desired.

Users should find the headphone output audio quality to be excellent, with high maximum output level and low distortion. Audio signals do not pass directly through the level pots. The position of the pots is recognized by the Model 374A’s processor which then adjusts the signal level within the digital domain. When a pot is in its fully counterclockwise position the associated audio signal is fully muted. In most cases the on/off status of the four talk channels does not impact the headphone output. However, one button configuration setting (*Talk Disabled/Phone Tap to Latch*) assigns the associated button to function as a channel listen audio on/off selector.

Button Operation

Four pushbutton switches are associated with the Model 374A’s four channels. How they function will depend on the configuration of the unit. Each button can be configured independently.

Push to Talk

When a button has been configured for the *Push to Talk* mode how it functions is pretty self-explanatory. Press and hold the button when headset microphone audio is to be sent out the associated Dante audio output (transmitter) channel. The button’s green LED will light to indicate that the output is active. The button will not be lit when the function is not active.

Push to Talk/Tap to Latch

If a button has been configured for the *Push to Talk/Tap to Latch* mode operation is a bit different and certainly more flexible. Press and hold the button to activate the talk function. When released the talk function will turn off. Momentarily pressing (“tapping”) the button will cause the function to change states; off-to-on or on-to-off. Whenever the talk function is active the green LED will light. The button will not be lit when the function is not active.

Talk Disabled

A button that is configured to the *Talk Disabled* mode will never allow talk audio to be sent to the associated Dante audio output channel. But to provide “feedback” that the button has been pressed the button’s green LED will flash rapidly three times. This says, in effect, “Yes, I recognize that you pressed the button but I’m not going to do anything in response!”

Talk Disabled/Phones Tap to Latch

In the *Talk Disabled/Phones Tap to Latch* mode the button will never allow talk audio to be sent to the associated Dante audio output channel. Instead the button will operate in a tap to enable/tap to disable (alternate action or “toggle”) manner and provide an audio channel listen on/off

function. The button's orange LED will light whenever audio is being sent to the headphone output. The headphone output level will continue to follow the setting of the associated rotary level control.

Call (Button 4 Only)

When button 4 is configured for the *Call* mode it will allow call signals to be generated whenever talk channels 1, 2, and/or 3 are active. The button functions in a push-to-call manner and will light orange whenever it is pressed and held. No microphone audio will be routed to audio output 4. Button 4 will never light in response to a call signal being present on audio input 4. The headphone output level will continue to follow the setting of the rotary level control associated with audio input 4.

Sidetone Function

The Model 374A includes a sidetone function that sends microphone audio to both the left and right headphone output channels whenever one or more of the talk buttons are active. The quality of the sidetone audio should be excellent and will provide Model 374A users with a confidence signal that they are actively talking to other intercom users. Sidetone audio will always be sent to both headphone channels and is not a configurable choice. This is because the function is trying to simulate what a user would hear if they didn't have a headset covering their ears. It is not intended to indicate to the user which Dante audio output (transmitter) channel or channels are actively sending audio.

The exact sidetone level is configured from among five values within the STcontroller application. There is also a selection choice for turning off sidetone. There is no means of adjusting the sidetone level using any

physical buttons or controls on the Model 374A unit. Also, the four headphone level controls on the top panel of the unit do not impact the sidetone level.

In most cases the exact sidetone level setting is not critical and typical users will not be concerned about revising it to a specific value. But setting the sidetone level to something reasonable is important. Setting the level too low will encourage users to speak too loudly; setting it too high and users will be tempted to speak hesitantly. And while the user isn't provided with a sidetone level control or other adjustment means, should the need arise STcontroller allows rapid adjustment of the sidetone level. In most cases the default sidetone level, *Medium*, should provide an appropriate level.

Call Function

General

The Model 374A includes a call function that allows users, and users of compatible equipment, to signal each other. A call receive function is provided as part of each of the Model 374A's four channels. Any combination of the four can have their call function active at any one time. Technically, a call signal is achieved by sending a nominal 20 kHz audio tone on the desired audio output channel. This signal, normally a sine- or square-wave, is summed (mixed) with normal talk audio. The Model 374A's four audio input channels are always monitoring for the presence of 20 kHz. A call signal is recognized when a continuous 20 kHz tone is present on the audio input for that channel.

Note that any Model 374A channel that has been configured to *Talk Disabled/Phones Tap to Latch* mode will not respond to the

presence of a call signal. Also, if channel 4 has been configured to the *Call* mode that channel will not respond to a call signal on audio input 4.

The Model 374A will not confuse a normal talk audio signal with a call signal. Digital filters within the unit's processor integrated circuit limits each channel's high-frequency response, helping to ensure that false call detection won't take place. Digital filtering is also performed on the Dante receiver (input) audio signals before they are sent to the headphone outputs. This prevents users with extended high-frequency sensitivity, such as presenters and guests associated with dog shows, from ever receiving undesirable audio content.

By using 20 kHz tones for call signaling the Model 374A is compatible with legacy intercom equipment, including the venerable RTS® BP-325 beltpack. When interconnecting Model 374A and BP-325 units using an appropriate Dante-enabled interface, such as the Studio Technologies' Model 45DR Intercom Interface, call signaling is fully compatible. Compatibility with the Clear-Com® method of call functionality is also possible by using the Model 45DC Intercom Interface. (It converts the DC call signal associated with pin 3 of a Clear-Com party-line circuit to a 20 kHz tone.)

Devices such as the Studio Technologies' Model 44D Audio Interface will also send and receive 20 kHz signals that are compatible with the Model 374A's call function. To generate a call signal a Model 44D will respond to the activation of a GPI (general-purpose input) signal by summing (combining) a 20 kHz tone with the normal audio signal that is being transported "in band" via a Dante audio path. On the call

receive side, audio signals that enter the Model 44D will be monitored for the presence of 20 kHz. If a call signal is detected the GPO (general-purpose output) associated with that audio channel will activate.

Receive

Whenever a Model 374A's Dante receive (input) channel receives a valid 20 kHz nominal call signal the action of the associated button's LED will follow the unit's call indication configuration. This one configuration will impact the action of all button LEDs. If the call indication function has been configured for *Disabled* a button's LED will not respond to the presence of a call signal. If the call indication configuration has been selected for *Flash* then a button's LED will flash orange when a call signal has been detected on its associated audio input and the talk function is not active. If a call tone is detected when the talk function is active then the associated button's LED will flash, alternating between green and orange. If the call indication has been configured for *Solid* then a button's LED will light orange whenever a call signal is detected. If *Flash then Solid* is selected for the call indication configuration a button's LED will first flash orange (or orange and green if the talk function is active) and then light solid orange.

Send

The Model 374A allows a call signal to be sent on channels 1, 2, and 3. This requires that button 4 be configured to the *Call* mode. To send a call signal is simple: just enable any combinations of channels 1, 2, and/or 3 and simultaneously press and hold button 4. When call sending is active the orange LED associated with button 4 will light. At the same time the channel or channels that are active in their talk mode

(from among channels 1, 2, and 3) will add 20 kHz to their audio output channels and have their associated LED flash, alternating between green and orange. (Green indicates that the talk function is active and orange indicates that the call function is active.) Release button 4 and the sending of call signals will cease. As expected, pressing button 4 when no talk channels are active will result in no call tones being generated.

How to Identify a Specific Model 374A

The Dante Controller software application offers an *Identify* command that can be used to help locate a specific Model 374A. When *Identify* is selected it will send a command to a single Model 374A unit. On that specific unit the four pushbutton LEDs will light in a unique pattern. In addition, the SYS and SYNC status LEDs, located directly below the etherCON RJ45 receptacle on the bottom panel, will slowly flash green. After a few seconds the LED identification pattern will cease and normal Model 374A button LED and Dante status LED operation will resume.

If configured, the *Identify* command can also cause the mic kill function to activate. For details please refer to the next paragraph of this guide.

Mic Kill Function

The Model 374A includes a mic kill function, allowing talk buttons that have been placed in their enabled (on) state to be remotely changed to their disabled (off) state. This allows one or more talk channels on a specific Model 374A that have been enabled to be remotely disabled. The reason for this function is simple. It's common in intercom applications for users to enable a talk chan-

nel and then go "off headset," forgetting that they've left the talk channel enabled. While they take a break or go to lunch, all other users listening to that channel may hear unwanted audio! Having the ability to disable this talk channel can be very useful.

A configurable choice in the STcontroller software application is used to select which of the mic kill methods, *Device ID* or *Global Kill Command*, will be active. Either or both can be enabled as desired. It's also possible to disable the mic kill function.

If the *Device ID* method of activating mic kill is enabled, whenever the specific Model 374A is identified using the *Identify* command within Dante Controller or STcontroller all enabled talk channels will be forced to their disabled state. If the *Global Kill Command* method is enabled the Model 374A will respond to any such request and force all talk channels to their disabled state.

Technical Notes

IP Address Assignment

By default the Model 374A's Ethernet interface will attempt to automatically obtain an IP address and associated settings using the DHCP (Dynamic Host Configuration Protocol). If a DHCP server is not detected an IP address will automatically be assigned using the link-local protocol. This protocol is known in the Microsoft® world as Automatic Private IP Addressing (APIPA). It is also sometimes referred to as auto-IP. Link-local will randomly assign a unique IP address in the IPv4 range of 169.254.0.1 to 169.254.255.254. In this way multiple Dante-enabled devices can be connected together and automatically function, whether or not a DHCP server

is active on the LAN. Even two Dante-enabled devices that are directly interconnected using an RJ45 patch cable will, in most cases, correctly acquire IP addresses and be able to communicate with each other.

An exception does arise when trying to directly interconnect two Dante-enabled devices that use Ultimo integrated circuits to implement Dante. The Model 374A uses the Ultimo “chip” and, as such, a direct one-to-one interconnection to another Model 374A (or other Ultimo-based product) is not supported. An Ethernet switch linking the two units is required to successfully interconnect two Ultimo-based devices. The technical reason that a switch is required relates to the need for a slight latency (delay) in the data flow. And an Ethernet switch will provide this. While this is certainly an anomaly, since PoE power is required for Model 374A operation it’s highly unlikely that an application would use two Model 374A units without a PoE-enabled Ethernet switch being present.

Using the Dante Controller software application the Model 374A’s IP address and related network parameters can be manually set for a fixed (static) configuration. While this is a more-involved process than simply letting DHCP or link-local “do their thing,” if fixed addressing is necessary then this capability is available. But in this case it’s highly recommended that each unit be physically marked, e.g., directly using a permanent marker or “console tape,” with its specific static IP address. If knowledge of a Model 374A’s IP address has been misplaced there is no reset button or other method to easily restore the unit to a default IP setting.

In the unfortunate event that a device’s IP address is “lost,” the Address Resolution Protocol (ARP) networking command can be used to “probe” devices on a network for this information. For example, in Windows OS the **arp -a** command can be used to display a list of LAN information that includes MAC addresses and corresponding IP addresses. The simplest means of identifying an unknown IP address is to create a “mini” LAN with a small PoE-enabled Ethernet switch connecting a personal computer to the Model 374A. Then by using the appropriate ARP command the required “clues” can be obtained.

Optimizing Network Performance

For best Dante audio-over-Ethernet performance a network that supports VoIP Quality-of-service (QoS) capability is recommended. This can be implemented on virtually all contemporary managed Ethernet switches. There are even specialized switches that are optimized for entertainment-associated applications. Refer to the Audinate website (audinate.com) for details on optimizing networks for Dante applications. Also, disable Energy-Efficient Ethernet (EEE) support on all Ethernet switch ports that are associated with Dante devices. Some implementations of EEE can incorrectly interpret that a connected device is not present and prevent proper Dante operation.

Application Firmware Version Display

There are two ways in which the version number of the Model 374A’s application firmware (embedded software) can be identified. One requires only the Model

374A unit and involves a button-press sequence performed upon power up. The other method utilizes the Model 374A and the STcontroller software application. Either method may prove to be useful when working with factory personnel on application support and troubleshooting.

As part of the Model 374A's power-up sequence the unit's application firmware (embedded software) version number can be displayed. This is useful when working with factory personnel on application support and troubleshooting. Before connecting the PoE-enabled Ethernet cable, press and hold the channel 4 button. Then connect the Ethernet cable. Upon application of PoE power the Model 374A will go through its normal power-up sequences followed by a display of the firmware version. The LED associated with the channel 1 button will "flash" to display the major version number. Then the LED associated with the channel 2 button will "flash" to display the minor version number. Once the version number has been displayed button 4 can be released and normal operation will begin. As an example of what would be a typical application firmware display, if the channel 1 button "flashes" twice followed by the channel 2 button "flashing" one time this would indicate that application firmware version 2.1 was present in the Model 374A.

A selection in the STcontroller software application allows the Model 374A's application firmware version to be identified. Connect the Model 374A unit to the network and let it connect and start to function. Then, after starting STcontroller, review the list of identified devices and select the specific Model 374A that interests you. Then select **Version** under the **Device** tab. A page will then display that

will provide lots of useful information. This includes the application firmware version and well as details on the firmware present in the Ultimo integrated circuit.

Application Firmware Update Procedure

It's possible that updated versions of the application firmware (embedded software) that is utilized by the Model 374A's processor (microcontroller or MCU) integrated circuit will be released to add features or to correct issues. Refer to the Studio Technologies' website for the latest application firmware file. The unit has the ability to load a revised file into the MCU's non-volatile flash memory by way of a USB interface. The Model 374A implements a USB host function that directly supports connection of a USB flash drive. The Model 374A's MCU updates its application firmware using a file named **M374A.bin**.

The update process begins by preparing a USB flash drive. The flash drive doesn't have to be empty (blank) but must be in the personal-computer-standard FAT32 format. Save the new application firmware file in the root directory with a name of **M374A.bin**. Be certain to use the eject command to ensure that the file is correctly stored on the USB flash drive. Studio Technologies will supply the application firmware file inside a .zip archive file. While the application firmware file inside of the zip file will adhere to the naming convention required by the Model 374A, the name of the zip file itself will include the file's version number. For example, a file named **M374Av2r1MCU.zip** would indicate that version 2.1 of the application firmware (**M374A.bin**) is contained within this zip file.

Once the USB flash drive is inserted into the USB interface, located on the main circuit board under the cover, the unit must be powered off and again powered on. At this point the file will automatically load into the processor's flash memory. The precise steps required will be highlighted in the next paragraphs of this guide.

To install the application firmware file follow these steps:

1. Disconnect power from the Model 374A. This will entail removing the Ethernet connection that is providing PoE power.
2. Remove the cover from the Model 374A. Begin by removing the four Phillips-head machine screws (#1 screw driver tip), two per side. Be certain to save the screws so that re-assembly will be fast and painless. Then carefully slide the cover forward to separate it from the level controls and buttons and then lift it off.
3. Locate the USB connector on the main circuit board. It's near the channel 1 button. Insert the prepared USB flash drive into it.
4. Apply power to the Model 374A by connecting to a Power-over-Ethernet (PoE) Ethernet source.
5. After a few seconds the Model 374A will run a "boot loader" program that will automatically load and save the new application firmware file (**M374A.bin**). This will take only a few seconds. During this time period the channel 4 button LED will flash slowly in alternating colors. Once the entire process is over, taking approximately 10 seconds, the Model 374A will restart using the newly saved application firmware.
6. At this time the Model 374A is operating under the newly saved application firmware and the USB flash drive can be removed. But to be conservative, remove PoE power first and then remove the USB flash drive.
7. Confirm that the desired application firmware version has been correctly saved. This can be done by pressing and holding the channel 4 button, applying PoE power to the Model 374A, and then "reading" the application firmware version number by first observing the channel 1 button's LED and then observing the channel 2 button's LED. Alternately, the STcontroller software application can be used to identify the application firmware version number. Whatever method you use, ensure that the desired version is present.
8. Once the update process has been completed reverse the steps and re-attached the cover using the four machine screws.

Note that upon power being applied to the Model 374A if a connected USB flash drive doesn't have the correct file (**M374A.bin**) in the root folder no harm will occur. If the correct file is not present upon power up the channel 4 button's LED will flash on and off rapidly for a few seconds to indicate this condition and then normal operation using the unit's existing application firmware will begin.

Ultimo Firmware Update

As previously discussed in this guide, the Model 374A implements Dante connectivity using the 4-input/4-output Ultimo integrated circuit from Audinate. The Dante Controller software application can be used to determine the version of the firmware

(embedded software) that resides in the Ultimo “chip.” The STcontroller software application can also be used to identify the Ultimo’s firmware version. (Use the **Version** selection under the **Device** tab.) The Ultimo firmware can be updated by way of the Model 374A’s Ethernet connection. The latest Ultimo firmware file is available on the Studio Technologies’ website. The Dante Firmware Update Manager (FUM) application program can be used to install the Ultimo firmware. The Dante Controller software application includes an automated method of updating Ultimo firmware. It offers a much simpler method of keeping the Ultimo firmware current.

Model 374A versus Model 374

Some users may be interested in the differences between the original Model 374 Intercom Beltpack and the newer Model 374A that is described in this guide. A comparison chart is available on the Studio Technologies’ website. In addition, the following text provides a summary of the changes:

- All configuration selections for the Model 374A are performed using the STcontroller software application. STcontroller also allows the version numbers of the Model 374A’s application and Ultimo firmware (embedded software) to be remotely identified.
- Support for electret microphones was added to the Model 374A. This involved incorporating a 5 volt DC power source that is associated with the microphone input pin. It can be enabled or disabled as required using STcontroller.

- The configurable microphone input gain settings were modified to be compatible with the increased output level supplied by electret microphones.
- The DIP switch assembly and the miniature pushbutton switch found on the Model 374 are not present on the Model 374A. As such the belt clip no longer needs to be rotated and its mounting arrangement has been changed.
- The user-accessible sidetone trim potentiometer found on the Model 374 is not present on the Model 374A. In the Model 374A the level of the sidetone function is configured using STcontroller.
- The Model 374A offers a second method of activating the mic kill function. This allows a data signal, in addition to the *Device ID* command, to activate mic kill.
- The STcontroller software application now offers the ability to configure the mic kill function, including allowing it to be disabled.
- The Model 374A allows button 4 to be used as a call button function.

Belt Clip

The belt clip is attached to the back of the Model 374A’s enclosure by way of two 6-32 thread, Philips-head machine screws. Unlike other the original Model 374 Intercom Beltpack units, the belt clip on the Model 374A will never have to be rotated as part of the configuration process. (There are no configuration DIP switches or a pushbutton switch under the belt clip.) But if the belt clip does need to be replaced a #1 Philips-head screw driver would be the correct tool to remove the machine screws.

Restoring Factory Defaults

A command in the STcontroller software application allows the Model 374A's configuration to be reset to the factory default values. From STcontroller select the Model 374A for which you want to restore its defaults. Select the **Device** tab and then select the **Factory Defaults** feature. Then click on the **OK** box. Refer to Appendix A for a list of the Model 374A's factory default values.

Specifications

Power Source:

Power-over-Ethernet (PoE): class 1 (very low power, ≤ 3.84 watts) per IEEE® 802.3af

Network Audio Technology:

Type: Dante audio-over-Ethernet

AES67-2018 Support: yes

Dante Domain Manager (DDM) Support: yes

Bit Depth: up to 24

Sample Rate: 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, Power-over-Ethernet (PoE) supported

Data Rate: 100 Mb/s (10 Mb/s and 1000 Mb/s GigE Ethernet not supported)

Audio Channels: 4 talk, 4 listen

Microphone Input:

Compatibility: dynamic or electret (low-voltage DC-powered) microphones

Type: unbalanced

Electret Microphone Power: 5 volts DC via 2.21 k resistor, selectable on/off

Gain: 22, 30, 42, or 48 dB, selectable, ref. -60 dBu input to Dante output (-20 dBFS nominal)

Frequency Response: 50 Hz to 10 kHz, -3 dB

Distortion (THD+N): $<0.02\%$

Dynamic Range: 75 dB

Compressor:

Threshold: 1 dB above nominal level (-19 dBFS)

Slope: 2:1

Status LED: compressor active

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: 3.8 Vrms, 1 kHz, 150 ohm load

Frequency Response: 20 Hz to 10 kHz, -3 dB

Distortion (THD+N): $<0.002\%$

Dynamic Range: >100 dB

Call Function:

Receive Support: channels 1-4

Send Support: channels 1-3

Signaling Method: 20 kHz, ± 800 Hz, within audio channels

Receive Level: -27 dBFS minimum

Send Level: -20 dBFS

Connectors:

Headset: 5-pin female XLR

Ethernet: Neutrik NE8FBH etherCON RJ45 receptacle

USB: type A receptacle (located inside Model 374A's enclosure and used only for application firmware updates)

Configuration: requires Studio Technologies' STcontroller software application

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: 0 to 95%, non-condensing

Altitude: not characterized

Dimensions (Overall):

3.6 inches wide (9.2 cm)

1.6 inches high (4.0 cm)

4.8 inches deep (12.6 cm)

Mounting: intended for portable applications; contains integral belt clip; optional MBK-01 Mounting Bracket Kit allows Model 374A to be permanently mounted

Weight: 0.6 pounds (0.3 kg)

Specifications and information contained in this User Guide subject to change without notice.

Appendix A

STcontroller default Model 374A configuration values:

Microphone Input – Electret Power: Off

Microphone Input – Gain: 42 dB

Headphone Output – Channel 1 Input Routes to: Left

Headphone Output – Channel 2 Input Routes to: Right

Headphone Output – Channel 3 Input Routes to: Left

Headphone Output – Channel 4 Input Routes to: Right

Sidetone – Level: Medium

Button Operation – Channels 1 through 4: Push to Talk/Tap to Latch

System – Mic Kill: Global Kill Command

System – Call Indication: Flash