

Model 342 Intercom Station

User Guide

Issue 1, November 2022

This User Guide is applicable for serial numbers M342-00151 and later with main firmware version 1.00 and later and STcontroller application version 3.08.00 and later.

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Revision History

Issue 1, November 2022:

- Initial release.

Introduction

The Model 342 Intercom Station is a compact, desktop device that supports two channels of talk and listen. The unit begins with the features offered by traditional analog party-line (PL) 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 342 Intercom Station units and other compatible Studio Technologies' products can be used to create party-line intercom applications with help from an external Dante-enabled audio matrix such as the Studio Technologies' Model 5421 or Model 5422A Dante Intercom Audio Engines. Alternatively, Model 342 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 power, microphone preamplifier gain, talk button operation, status LED action and intensity, sidetone operation, and headphone channel assignment. Hardware features include dual-channel (stereo) headphone output, dual headset connectors, integrated sidetone, call signal receive display, and remote mic kill ("talk off"). The range of capabilities, along with the excellent audio quality supported by the digital audio path, offers a unique and powerful user experience.

Setting up and configuring a Model 342 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. The unit is compatible with both broadcast and "gaming" headsets. A "professional" broadcast or intercom-style headset with a dynamic or electret (DC-powered) microphone can be interfaced with a Model 342 using a 5-pin XLR connector. The Model 342 also directly supports connection of earbuds or gaming headsets that utilize a 3.5 mm 4-conductor (TRRS) CTIA-compliant plug. These moderately priced devices, commonly associated with mobile phones or personal computers, are often of high quality and may be the preferred headset for some applications. With the Model 342's moderate price and ability to support a broad range of headsets, the overall cost of deploying a high-performance intercom system can often meet budget goals.

The STcontroller software application is used to select the Model 342's operating parameters. Versions are available, free of charge, that support the Windows® and macOS® operating systems. The two LED-illuminated talk push-button switches can be independently configured for optimal operation. Two "push-in/push-out" ("pop-out") rotary controls make it easy to set and maintain the desired head-



Figure 1. Model 342 Intercom Station front and back views

phone output level. The Model 342's compact enclosure is made from steel which offers both stability and ruggedness.

The audio quality of the Model 342 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 education and commercial theater, sports and entertainment TV and radio events, streaming broadcasts, house-of-worship, corporate and government AV, post production, and aerospace.

Dante Audio-over-Ethernet

Audio data is sent to and received from the Model 342 using the Dante audio-over-Ethernet media networking technology. As a Dante-compliant device, the Model 342's two Dante transmitter (output) and two Dante receiver (input) channels will be routed (subscribed) with other devices using the Dante Controller software application. The digital audio's bit depth is up to 24 with a sampling rate of 48 kHz. The Model 342 is AES67-compliant and is compatible with the Dante Domain Manager™ (DDM) software application.

Dual-color LEDs provide status indications of the Dante interface. The Dante Identify command can take on a unique role with the Model 342. Not only can it cause the two talk pushbutton switches to light orange in a highly visible sequence, it can be configured to turn off (“kill”) the talk functions if either or both are active.

Audio Quality

The Model 342 offers “pro” audio performance that is not found in typical party-line (PL) intercom devices. 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 as required. 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 342’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 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.

Call Receive Function

A call receive function allows Model 342 users to be provided with a visual indication that a call signal is active on a Dante receiver (input) channels. The cadence of the visual indication can be configured to meet an application’s needs. Using 20 kHz tones, the call signals are sent within the Dante audio channels (“in band”) allowing interoperability between multiple Studio Technologies’ belt-pack 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 342 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 342 by way of an Ethernet network connection. Configurable parameters include microphone power and preamplifier gain, headphone monitoring, sidetone operation, call receive cadence, and talk button operation.

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 five choices. These choices allow compatibility with the variety of microphones that are part of broadcast, intercom, and computer gaming headsets.

To support optimum user performance, the Model 342’s two talk pushbutton switches can be independently configured from among four choices: Push to Talk, Latching, Push to Talk/Tap to Latch, or Disabled. Two audio channels arrive via Dante receiver (input) channels 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, dual-channel monaural, and single-channel monaural.

Ethernet Data and PoE

The Model 342 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, located on the unit’s back panel, displays the status of the network connection.

The Model 342’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 an associated data network. To support PoE power management, the Model 342’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 342 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 standard USB flash drive. The Model 342 uses the UltimoX2™ integrated circuit from Audinate to implement its Dante interface. The firmware in this integrated circuit can be updated via the Ethernet connection, helping to ensure that its capabilities remain up to date.

Getting Started

What's Included

Included in the shipping carton are a Model 342 Intercom Station and information 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 may be made using the three connectors located on the back of the Model 342'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. Alternately, a headset with a 3.5 mm 4-conductor TRRS plug can be used. (The headset's plug needs to follow the CTIA™/AHJ configuration standard.)

Ethernet Connection with PoE

A 100BASE-TX Ethernet connection that supports Power-over-Ethernet (PoE) is required for Model 342 operation. This one connection will provide both the Ethernet data interface and power for the Model 342's circuitry. A 10BASE-T connection is not sufficient. A 1000BASE-T (GigE) connection is not supported unless it can automatically "fall back" to 100BASE-TX operation. The Model 342 supports Ethernet switch power management, enumerating itself as a PoE class 1 device. Any PoE 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. (This is applicable for all Dante-compatible products.)

The Ethernet connection is made by way of an etherCON RJ45 jack that is located on the Model 342's back panel. This allows connection by way of a RJ45 plug that's part of a typical Ethernet "patch cable." Alternately, a twisted-pair data cable terminated with an etherCON plug can be utilized. A crossover cable will never be required as the Model 342's Ethernet interface supports auto MDI/MDI-X. The maximum cable distance is 100-meters (325-feet) for twisted-pair Ethernet cabling.

Headset Connections

The Model 342 allows two different types of headsets to be connected. A 5-pin female XLR connector is provided on the unit's back panel to support connection of a "professional" broadcast- or intercom-style communications headset.

A 3.5 mm 4-conductor TRRS jack allows a computer gaming headset to be directly connected. The Model 342's two headset connectors are electrically wired in parallel. As such, only one type of headset should be connected at one time.

Headset A

The Model 342 provides a 5-pin female XLR connector that interfaces with the microphone and headphone connections of a single- or dual-ear intercom- or broadcast-style headset. The connector is labeled Headset A. 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 342's mic in –/shield 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 in a later section, can then be used to create the desired monaural output. It's important not to connect together (short) pins 4 and 5 of the headset's connector as damage to the Model 342's output circuitry could result.

A monaural (single-earpiece or "single muff") headset should be wired such that its headphone is wired only to pin 4; pin 5 should be remain unused. Configuration choices, discussed in a later section, can be used to create a single-channel monaural output.

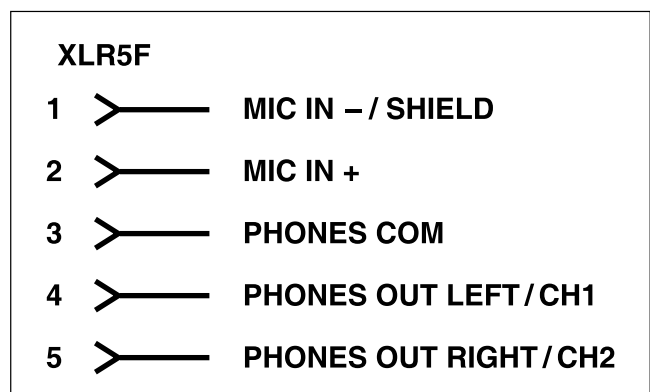


Figure 2. Headset A connection pinout chart

It's possible that some beyerdynamic headset interconnecting cable assemblies terminate the earpiece's left and right connections opposite from what the Model 342 and other broadcast equipment require. These cables may terminate the left earpiece to pin 5 of a 5-pin male XLR connector and the right earpiece to pin 4. If this condition is present, it will require reversing or "flipping" the two wires in the headset's connector such that the left earpiece connects to pin 4 and the right earpiece to pin 5.

If a separate microphone and pair of headphones need to be connected then an adapter cable assembly should be fabricated. It would consist of a 5-pin male XLR connector wired to both a 3-pin female XLR connector for the microphone and a 1/4-inch or 3.5 mm TRS jack for the headphones. In this scenario, the microphone would, in most cases, be a dynamic type as the Model 342 provides only low-voltage DC "electret" power. Most hand-held or "stick" microphones are dynamic and should function correctly. But phantom-powered (P12 or P48) microphones would not be compatible.

Headset B

The Model 342 also allows direct connection of gaming headsets that are ubiquitous in the personal computer world. The 3.5 mm 4-conductor (TRRS) jack, labeled Headset B, is compatible with the CTIA/AHJ configuration standard which has the headphone left channel on the tip connection, the headphone right channel on the ring 1 connection, common on the ring 2 connection, and the microphone on the sleeve connection. Compatible headsets are readily available, typically described as "personal computer" or "gaming" headsets. The microphones used in these headsets are electret type which require a low-voltage DC source for operation. The Model 342 is able to provide this power and requires only that the appropriate setting in STcontroller be selected. Refer to Figure 3 for a detailed description of the compatible 3.5 mm plug.

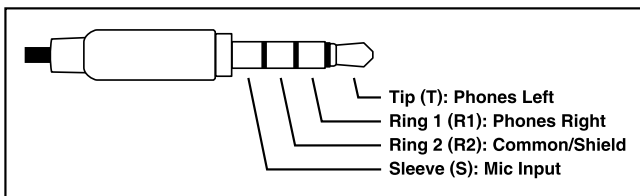


Figure 3. Headset B (TRRS) connection pinout chart

Dante Configuration

For audio to pass to and from the Model 342 requires that several Dante-related parameters be configured. These configuration settings will be stored in non-volatile memory within the Model 342's circuitry. Configuration will typically be done with the Dante Controller software application, available for download free of charge at audinate.com. Versions of Dante Controller are available to support various personal computer operating systems. The Model 342 uses the UltimoX2 2-input/2-output integrated circuit to implement its Dante interface. The unit is compatible with the Dante Domain Manager (DDM) software application.

Audio Routing

The two Dante receiver (input) channels associated with the Model 342 need to be routed (subscribed) to Dante transmitter (output) channels on associated equipment. Configuration settings in the STcontroller software application allow these two audio sources to be sent to the Model 342's 2-channel headphone output. The Model 342's two Dante transmitter (output) channels must be routed (subscribed) to Dante receiver (input) channels on associated equipment. This achieves routing the Model 342'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 channel or flow (a group of up to four output channels) to a receiver channel or flow (a group of up to four input channels). The number of transmitter flows associated with an UltimoX2 integrated circuit is limited to two. These can either be unicast, multicast, or a combination of the two. If the Model 342's 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.

Unit and Channel Names

The Model 342 has a default Dante device name of **ST-M342-** followed by a unique suffix. The suffix identifies the specific Model 342 that is being configured. The suffix's actual alpha and/or numeric characters relate to the MAC address of the unit's UltimoX2 integrated circuit. The Dante transmitter (output) channels have the 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.

Device Configuration

The Model 342 only supports an audio sample rate of 48 kHz with no pull-up/pull-down values available. The audio encoding is fixed for PCM 24. Device Latency and Clocking can be adjusted if required but the default value is typically correct.

Network Configuration – IP Address

By default, the Model 342's Dante IP address and related network parameters will be determined automatically using DHCP or, if not available, the link-local network protocol. If desired, Dante Controller allows the IP address and related network parameters to be manually set to 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. In this case, it's highly recommended that a 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 342's IP address has been misplaced there is no reset button or other method to easily restore the unit to a default IP setting.

AES67 Configuration – AES67 Mode

The Model 342 can be configured for AES67 operation. This requires the AES67 Mode to be set for Enabled. By default, AES67 mode is set for Disabled. Note that in the AES67 mode the Dante transmitter (output) channels will function in multicast; unicast is not supported.

Model 342 Clocking Source

While technically the Model 342 can serve as a Leader clock for a Dante network (as can all Dante-enabled devices) in virtually all cases the unit will be configured to receive "sync" from another device. As such, the check box for Preferred Leader associated with the Model 342 would not be enabled.

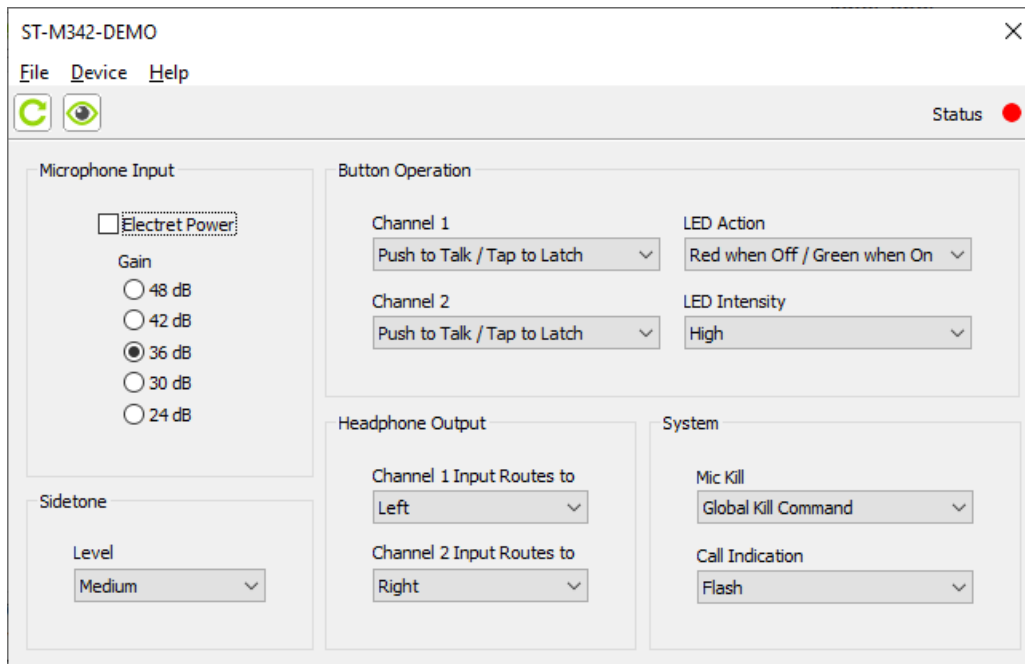
Model 342 Configuration

The STcontroller software application is used to configure the way in which the Model 342 functions. 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 on a personal computer that's connected to the related LAN.

Installing STcontroller

STcontroller is available, free of charge, on the Studio Technologies' website (studio-tech.com). Versions are available that are compatible with personal computers running selected versions of the Windows and macOS operating systems. If required, 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 342 units that are to be configured. Immediately after starting STcontroller the application will locate all the Studio Technologies' devices that it can control. The one or more Model 342 units to be configured will appear in the device list. Use the Identify command to allow easy recognition of a specific Model 342 unit. Double-clicking on a device name will cause the associated configuration menu to appear. Review the current configuration and make any changes that are desired.

Changes made using STcontroller will be immediately reflected in the unit's operation; no Model 342 reboot is required. Each time a change is made the two talk pushbutton switches, located on the Model 342's front panel, will flash orange to indicate that a command from STcontroller has been received.



Microphone Input – Electret Power

Choices are *Enabled* or *Not Enabled* (box checked or not).

Enable the Electret Power check box if the connected headset has an electret microphone that requires a source of low-voltage DC power for operation. The electret power on/off status is displayed by way of a red LED, labeled MIC PWR, that is located on the back of the Model 342's enclosure adjacent to the headset connector. Whenever the PWR LED is lit, 3.3 volts DC is being provided to the headset connectors.

In virtually all cases, gaming or computer headsets that use a 3.5 mm TRRS plug will require microphone power. If the associated headset has a dynamic (non-powered) microphone do not enable the Electret Power check box. Most broadcast headsets that terminate on 5-pin male XLR connectors will not require microphone power.

Note that the Model 342 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 *24 dB*, *30 dB*, *36 dB*, *42 dB*, and *48 dB*.

Electret microphones typically have a relatively high output level due to their internal preamplifier circuitry. As such, a moderate amount of preamplifier gain may be required. Selecting the 24 dB or 30 dB gain setting will probably be appropriate in these cases.

Dynamic microphones have an output level that is typically lower than that provided by electret microphones. As such, the 36 dB, 42 dB, or 48 dB gain settings will, in many cases, be appropriate for them. The 42 dB gain setting is often a good starting point. The 36 dB choice may be correct should a connected dynamic microphone have a high sensitivity (high output level for a given acoustical input) or is associated with an enthusiastic user that routinely talks loudly into the microphone. Setting the gain for 48 dB may be helpful in some applications, such as with headsets that have a dynamic microphone with a low output level. The 48 dB gain setting may also be useful when the Model 342 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.

The compressor active LED, labeled COMP and visible on the unit’s back panel adjacent to the HEADSET A 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 COMP 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 24 dB might be warranted.

Button Operation – Channel 1

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

This configuration allows how the Talk 1 pushbutton switch will function. Four modes are available.

Push to Talk: When this mode is selected, the operation is self-explanatory. Only when the Talk 1 button is pressed and held will talk audio be sent out the associated Dante transmitter (output) channel.

Latching: When this mode is selected, tapping (momentarily pressing) the Talk 1 button will cause the function to “latch” into the talk active mode. Tapping the button again will cause the function to “unlatch” and Talk 1 will no longer be active.

Push to Talk/Tap to Latch: When this mode is selected, a “hybrid” function of sorts is enabled. Pressing and holding the talk button will enable audio to be connected to the associated Dante transmitter (output) channel. When the button is released, audio will stop being sent to the 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.

Disabled: Selecting this mode causes the Talk 1 function to never connect audio to the associated Dante transmitter (output) channel.

Many applications will be best served when the button is configured for the *Push to Talk* mode. This ensures that the channel can’t accidentally be left in its talk active condition. However, there are certainly valid situations when the *Latching* mode or *Push to Talk/Tap to Latch* mode settings will prove to be very useful. Selecting the *Disabled* mode could be useful if a “listen-only” channel is desired.

Button Operation – Channel 2

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

This configuration determines how the Talk 2 pushbutton switch will function. Four modes are available. The manner in which these modes function is identical to those for the Talk 1 pushbutton switch. Details were provided in the previous section.

Button Operation – LED Action

Choices are *Red when Off/Green when On* and *Unlit when Off/Green when On*.

The action of the red and green LED indicators associated with the two talk pushbutton switches can be configured. (There are two red and two green LEDs in each of the pushbutton switches.) The action of the LEDs in the talk pushbutton switches are configured as a group, all acting in the same manner. The second choice was specifically provided to support users who have limitations in their ability to discern between two colors (“color blindness”).

Red when Off/Green when On: The LEDs in both of the talk pushbutton switches will light red when its associated function is off (not active). The LEDs in each pushbutton switch will light green when its associated function is on (active).

Unlit when Off/Green when On: The LEDs in both of the talk pushbutton switches will not light when its associated function is off (not active). The LEDs in each pushbutton switch will light green when its associated function is on (active).

Button Operation – LED Intensity

Choices are *High* and *Low*.

The two pushbutton switches have LED indicators associated with them. The LED intensity configuration choice allows the overall intensity of these LEDs to be selected. Deciding which choice, *High* or *Low*, is optimal will typically depend on the amount of ambient light that is present in the area where the Model 342 located.

Headphone Output – Channel Routing

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

Two Dante transmitter (output) channels can be assigned to the Model 342's two Dante receiver (input) channels using the Dante Controller application. How these two audio signals, called 1 and 2, are routed to the Model 342's left and right headphone output channels can be independently configured. For flexibility, each input source has three routing options. They can be configured for sending only to the left channel, only to the right channel, or sending to both the left and right headphone output channels.

In some applications, stereo or what might be called split-mono operation will be desired. In this case, input channel 1 might be routed to the left headphone output while input channel 2 might be routed to the right headphone output. When using a stereo or dual-ear headset, routing input 1 and input 2 to both headphone output channels is often referred to as creating a dual-channel monaural output. If a monaural ("single muff") headset is used the Left configuration option allows both input channel 1 and input channel 2 to be combined to monaural and sent out only the left headphone output channel.

Sidetone – Level

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

The Model 342 includes a sidetone function that allows microphone audio coming from the microphone pre-amplifier and associated compressor circuit to be sent to the headphone output. This serves as a user confirmation that they are actively sending audio out one or both of the intercom output channels. To clarify, sidetone audio will only be routed to the headphone output when either or both of the talk channels is active.

If Dante input signals are routed to both the left and right headphone output channels then sidetone audio will be sent to both the left and right headphone output channels. If the input channels are routed only to the left headphone output channel then sidetone audio will also only be sent to the left headphone output channel. (This protects the right headphone output channel should it be connected to common due to a wiring abnormality.)

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 in the unlikely situation where user talk audio is returned as part of their listen audio signals. It can also find use in special applications such as during troubleshooting. The two rotary level controls associated with the intercom listen channels will not impact the sidetone level.

System – Mic Kill

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

The mic (microphone) kill function allows a network-provided message to automatically disable either or both of the talk channels if they are "latched" on. Specifically, it's possible to remotely change an active (on) talk channel to its off state. This function is also sometimes referred to as a "talk off" function. There are two means available to remotely disable either or both active talk channels. The *Device ID* method uses the identification command generated by the Dante Controller or STcontroller applications as a means to disable an active talk channel. The *Global Kill Command* method uses the Studio Technologies' Global Mic Kill command that is available from a menu choice in the STcontroller software application. This will cause all Studio Technologies' units that are configured to follow this command to respond by turning off any active channels. Either mic kill method can be selected to function individually or both can be selected to be recognized. Selecting *Off* simply means that no remote mic kill method is supported.

System – Call Indication

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

The Call Indication configuration allows the manner in which the two talk pushbutton switches will light when a call signal is detected on their respective Dante receiver (input) channel. Technically, a call is detected as being 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.

Off: When this mode is selected and a call signal is detected in a Dante receiver (input) channel, then the LEDs in the associated pushbutton switch will not light.

Flash: In this mode, the LED in a pushbutton switch 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 LED in the button will flash alternately green and orange. (Green indicates that the talk function is active and orange indicates that a call signal is being detected.)

Solid: When this mode is selected, the LED in a pushbutton switch 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.

Flash then Solid: In this mode, the LED in a pushbutton switch will first flash orange (or green and orange) for a few seconds and then light solid orange, remaining lit orange until the call signal is no longer present.

Operation

At this point, everything should be ready and Model 342 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 may be plugged into the Headset A connector. Alternately, a gaming or computer-type headset will be connected to Headset B using a 3.5 mm 4-conductor TRRS plug.

The Model 342's Dante configuration settings should have been selected using the Dante Controller software application. In this way, the Model 342's two Dante transmitter (output) channels and two Dante receiver (input) channels should have been routed, by way of Dante subscriptions, to the receiver and transmitter channels on associated Dante-enabled equipment. Using the Studio Technologies' STcontroller software application, the unit's configuration should have been selected to meet the needs of the specific application.

Initial Operation

The Model 342 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 back panel below the etherCON RJ45 receptacle, will begin to light as network and Dante connections are established. The compressor active LED might somewhat randomly flash for a brief period. The green and orange LEDs that illuminate the talk pushbutton switches will light as part of a short test sequence to indicate that the application firmware (embedded software) has started. The mic power LED will also light for a short interval to indicate that it is functioning. Once the test 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 342's back 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 342 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 342 is not synchronized with a Dante network. It will light solid green when the Model 342 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 342 is serving as the Leader clock for the network of Dante devices. (Typically, the Model 342 should not be serving as the Leader clock!) 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 back panel adjacent to the Headset A connector. Labeled COMP, the LED displays the status of the microphone preamplifier 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 connected 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 a talk channel is active.

Headphone Output

Two rotary potentiometers ("pots"), located on the Model 342's front 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 342'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 or off status of a talk channel does not impact the headphone output.

Button Operation

Two pushbutton switches are associated with the Model 342's two talk channels. How the switches function will depend on the configuration of the unit.

Push to Talk: When a button has been configured for the *Push to Talk* mode how it functions should be self-explanatory. Press and hold the button when headset microphone audio is to be sent out its associated Dante transmitter (output) audio channel. The button's green LED will light to indicate that the output is active. Depending on the unit's configuration, the button will either be red or not lit when the function is not active.

Latching: If a button has been configured for *Latching* mode operation momentarily pressing ("tapping") it will cause the function to change states: off-to-on or on-to-off. Whenever the talk function is active the button LED will light green. Depending on the unit's configuration, the button will either be red or not 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 it is a bit different and certainly more flexible. Press and hold the button to activate the associated 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 associated talk function is active the pushbutton will light green. Depending on the unit's configuration, the button will either be red or not lit when the function is not active.

Disabled: A button that is configured to the *Disabled* mode will not allow talk audio to be sent to its associated Dante transmitter (output) channel. To provide "feedback" that the button has been pressed the button's red 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 342's sidetone function can send microphone audio to the headphone output whenever either or both of the talk functions are active. The quality of the sidetone audio should be excellent and will provide Model 342 users with a confidence signal that they are actively talking to other intercom users. Sidetone audio will typically be sent to both the left and right headphone output channels. This is because the function is trying to simulate what a user would hear if they didn't have a headset covering both their ears. An exception is if both Dante receiver (input) channels are routed only to the left headphone output channel. In this case, sidetone audio will only be sent to the left headphone output channel.

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 342 unit; the buttons or headphone level controls on the front panel of the unit do not impact the sidetone level.

In most cases, the exact sidetone level setting is not critical and users will not be concerned about revising it. 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 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 Medium sidetone configuration should provide an appropriate level.

Call Detection Display

A Model 342 function allows a call signal that's present on either Dante receiver (input) channel to cause its associated pushbutton switch's LED to light. Whenever a Dante receiver (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 both buttons. 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.

Technically, a call signal is achieved by sending a 20 kHz audio tone on the desired Dante audio channel. This signal is summed (mixed) with normal talk audio. The Model 342's two audio input channels continually monitor the audio input for the presence of 20 kHz.

The detection circuitry will not confuse normal talk audio signals with a call signal. Digital filters within the Model 342's processor integrated circuit help to ensure that false call detection won't take place. Digital filtering is also performed on the microphone audio output signals as well as the Dante receiver (input) channels 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. By using a 20 kHz tone for call signaling the Model 342 is compatible with legacy intercom equipment, including the venerable RTS BP-325 beltpack. When interconnecting Model 342 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, Model 5304 Intercom Station, and Model 348 Intercom Station will send and receive 20 kHz signals that are compatible with the Model 342. 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.

How to Identify a Specific Model 342

Both the Dante Controller and STcontroller software applications offer a command that can be used to help locate a specific Model 342. When the Identify command is selected it will send a message to a single Model 342 unit. On that specific unit the LEDs in the two pushbutton switches will rapidly flash orange. In addition, the SYS and SYNC status LEDs, located directly below the etherCON RJ45 receptacle on the back panel, will slowly flash green. After a few seconds, the LED identification pattern will cease and normal Model 342 button LED and Dante status LED operation will resume.

Mic Kill Support

The Model 342 includes a mic kill function, allowing either or both talk pushbutton switches, if placed in their enabled (on) state, to be remotely forced to their disabled (off) state. This function is sometimes referred to as a "talk off" function. Two actions can enable the mic kill function. Any time a Model 342 receives a Dante Identify command it can cause both an LED pattern to start as well as enabling the mic kill function. The second "trigger" method uses the Studio Technologies' Global Mic Kill command. This command can be activated from a menu choice in the STcontroller software application.

The reason for the Model 342 to offer a mic kill function is simple. It's common in intercom applications for users to enable ("latch on") a talk channel and then go "off headset," forgetting that they've left one or more 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. This makes having the ability to disable talk channels very useful. The Dante Identify command allows a "latched on" talk channel on a specific Model 342 to be remotely disabled. Alternately, by using the Global Mic Kill command a large group of units can simultaneously have their talk channels disabled. This would include any Studio Technologies' compatible device that follows this protocol.

Technical Notes

IP Address Assignment

By default, the Model 342's Ethernet interface will attempt to automatically obtain an IP address and associated settings using 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 (PIPPA). 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 cord should, 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 342 uses the UltimoX2 "chip" and, as such, a direct one-to-one interconnection with another Ultimo-based product is not supported. An Ethernet switch that links Ultimo-based units is required to successfully interconnect them. The technical reason that a switch is required relates to the need for a slight latency (delay) in the data flow and utilizing an Ethernet switch in the application deployment will provide this.

Using the Dante Controller software application, the Model 342's IP address and related network parameters can be 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. In this case, it's highly recommended that every 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 342'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 operating systems 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 342. 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 QoS capability is recommended. In applications that utilize multicast Ethernet traffic, enabling IGMP snooping can be valuable (as long as PTP v1 is also supported). This protocol 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.

Application Firmware Version Display

A selection in the STcontroller software application allows the Model 342’s application firmware version to be identified. This can be useful when working with factory personnel on application support and troubleshooting. To identify the firmware version, begin by connecting the Model 342 unit to the local area network (via Ethernet with PoE) and wait until the unit starts to function. Then, using STcontroller, review the list of identified devices and select the specific Model 342 for which you want to determine its application firmware version. Then within STcontroller select **Version and Information** under the **Device** tab. A page will display that will provide lots of useful information. This includes the application firmware version as well as details on the Dante interface firmware.

Application Firmware Update Procedure

It’s possible that updated versions of the application firmware (embedded software) that is utilized by the Model 342’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 its MCU’s non-volatile flash memory by way of a USB interface. The Model 342 implements a USB host function that directly supports connection of a USB flash drive. The Model 342’s MCU updates its application firmware using a file named **M342vXrXX.stm**, where “XrXX” represents the revision level contained within the file.

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. The USB interface in the Model 342 is compatible with USB 2.0-, USB 3.0-, and USB 3.1-compliant flash drives. Save the new application firmware file in the root directory of the flash drive with a name of **M342vXrXX.stm**. Studio Technologies will supply the application firmware file inside a .zip archive file. The name of the zip file will reflect the application file’s version number and will contain two files. One file will be the actual application file and the other a readme (.txt) text file. It’s recommended that the readme (.txt) file be reviewed as it will contain details about the associated application firmware. The application firmware file inside of the zip file will adhere to the required naming convention. For example, a zip file named **M342v1r00MCU.zip** would indicate that version 1.00 of the application firmware (**M342v1r00.stm**) is contained within it.

A USB Type A receptacle and associated LED are located on the main circuit board. The unit’s cover must be removed to access the USB connector. Once a USB flash drive is correctly prepared, insert it into the USB receptacle. Then 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 following paragraphs.

To install the application firmware file, follow these steps:

1. Disconnect power from the Model 342. This will entail removing the Ethernet connection that is providing PoE power.
2. Remove the cover from the Model 342. Begin by using a Phillips-head screw driver with a #1 tip to remove six machine screws, two on the top edge of the back panel, one on each side, and two on the front edge of the bottom surface. Be certain to save the screws so that re-assembly will be fast and painless. Then carefully slide the cover forward, rotating it forward 180 degrees once it has cleared away from the two rotary level controls. Be very careful not to kink or damage the small ribbon interconnecting cable.
3. Locate the USB connector on the main circuit board. It’s near the front, between the two level controls. Insert the prepared USB flash drive into the USB connector.
4. Apply power to the Model 342 by connecting to a Power-over-Ethernet (PoE) Ethernet source.
5. After a few seconds, the Model 342 will run a “boot loader” program that will automatically load the new application firmware file (**M342vXrXX.stm**). This will take only a few seconds. During this time period the green LED adjacent to the USB receptacle will flash

slowly. Once the entire process is over, taking approximately 10 seconds, the Model 342 will restart using the newly loaded application firmware.

6. At this time, the Model 342 is functioning with the newly loaded 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. Using the STcontroller software application, confirm that the desired Model 342 application firmware version has been correctly loaded and saved.
8. Once the update process has been completed reverse the steps and reattach the cover using the six machine screws.

Note that upon power being applied to the Model 342, if the connected USB flash drive doesn't have the correct file (**M342vXrXX.stm**) in its root folder no harm will occur. If the correct file is not present upon power up the USB LED will flash rapidly for a few seconds to indicate this error condition after which normal operation using the unit's existing application firmware will begin.

Ultimo Firmware Update

As previously discussed, the Model 342 implements its Dante connectivity using the UltimoX2 integrated circuit from Audinate. The Dante Controller software application can be used to determine the version of the firmware (embedded software) that resides in this integrated circuit. This firmware can be updated by way of the Model 342's Ethernet port. Performing the update process is easily accomplished using an automated method called Dante Updater that's included as part of the Dante Controller application. This application is available, free of charge, from the Audinate website (audinate.com). The latest Model 342 firmware file, with a name in the form of **M342vXrXrX.dnt**, will be available on the Studio Technologies' website as well as being part of Audinate's product library database. (Note that "XrXrX" will be the actual version number.) By Studio Technologies' including the latest file in Audinate's database it allows the Dante Updater software application to automatically query both the Model 342's Dante interface and the database. If a newer file is found in the database the Model 342's Dante interface can then be easily updated.

Restoring Factory Defaults

A command in the STcontroller software application allows the Model 342's configuration to be reset to the factory default values. From STcontroller select the Model 342 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 342'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, selectable on/off

Dante Domain Manager (DDM) Support: yes

Bit Depth: up to 24

Sample Rate: 48 kHz

Pull-Up//Down Support: no

Dante Transmitter (Output) Channels: 2

Dante Receiver (Input) Channels: 2

Dante Audio Flows: 4; 2 transmitter, 2 receiver

Network Interface:

Type: 100BASE-TX, Fast Ethernet per IEEE 802.3u (10BASE-T and 1000BASE-T (GigE) not support)

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

Compatibility – Headset A: single- or dual-ear broadcast-style with dynamic or electret (low-voltage DC-powered) microphone: pin 1 mic common; pin 2 mic; pin 3 phones common; pin 4 phones left; pin 5 phones right

Compatibility – Headset B: CTIA™/AHJ configuration (typically uses electret powered mic): tip phones left; ring 1 phones right; ring 2 common; sleeve mic

Audio Channels: 1 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 resistor, selectable on/off

Impedance: 1 k ohms, nominal, microphone power off; 690 ohms, nominal, microphone power on

Gain: 24, 30, 36, 42, or 48 dB, selectable, ref. –60 dBu input to Dante output (–20 dBFS nominal)

Frequency Response: 40 Hz to 20 kHz, –3 dB

Distortion (THD+N): <0.02% (at minimum gain)

Dynamic Range: 91 dB of dynamic range

Compressor:

Application: applies to Dante transmitter (output) channel and sidetone audio

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

Slope: 2:1

Status LED: lights when 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: 2.8 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 Receive Function:

Implementation: monitors both Dante receiver (input) channels for presence of call signals

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

Call Receive Level: –27 dBFS minimum

Connectors:

Headset A: 5-pin female XLR

Headset B: 4-conductor (TRRS) 3.5 mm jack, per Japanese standard JEITA/EIAJ RC-5325A

Ethernet: Neutrik NE8FBH etherCON RJ45 jack

USB: type A receptacle (located in side Model 342's enclosure and used only for application firmware updates)

Configuration: uses Studio Technologies' STcontroller personal computer 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):

4.3 inches wide (10.9 cm)

2.1 inches high (5.4 cm)

5.1 inches deep (13.0 cm)

Weight: 1.1 pounds (0.50 kg)

Deployment: intended for tabletop applications

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

Appendix A: STcontroller Default Configuration Values

Microphone Input – Electret Power: Off (select box not checked)

Microphone Input – Gain: 36 dB

Button Operation – Channel 1: Push to Talk/Tap to Latch

Button Operation – Channel 2: Push to Talk/Tap to Latch

Button Operation – LED Action: Red when Off/Green when On

Button Operation – LED Intensity: High

Headphone Output – Channel 1 Input Routes to: Left

Headphone Output – Channel 2 Input Routes to: Right

Sidetone – Level: Medium

System – Mic Kill: Global Kill Command

System – Call Indication: Flash