Model 370A
Intercom Beltpack

User Guide

Issue 4, June 2023

This User Guide is applicable for serial numbers
M370A-04501 and later with application firmware 2.1 and later

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Revision History

Issue 4, June 2023:
- Adds screen capture for the STcontroller application.
- Miscellaneous improvements and clarifications.
- Updated to meet latest document format.

Issue 3, May 2021:
- Documents changes to several specifications.

Issue 2, August 2019:
- Documents revision to STcontroller (version 2.02.00 and later) which separates microphone power and microphone gain configuration.

Issue 1, June 2018:
- Initial release.

Introduction

The Model 370A Intercom Beltpack begins with the features offered by traditional 2-channel 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. Over a standard IP network, multiple Model 370A 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 5422A Dante Intercom Audio Engine. Alternatively, 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 preamplifier gain, talk button operation, and headphone channel assignment. User features include integrated sidetone, call function, and remote mic kill ("talk off"). 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 370A is simple. An etherCON® RJ45 jack 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. Two talk pushbutton switches can be configured for optimal operation. Two push-in/push-out (pop out) rotary controls make it easy to set and maintain the desired headphone output level. The Model 370A'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.

The audio quality of the Model 370A's 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 370A using the Dante audio-over-Ethernet media networking technology. As a Dante-compliant device, the Model 370A's two Dante audio transmitter (output) and two Dante audio receiver (input) channels can be interconnected (routed) 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 digital audio's bit depth is up to 24 with a sampling rate of 48 kHz. The Model 370A 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 370A. Not only will it cause the talk and call button LEDs to light in a unique highly visible sequence, it can also be configured to turn off any active talk channels.



Figure 1. Model 370A Intercom Beltpack top and bottom views

Audio Quality

The Model 370A'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 two Dante receiver (input) channels. The supported sampling rate is 48 kHz with a bit depth of up to 24. The audio signals pass into the Model 370A's processor where channel routing, headphone level control, and sidetone creation are performed within the digital domain. This provides flexibility, allowing precise control of the audio signals and eliminating the need for the two rotary level controls 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 370A users to send and receive channel-specific visual alert signals. Pressing the call pushbutton on the top of the unit is all that's required to signal other users that attention is requested. Using 20 kHz tones, the call signals are sent within the audio channels ("in band") allowing interoperability between multiple Model 370A 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.

Configuration Flexibility

A highlight of the Model 370A 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 370A by way of an Ethernet network connection. Configurable parameters include microphone power and preamplifier gain, sidetone audio operation, talk button operation, 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 the variety of microphones that are part of broadcast and intercom headsets.

A unique Model 370A feature is the ability to individually configure the way in which the two talk pushbutton switches function. Four choices are available. For standard intercom beltpack operation, it's typical to select *Push to Talk*, *Latching*, or *Push to Talk/Tap to Latch*. For situations where only monitoring of an intercom channel is desired a *Disabled* mode is available.

Two 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 370A 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 jack. 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 370A'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 370A'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 370A was designed such that its capabilities and performance can be enhanced in the future. A USB receptacle, 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 370A 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 370A Intercom Beltpack and instructions on how to obtain an electronic copy of this guide. Because the unit 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 370A'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 370A operation. This one connection will provide both the Ethernet data interface and power for the Model 370A's circuitry. A 10BASE-T connection is not sufficient and a 1000BASE-T (GbE) connection is not supported unless it can automatically fall back to 100BASE-TX operation. The Model 370A 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 jack that is located on the bottom of the Model 370A's enclosure. This allows connection by way of a cable-mounted etherCON connector or a standard RJ45 plug. The Model 370A's Ethernet interface supports auto MDI/MDI-X so that a crossover cable will never be required.

Headset Connection

The Model 370A 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 its signal – (low) is connected to Model 370A's mic in –/shield connection. No support is provided for microphones that require P12 or P48 phantom power.

Allowing 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 370A's headset connector as damage to the Model 370A's output circuitry could result.

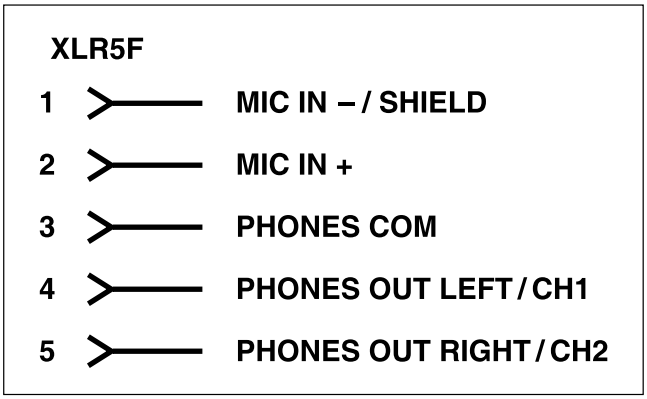


Figure 2. Headset connection pinout chart

Monaural (single-ear or "single-muff") headsets should be wired such that their headphone is wired only to pin 4; pin 5 should 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 370A 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

Passing audio to and from the Model 370A requires that several Dante-related parameters be configured. These configuration settings will be stored in non-volatile memory within the Model 370A'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 370A uses the Ultimo 2-input/2-output integrated circuit to implement the Dante architecture.

The two Dante transmitter (output) channels associated with the Model 370A's Dante interface must be assigned to the desired receiver (input) channels. This routes the Model 370A's two 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 370A's Dante transmitter (output) channels need to be routed using more than two flows, it's possible that an intermediary device, such as the Studio Technologies Model 5422A Dante Intercom Audio Engine, can be used to repeat the signals. (Use the Model 5422A's pass-thru group configuration mode to provide this resource.)

The two Dante receiver (input) channels associated with the Model 370A's audio inputs also need to be routed to the Dante transmitter (output) channels provided by the desired source device. These two audio signals can be sent to the Model 370A's 2-channel headphone output.

The Model 370A supports an audio sample rate of 48 kHz with no pull-up/pull-down values available. The Model 370A can serve as the Leader Clock for a Dante network, but in most cases, it will be configured to "sync" to another device that is serving as the Leader Clock for the Dante implementation.

The Model 370A has a default Dante device name of **ST-M370A-** followed by a unique suffix. The suffix identifies the specific Model 370A 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 two Dante transmitter (output) channels have default names of **Ch1** and **Ch2**. The two Dante receiver (input) channels have default names of **Ch1** and **Ch2**. Using the Dante Controller application the default device name and channel names can be revised as appropriate for the specific application.

Model 370A Configuration

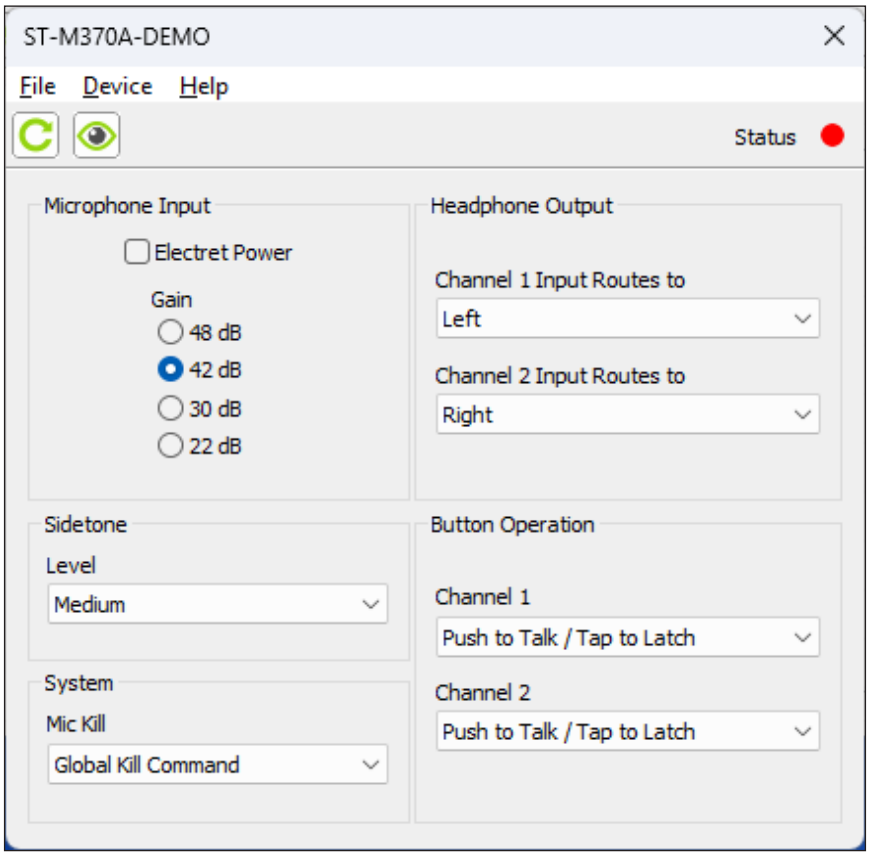
Many of the Model 370A's operating parameters can be configured to match the needs of specific applications. The STcontroller software application is used to observe a unit's current configuration and perform any changes that are required. No DIP switch settings or other local actions are used to configure the unit. This makes it imperative that the STcontroller software application be available for use in a personal computer that's connected to the related LAN.

STcontroller is available free of charge on the Studio Technologies website (studio-tech.com/stcontroller) and is compatible with personal computers running Windows® and macOS® operating systems. 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 370A unit or units that are to be configured.

Changes made using STcontroller will be immediately reflected in the unit's operation; no Model 370A reboot is required. Each time a change is made, the three buttons, talk 1, talk 2, and call, on the top panel will momentarily flash orange in a distinctive pattern to indicate that a command from STcontroller has been received.

Using STcontroller

Immediately after starting STcontroller, the application will locate and display the devices that it can control. The one or more Model 370A units that are recognized will appear in the device list. Use the *Identify* command to allow easy recognition of a specific Model 370A unit. Double-clicking on a device name will cause the associated configuration menu to appear. Review the current configuration and make changes as required.



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 370A 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 370A, 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 370A 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*.

Two Dante receiver (input) channels can be assigned to the headphone output channels using the Dante Controller application. How these two audio signals are routed to the Model 370A'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. The Model 370A'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 two 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 370A includes a sidetone function that allows microphone audio coming from the microphone preamplifier to be sent to both channels of the headphone output. This serves as a user confirmation that they are actively sending audio to either or both of the talk output channels. Sidetone audio will only be routed to the headphone output when either or both of the talk channels are 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 two rotary level controls will not impact the sidetone level.

Button Operation

Choices are *Push to Talk*, *Latching*, *Push to Talk/ Tap to Latch*, and *Disabled*.

This configuration section allows independent selection of how the two talk buttons will function. When the *Push to Talk* mode is selected, the operation is self-explanatory. Only when a talk button is pressed and held will talk audio be sent out its associated Dante transmitter (output) channel.

When the *Latching* mode is selected, 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.

When the *Push to Talk/Tap to Latch* mode is selected, a hybrid function of sorts is enabled. Pressing and holding the talk button will enable audio to be sent out its associated Dante transmitter (output) 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 talk-active mode. There are certainly valid situations when the *Latching or Push to Talk/Tap to Latch* mode settings will prove to be very useful.

When the *Disabled* mode is selected, microphone audio will never be sent out the associated Dante transmitter (output) 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.

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 software 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.

Operation

At this point everything should be ready and Model 370A operation can commence. An Ethernet connection with Power over Ethernet (PoE) capability should have been made. A headset terminated with a cable-mounted 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 370A's Dante configuration settings should have been selected using the Dante Controller software application. In this way, the Model 370A's two Dante audio transmitter (output) channels and two Dante audio receiver (input) 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 370A 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 jack will begin to light as network and Dante connections are established. The green and orange LEDs that illuminate the three 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 jack on the Model 370A'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 370A 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 370A is not synchronized with a Dante network. It will light solid green when the Model 370A 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 370A 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. 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 either or both of the talk channels are active.

Headphone Output

Two rotary potentiometers ("pots"), located on the Model 370A's top panel, allow individual adjustment of the level of the two 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 370A'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. The on/off status of the two talk channels, or the status of the call function, does not impact the headphone output.

Button Operation

Two pushbutton switches are associated with the Model 370A's two talk 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 transmitter (output) 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.

Latching: If a button has been configured for the *Latching* mode operation, 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.

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.

Disabled: A button that is configured to the *Disabled* mode will never allow talk audio to be sent to the associated Dante audio output channel. 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."

Sidetone Function

The Model 370A includes a sidetone function that sends microphone audio to the headphone output channels whenever one or both of the talk buttons are active. The quality of the sidetone audio should be excellent and will provide Model 370A users with a confidence signal that they are actively talking to other intercom users. Sidetone audio will always be sent to both the left and right 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 transmitter (output) 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 a physical button or control on the Model 370A unit. Also, the two 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. 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 users aren'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

An integrated call function allows Model 370A users, and users of compatible equipment, to signal to each other visually. Individual call functions are provided for each of the two talk channels. Either or both can have its call function active at any one time. Technically, a call is signaling by sending a 20 kHz audio tone on the desired audio output channel. This signal is summed (mixed) with normal talk audio. The Model 370A's two audio input channels continually monitor for the presence of 20 kHz. A call signal is recognized when a continuous 20 kHz tone is detected on the audio input for that channel.

Normal talk audio signals will not be confused with a call signal. Digital filters within the Model 370A's processor integrated circuit limit the microphone input's high-frequency response to about 10 kHz. This helps to ensure that false call detection won't take place. Digital filtering is also performed on the Dante audio receiver (input) signals before they are sent to the headphone outputs. This prevents users with extended high-frequency sensitivity, such as hosts and guests associated with dog shows, from receiving undesirable audio content.

To send a call signal is simple: just enable either or both of the talk buttons and simultaneously press and hold the call button. When call sending is active, the orange LED associated with the call button will light. At the same time, the channel or channels that are active in their talk mode will have their associated orange LED flash. Release the talk button and/or the call button and the sending of a call signal will cease. As expected, pressing the call button when neither talk channel is active will result in nothing occurring.

Whenever a Model 370A audio input channel receives a call signal (20 kHz audio tone) the orange LED on its companion talk button will first flash and then light continually. If a call signal is present on both audio input channels, the orange LEDs on both talk buttons will first flash then remain lit. When receiving a call signal on either or both audio input channels, the orange LED associated with the call button will not light.

By using a 20 kHz tone for call signaling, the Model 370A is compatible with legacy intercom equipment, including the venerable RTS BP-325. When interconnecting Model 370A and BP-325 units using an appropriate Dante-enabled interface, such as the Studio Technologies Model 545DR Intercom Interface, call signaling is fully compatible. Compatibility with the Clear-Com method of call functionality is also possible by using the Model 545DC Intercom Interface. (It converts the DC call signal associated with pin 3 of a Clear-Com party-line circuit to a 20 kHz tone.) Also, devices such as the Studio Technologies Model 544D Audio Interface will send and receive 20 kHz signals that are compatible with the Model 370A. The Model 544D converts its GPI (general-purpose input) signals to 20 kHz tones and sums them with the audio signals which are then transported "in band" via the Dante audio paths. Audio signals received by the Model 544D will be monitored for the presence of 20 kHz call signals. If call signals are detected, the GPO (general-purpose output) signals will activate.

How to Identify a Specific Model 370A

The Dante Controller software application offers an *Identify* command that can be used to help locate a specific Model 370A. When *Identify* is selected, it will send a command to a single Model 370A unit. On that specific unit the three pushbutton LEDs (talk 1, talk 2, and call) will light in a unique pattern. In addition, the SYS and SYNC status LEDs, located directly below the etherCON RJ45 jack on the bottom panel, will slowly flash green. After a few seconds the LED identification pattern will cease and normal Model 370A 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.

Mic Kill Function

The Model 370A 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 both talk channels on a specific Model 370A 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 channel and then go "off headset,"

forgetting that they've left that talk channel enabled. While they take a break or go to lunch, all other users are forced to listen to that channel which may include 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 recognized. 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 a specific Model 370A is identified using the *Identify* command within Dante Controller or STcontroller any enabled talk channel will be forced to its disabled state. If the *Global Kill Command* method is enabled, the Model 370A will respond to any such request and force all talk channels to their disabled state.

Technical Notes

IP Address Assignment

By default, the Model 370A'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 (AutoIP or APIPA). 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 370A uses the Ultimo chip and, as such, a direct one-to-one interconnection to another Model 370A (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, which an Ethernet switch provides. While this is certainly an anomaly, since PoE power is required for Model 370A operation, it's highly unlikely that an application would use two Model 370A units without a PoE-enabled Ethernet switch being present.

Using the Dante Controller software application, the Model 370A'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 automatically assign an address, if fixed addressing is necessary then this capability is available. 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 370A'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 370A. 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, be certain to 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

A selection in the STcontroller software application allows the Model 370A's application firmware version to be identified. Connect the Model 370A 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 370A 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 as 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 370A'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 receptacle. The Model 370A implements a USB host function that directly supports connection of a USB flash drive. The Model 370A's MCU updates its application firmware using a file named **M370A.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 **M370A.bin**. Studio Technologies will supply the application firmware file inside a .zip archive file. While the application firmware file inside the zip file will adhere to the naming convention required by the Model 370A, the name of the zip file itself will include the file's version number. For example, a file named **M370Av2.1MCU.zip** would indicate that version 2.1 of the application firmware (**M370A.bin**) is contained within this zip file.

Once the USB flash drive is inserted into the USB receptacle, 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 be loaded into the processor's flash memory. The precise steps required will be highlighted in the next paragraphs.

To update the application firmware file follow these steps:

1. Disconnect power from the Model 370A. This will entail removing the Ethernet connection that is providing PoE power.
2. Remove the cover from the Model 370A. Begin by removing the four Phillips-head machine screws (#1 screwdriver 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 receptacle on the main circuit board. It's near the call button. Insert the prepared USB flash drive into it.
4. Apply power to the Model 370A by connecting to a Power over Ethernet (PoE) Ethernet source.
5. After a few seconds the Model 370A will run a boot-loader program that will automatically load and save the new application firmware file (**M370A.bin**). This will take only a few seconds. During this time period, the call button's LED will flash slowly in alternating colors. Once the entire process is over, taking approximately 10 seconds, the Model 370A will restart using the newly saved application firmware.
6. At this time, the Model 370A is operating under the newly saved application firmware and the USB flash drive can be removed. 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 call button, applying PoE power to the Model 370A, and then reading the application firmware version number by first observing the channel 1 talk button's LED and then observing the channel 2 talk button's LED. Alternatively, 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 reattach the cover using the four machine screws.

Note that if power is being applied to the Model 370A while a connected USB flash drive doesn't contain the correct file (**M370A.bin**) in its root folder, no harm will occur. If the correct file is not present upon power up, the call button's LED will flash on and off rapidly for a few seconds to indicate this error condition, then normal operation using the unit's existing application firmware will begin.

Ultimo Firmware Update

As previously discussed, the Model 370A implements Dante connectivity using the 2-input/2-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.) Ultimo's firmware can be updated by way of the Model 370A'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 Ultimo's firmware. The Dante Controller software application also includes an automated method of updating Ultimo firmware. It offers a much simpler method of keeping the Ultimo firmware current.

Model 370A versus Model 370

Some users may be interested in the differences between the original Model 370 Intercom Beltpack and the newer Model 370A that are 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 370A are performed using the STcontroller software application. STcontroller also allows the version numbers of the Model 370A's application firmware (embedded software) and Ultimo firmware to be remotely identified.
- Support for electret microphones was added to the Model 370A. This involved adding a 5 volt DC power source to the microphone input circuitry. This power source 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 on the Model 370 is not present on the Model 370A. 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 370 is not present on the Model 370A. In the Model 370A the level of the sidetone function is configured using STcontroller.
- The Model 370A 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.

Belt Clip

The belt clip is attached to the back of the Model 370A's enclosure by way of two 6-32 thread, Phillips-head machine screws. Unlike the original Model 370 Intercom Beltpack units, the belt clip on the Model 370A will never have to be rotated as part of the configuration process. (There are no configuration DIP switches under the belt clip.) If the belt clip does need to be replaced, a #1 Phillips-head screwdriver would be the correct tool to remove the machine screws.

Restoring Factory Defaults

A command in the STcontroller software application allows the Model 370A's configuration to be reset to the factory default values. From STcontroller, select the Model 370A 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 370A'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

AES67-2013 Support: yes

Dante Domain Manager (DDM) Support: yes

Bit Depth: up to 24

Sample Rate: 48 kHz

Number of Transmitter (Output) Channels: 2

Number of Receiver (Input) Channels: 2

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 GbE Ethernet not supported)

Audio Channels: 2 talk, 2 listen

Microphone Input:

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

Type: unbalanced

Electret Microphone Power: 3.3 volts DC via 2.00 k ohms 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%

Noise Floor: –95 dBFS (A-weighted)

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:

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

Call Send Level: –20 dBFS

Call Receive Level: –27 dBFS minimum

Connectors:

Headset: 5-pin female XLR

Ethernet: Neutrik NE8FBH etherCON RJ45 jack

USB: Type-A receptacle (located inside Model 370A'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: 5 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 Options: intended for portable applications; contains integral belt clip; optional MBK-01 Mounting Bracket Kit allows Model 370A 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 Configuration Values

STcontroller default Model 370A 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

Sidetone – Level: Medium

Button Operation – Channels 1 and 2: Push to Talk/Tap to Latch

System – Mic Kill: Global Kill Command