Model 5312
Intercom Station

User Guide

Issue 1, May 2025

This User Guide is applicable for serial numbers
M5312-00151 and later with Main MCU Firmware v1.04 and later,
Secondary MCU Firmware v1.01 and later, and STcontroller v4.03.15 and later

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Table of Contents

Revision History

Issue 1, May 2025:

- Initial release.

Introduction

The Model 5312 Intercom Station provides 12 independent talk and listen channels that are compatible with Dante® audio-over-Ethernet networks. The rack-mounted unit is designed to serve as an audio control center for production and support personnel in numerous applications including on-air television sports and news broadcasting, live events, theater, industrial, aerospace, and corporate AV. The Model 5312's channels can be part of virtual "party-lines" created with other compatible devices or be used directly in point-to-point intercom implementations. The range of resources makes it simple to use the Model 5312 locally, or as part of a REMI or "At-Home" geographically diverse implementation. In addition to intercom applications, the unit can create multiple independent IFB (talent cue) channels. Other applications may benefit from a Model 5312 user's ability to easily create monitor mixes from the 12 input audio channels. This makes the unit a viable choice for listen-only scenarios.

Over a standard Ethernet network, multiple Model 5312 units can be used in party-line (PL) intercom applications with help from external Dante-enabled audio devices such as the Studio Technologies' Dante Intercom Audio Engines. Model 5312 units can also be used "point-to-point" or interfaced with Dante-compatible matrix intercom systems. The Model 5312 includes two RJ45 jacks which allow interfacing with single or redundant Dante Ethernet networks. The unit features a "universal" AC mains input, allowing a source of 100-240 volts, 50/60 Hz to provide operating power.

The Model 5312 supports connection of a broadcast- or intercom-style headset that incorporates a dynamic or electret (DC powered) microphone. A 5-pin female XLR connector, located on the front panel, allows traditional "pro" headsets to be utilized. In addition, the Studio Technologies' GME-3-12 electret gooseneck microphone can be directly connected using the ¼-inch jack assembly that is also located on the front panel. A low-noise microphone preamplifier and associated voltage-controlled-amplifier (VCA) dynamics controller (compressor) ensures excellent headset and gooseneck microphone audio quality while minimizing the chance of signal overload.

The Model 5312 includes a hot mic Dante transmitter (output) channel, a channel active channel, and four auxiliary Dante receiver (input) channels, with one of the latter able to be used as the unit's talk audio source. These resources were specifically included to allow two Model 5312 units to "work" together to support more than 12 talk channels. A graphics display and pushbutton switches on the unit's front panel allows users to select the active talk audio source. Choices include the headset mic, the gooseneck mic, and an auxiliary Dante receiver (input) channel.

All Model 5312 operating features are configured using the STcontroller software application. An extensive set of parameters allows the unit's functions to be tailored to meet the needs of many applications. STcontroller is available, free of charge, from the Studio Technologies' website. Versions are available that are compatible with the Windows® and macOS® operating systems. STcontroller is a fast and simple means of reviewing, revising, saving, and loading a unit's operating parameters.

Figure 1. Model 5312 Intercom Station front and back views

The Model 5312's front panel includes 13 rotary controls (encoders), 12 of which are used to adjust the level of the Dante receiver (input) signal sources and create a monitor "mix." They are also used to fully mute an input as well as activating a channel "solo" listen function. Using RGB (red-green-blue) LEDs, the knob of each encoder is illuminated and can display if a channel is muted, can indicate if a signal is present on its associated audio input, and can light when an in-band (20 kHz tone) call signal is detected. A graphics display and five pushbutton switches on the Model 5312's front panel allows select operating features to be displayed and configured.

The user can monitor the mix of the Dante receiver (input) channels by means of the headset, a built-in speaker, or two Dante transmitter (output) channels. The 13th rotary encoder, located on the front panel, is used to control the overall audio level and on/off (mute) status of the signals being sent to the headset, speaker, and Dante monitor output channels.

Extensive configuration choices allow the operation of the 12 pushbutton switches and associated Dante transmitter (output) channels to be optimized to meet the needs of an extensive range of specialized applications. They can be independently configured for talk (intercom), IFB (talent cue), call signal (20 kHz tone), and other related actions. Buttons can also be configured to provide an "all-call" action associated with other buttons that are configured for talk or IFB functions.

As previously mentioned, the Model 5312 includes a Dante transmitter (output) channel called Hot MIc. When enabled, this allows an always-active, or an active when a talk channel is active, function associated with the selected talk audio source. The talk audio source will typically be a headset's microphone or a gooseneck microphone. The hot mic output function can be utilized by devices such as monitor loudspeakers, matrix intercom systems, or audio logging equipment.

A tally tone Dante transmitter (output) channel is also provided. This output provides an 18 kHz sine wave signal whenever one or more of the 12 talk button functions is active. This can be utilized by external systems that require a trigger signal for muting a loudspeaker system or to indicate that a audio source associated with the Model 5312 is active.

For performance confirmation the unit provides an integrated sidetone function, allowing audio coming from the active talk audio source to be routed to the headset output. An audible alert, using the internal speaker, can be generated in response to a high-frequency call signal. The Model 5312 includes two remote control inputs, accessible by way of a 3-conductor 3.5 mm TRS jack, which can be configured to mimic the action of two of the talk pushbutton switches.

The Model 5312 is intended for rack (1U) mounting and has overall dimensions of 19.0 inches wide (16.5 cm), 1.72 inches high (4.4 cm), and 5.3 inches deep (13.5 cm). The enclosure is made of aluminum and weighs just 2.4 pounds (1.1 kg). The unit's firmware (embedded software) can be updated using the USB port on the back of the unit; the Dante firmware can be updated via an Ethernet connection.

Ethernet Data

The Model 5312 connects to one or two local area networks (LANs) by way of twisted-pair Ethernet interfaces. The unit's 1000BASE-T Gigabit Ethernet (GbE) interconnections are made by way of two RJ45 jacks. The Ethernet interfaces can be configured, using the Dante Controller software applications, to serve in switched or redundant modes.

Dante Audio-over-Ethernet

Audio data is sent to and received from the Model 5312 using the Dante audio-over-Ethernet media networking technology. As a Dante-compliant device, the Model 5312's 16 Dante transmitter (output) audio channels and 16 Dante receiver (input) audio channels can be assigned (routed or "subscribed") using the Dante Controller software application. The Dante transmitter and receiver channels support 32 Dante flows in each direction. The digital audio's bit depth is up to 32 with a sample rate of 48 kHz.

The Model 5312 is compliant with the AES67 interoperability standard. In addition, it's compatible with the Dante Domain Manager™ (DDM) software application from Audinate®. Bi-color LEDs, located on the unit's back panel, provide status indications of Ethernet network performance.

Audio Quality

The Model 5312's audio performance is completely "pro." A low-noise, wide dynamic-range microphone preamplifier and associated voltage-controlled-amplifier (VCA) dynamics controller (compressor) ensure that headset and gooseneck microphone audio quality is preserved and minimizes the chance of signal overload. The output of the microphone preamp and compressor is routed to an analog-to-digital conversion (ADC) section that supports a sampling rate of 48 kHz. The now-digital talk audio signal routes through a 32-bit microcontroller integrated circuit and on to the Dante interface section where it is packetized and prepared for transport over Ethernet. A total of 16 Dante transmitter (output) channels are provided: one associated with each of the unit's 12 talk channels, two monitor output channels, one hot mic output channel, and one tally tone channel.

Audio input signals arrive via 16 Dante receiver (input) channels and pass into the Model 5312's 32-bit microcontroller. Twelve input channels are associated with the monitor section while the other four serve as auxiliary channels. One or more of these latter channels can be used as program sources for the IFB (talent cue) functions or as a talk audio source. All channel routing, headphone, speaker, and monitor level control, IFB creation, and sidetone functionality are performed within the digital domain. This provides flexibility, allows precise level control, and eliminates the need for analog audio signals from having to pass through electromechanical level controls. The audio signals destined for the headphone outputs and the speaker are sent to high-performance digital-to-analog (DAC) converter circuitry and then on to robust driver circuitry.

Future Capabilities and Firmware Updating

The Model 5312 was designed so that its capabilities and performance can be easily enhanced in the future. A USB receptacle, located on the unit's back panel, allows the application firmware (embedded software) files to be updated using a USB flash drive. The Model 5312 uses the Brooklyn module from Audinate to implement its Dante interface. The firmware in this module can be updated via an Ethernet connection, helping to ensure that its capabilities remain up to date.

Getting Started

In this section, the Model 5312 will be mounted in one space (1U) of an equipment rack. One or two Ethernet data connections will be made using standard RJ45 patch cables. AC mains power will be connected by means of a detachable cord that is compatible with the unit's 3-pin IEC 320 C14 inlet connector. Two contact closures can be connected to the Model 5312's remote control inputs using a 3-conductor 3.5 mm TRS plug.

Many applications will utilize the Studio Technologies' GME-3-12 gooseneck microphone which is attached via the ¼-inch jack located on the front panel. A single- or dual-earpiece intercom- or broadcast-style headset whose cable terminates on a 5-pin male XLR plug can be connected to the 5-pin female XLR connector that's located on the unit's front panel.

What's Included

Included in the shipping carton are a Model 5312 Intercom Station and instructions on how to obtain an electronic copy of this guide. Also included in the shipping carton is an AC mains cord that has a North American standard plug (NEMA 5-15L) on one end and an IEC 320 C13 connector on the other end. For use in destinations outside of North America the local reseller or distributor should provide an appropriate AC mains cord.

Mounting

The Model 5312 requires one space (1U) in a standard 19-inch (48.3 cm) equipment rack. Select a location that is convenient for it to be accessed by the user. Secure the unit into the designated equipment rack using two mounting screws per side.

Connecting One or Two Ethernet Signals

One or two Ethernet connections can be made using standard RJ45 patch cables that are plugged into the connectors labeled PRI and SEC on the back panel of the Model 5312's enclosure. Only one 1000BASE-T Gigabit Ethernet (GbE) connection is required for Model 5312 operation. It would be plugged into the jack labeled PRI. A 100BASE-TX (100 Mb/s) connection may be adequate but would not be optimal. A 10BASE-T (10 Mb/s) connection would not be sufficient.

A second 1000BASE-T Gigabit Ethernet (GbE) connection can be made if Redundant Dante is desired. It would be plugged into the jack labeled SEC. Using the Dante Controller software application, the Model 5312's network configuration must be set for *Redundant* for this functionality to be active.

The Secondary Ethernet interface (SEC) can also be used as a "loop through" connection such as would be provided by an Ethernet switch. This requires that the Model 5312's network configuration be set for *Switched*. Using the secondary (SEC) port in this mode for applications other than troubleshooting is not recommended. It will function reliably but "daisy chaining" Ethernet signals can limit flexibility and present a failure point.

The Model 5312's Ethernet interfaces support auto MDI/MDI-X such that crossover cables are never required. Twisted-pair (UTC) Ethernet, as is utilized by the Model 5312 and many other products, has a 100-meter (325- foot) interconnecting cable limit. But this distance limitation can be overcome using fiber-optic interconnections between the Model 5312 and the Ethernet switch or switches in the one or more associated local-area-networks (LANs). This can be easily accomplished using low-cost twisted-pair-to-fiber adapter products that are readily available.

Connecting AC Mains Power

The Model 5312 operates directly from an AC mains power source of 100 to 240 volts, 50/60 Hz, 30 watts maximum. As a "universal AC mains input" device, there are no switches to set or jumpers to install. A 3-pin IEC 320 C14 inlet connector on the back panel mates with a detachable AC mains cord set. The Model 5312 does not contain a power on/off switch; operation will begin as soon as AC mains power is connected.

Remote Control Inputs

Provision has been made to allow two external switches or contact closures to mimic the operation of one or two of the 12 intercom talk pushbutton switches. The exact functioning of the two remote control inputs is determined by STcontroller configuration settings, details of which are discussed in later sections.

A 3-conductor 3.5 mm TRS jack is located on the Model 5312's back panel and provides access to the two remote control inputs. The input circuitry is "active low," which means that they are enabled whenever they are connected (shorted) to the common connection. Technically, each remote-control input is created with a 3.4 k (3400) ohm resistor connected to +3.3 volts DC that acts as an input "pull up." Additional resistors and capacitors provide ESD protection, minimizing the chance of damage to a remote-control input due to static discharge or other extraneous signals. A current flow of approximately one milliampere is required for a remote-control input to be recognized as active.

Prepare an interconnecting cable and associated 3-conductor 3.5 mm TRS plug to reflect that the tip lead is used by Remote Control Input 1, the ring lead by Remote Control Input 2, and the sleeve lead is the remote control common. Refer to Figure 2 for connection details.

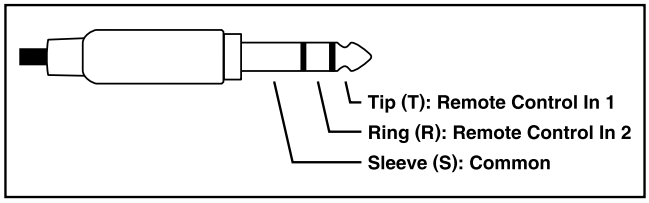


Figure 2. 3-conductor 3.5 mm TRS remote control in pinout diagram

Gooseneck Microphone

A threaded combination bushing/3-conductor 1/4-inch jack is incorporated into the front panel of the Model 5312. This allows direct connection of the Studio Technologies' GME-3-12 Gooseneck Microphone. This unidirectional, electret microphone was designed specifically to maximize performance in intercom and related applications. The RTS/Telex/Bosch MCP 90-series is also directly compatible and will perform well. The two main requirements for a compatible gooseneck microphone are that it contain an electret microphone and its interconnection be in the form of a 3-conductor 1/4-inch plug with integrated threads that have a pitch 7/16-20 UNF.

The 3-conductor 1/4-inch jack associated with the Model 5312's gooseneck bushing has a tip connection that is used for both microphone audio as well as for supplying the low-voltage DC needed for powering the electret microphone. The ring connection is used for the microphone low signal and the sleeve connection is chassis ground. Within the Model 5312's circuitry the

ring and sleeve connections are connected together as well as being "tied" (connected) to the chassis.

The Model 5312's gooseneck bushing includes a hex head socket set screw with a thread pitch of 4-40 UNC. This allows the gooseneck microphone to be secured into the bushing by simply tightening the set screw against the microphone using a 5/64 hex driver. In many cases, especially in applications where the Model 5312 will be moved from venue to venue, it will not be optimal for the hex screw to be utilized. This is because the gooseneck microphone may need to be removed and stored for transit. In this case, the set screw should be removed and stored.

Headset Connection

The Model 5312 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, labeled HEADSET, is located on the left side of the unit's front panel. Refer to Figure 3 for connection details.

The headset's microphone input connections are compatible with most unbalanced dynamic or electret (low-voltage DC-powered) microphones. No support is provided for microphones that require P12 or P48 phantom power. A balanced dynamic microphone should, in most cases, also function correctly if its signal – (low) is connected to Model 5312's mic in –/ shield connection.

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 headset's 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 within the STcontroller software application, as discussed in a later section, can be used to create the desired dual-channel monaural output. It's important not to connect together (short) pins 4 and 5 of the Model 5312's headset connector as damage to the unit's output circuitry could result.

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

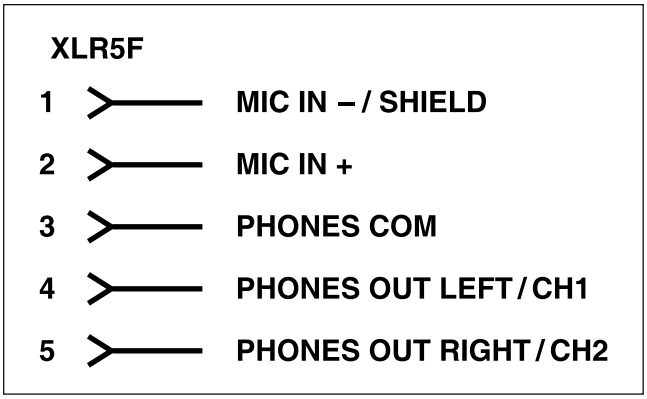


Figure 3. Headset connection pinout chart

It's possible that some beyerdynamic headset interconnecting cable assemblies will terminate its left and right earpiece connections opposite from what the Model 5312 and other broadcast equipment require. These cables may terminate the left earpiece to pin 5 of the 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 assembly such that the left earpiece connects to pin 4 and the right earpiece to pin 5.

If a separate microphone and pair of stereo or monaural headphones need to be connected an adapter cable assembly must 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 3-conductor 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 5312 provides only low-voltage DC electret power. Phantom-powered (P12 or P48) microphones would not be compatible. Most hand-held or "stick" microphones are dynamic and should function correctly.

Dante Configuration

For audio to correctly pass to and from the Model 5312 requires, at a minimum, that several Dante-related parameters be configured. These configuration settings will be stored in non-volatile memory within the Model 5312's circuitry. Configuration will typically be done with the Dante Controller software application which is available for download, free of charge, at the Audinate website. Versions of Dante Controller are available to support both the Windows and the macOS operating systems. The Model 5312 uses a Brooklyn module to implement its Dante functionality.

The Model 5312 is compatible with Dante's AES67 implementation as well as the Dante Domain Manager (DDM) software application.

Audio Routing

The Model 5312's 16 Dante transmitter (output) channels must be assigned to the desired Dante receiver (input) channels on associated equipment. This will route the Model 5312's 12 talkback, two monitor, one hot mic, and one tally tone output channels to the devices that will be "listening" to them. Within Dante Controller, a subscription is the term used for routing a transmitter flow (a group of up to four output channels) to a receiver flow (a group of up to four input channels).

The number of transmitter flows associated with a Brooklyn module and, as such, the Model 5312, is 32 so there's a little chance of a flow limitation. These flows can either be unicast, multicast, or a combination of the two. (Note that in the AES67 mode the Model 5312's Dante transmitter (output) channels will function only in multicast; unicast is not supported.)

Using the Dante Controller application, the desired audio sources need to be routed to the Model 5312's 16 Dante receiver (input) channels. The exact number utilized will depend on the specific application. The first 12 Dante receiver (input) channels are assigned to the rotary encoders and can be used for listening to the associated intercom channels or as general-purpose audio channel monitoring. Four additional Dante receiver (input) channels are associated with the four auxiliary inputs. These can be used for a variety of functions including serving as IFB program sources, a talk audio input source, and as a monitor mute source.

Unit and Channel Names

The Model 5312 has a default Dante device name of **ST-M5312-** along with a unique suffix. The suffix identifies the specific Model 5312 that is being configured. The suffix's actual alpha and/or numeric characters relate to the MAC address of the unit's Brooklyn module. Using Dante Controller, the default device name and channel names can be revised as appropriate for the specific application. The 16 Dante receiver (input) audio channels have default names of **Ch01 – Ch12** and **AuxInA – AuxInD**. The 16 Dante transmitter (output) audio channels have default names of **Ch01 – Ch12**, **MonA**, **MonB**, **HotMic**, and **TallyTone**. Refer to Appendix C for unit and channel name details.

Device Configuration

The Model 5312 only supports an audio sample rate of 48 kHz with no pull-up/pull-down values available. Encoding choices are *PCM 24*, *PCM 16*, and *PCM 32* but in virtually all cases *PCM 24* would be appropriate. Clocking and Device Latency can be adjusted if required.

Network Configuration

The Model 5312 allows connection of two Ethernet signals. Two RJ45 jacks are located on the unit's back panel and are labeled PRI and SEC. In Dante Controller's Network Config, Dante Redundancy section the way in which these ports function can be selected. The choices are *Switched* or *Redundant*.

If *Switched* is selected, the Model 5312 will be able to establish one connection with an Ethernet network. It doesn't matter which RJ45 jack is utilized, although for clarity using the PRI jack is logical. The other RJ45 jack can be used to interconnect with another piece of networked equipment. If the Model 5312's network configuration is *Switched* ensure that only one of the RJ45 jacks on the back panel is connected to the LAN associated with the Dante devices. If both of the Model 5312's RJ45 jacks are routed to ports on the same LAN this will typically "crash" the network! (Although some of the latest/most advanced Ethernet switches will automatically detect and prevent an issue from occurring.)

If *Redundant* is selected then Dante's redundant networking implementation will be enabled. In this case, separate network connections should be made to the PRI and SEC RJ45 jacks. A personal computer that's running STcontroller will typically be associated with the network that is connected to the PRI RJ45 jack.

Network IP Address and Related Parameters

When the Model 5312 has been configured for the *Switched* network mode, one Dante IP address will be associated with the network connection that is made to either the PRI or SEC RJ45 jack. If the network configuration has been configured for *Redundant,* separate IP addresses and related network parameters will be assigned to the PRI and SEC jacks.

By default, the Model 5312's Dante IP address and related network parameters will be determined automatically using the DHCP or, if not available, link-local network protocols. 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 every unit be physically labeled, e.g., directly marked using a permanent-ink pen on "console tape," with its specific static IP addresses. If knowledge of a Model 5312's IP addresses has been misplaced there is no method to easily restore the unit to a default IP setting.

Note that if the Model 5312's network configuration has been set for *Redundant* then the Primary and Secondary Dante IP addresses and related parameters can be independently configured. This allows both to be automatic, both to be manually configured, or one to be automatic and the other to be manually configured.

AES67 Configuration – AES67 Mode

The Model 5312 can be configured for AES67 operation. This requires that the AES67 Mode in Dante Controller be set for *Enabled.*

Model 5312 Clocking Source

While technically the Model 5312 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 5312 would not be enabled.

Model 5312 Configuration

The STcontroller software application from Studio Technologies is used to configure the way in which a Model 5312 Intercom Station functions. STcontroller can also be used in real-time to select several operation conditions. This makes it imperative that STcontroller be available for convenient use on a personal computer that's connected to the related local area network (LAN). (Note that some operating conditions can be selected using the front-panel buttons and display).

Installing STcontroller

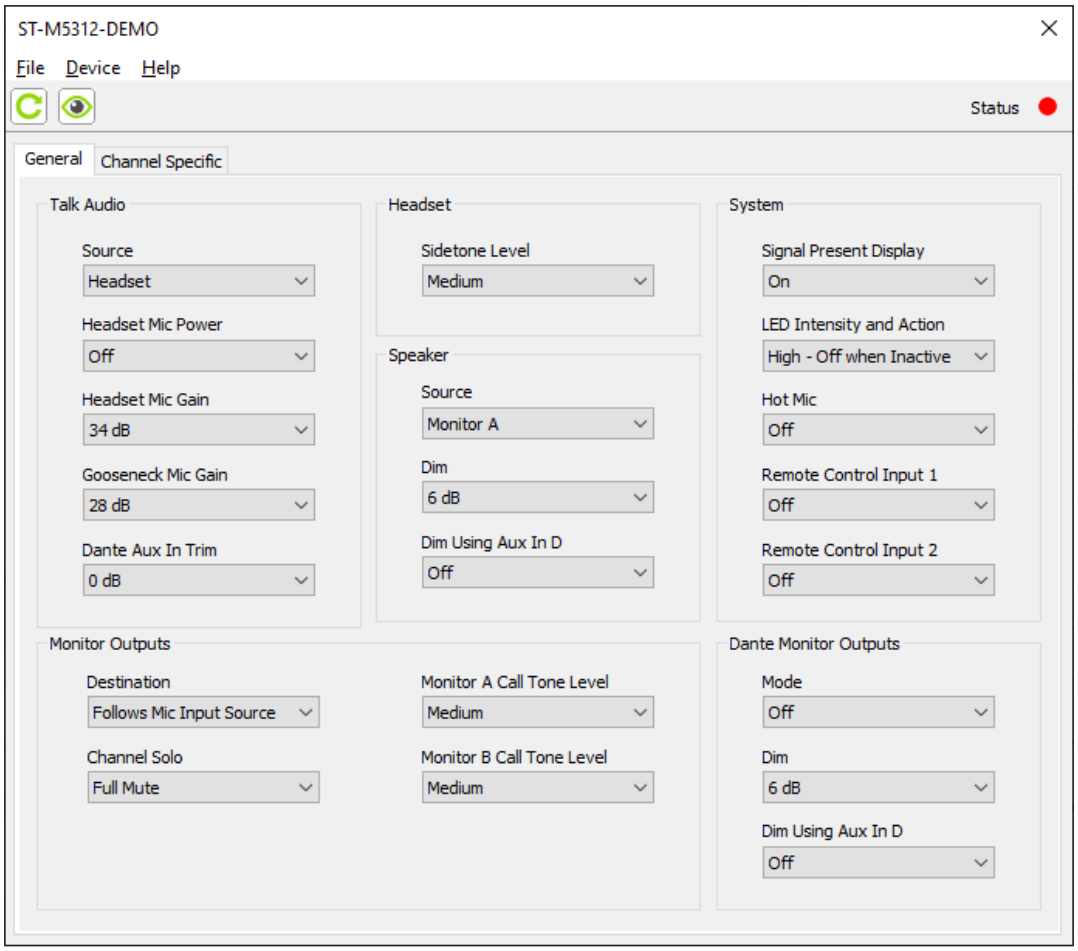
STcontroller is available free of charge for download from the Studio Technologies' website (studio-tech.com). Versions are available that are compatible with personal computers running select versions of the Windows and macOS operating systems. If required, download and install STcontroller onto a designated personal computer. This personal computer must be on the LAN and subnet as the Model 5312 unit or 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 5312 units to be configured will appear in the device list. The Identify command can be used to allow easy recognition of a specific Model 5312 unit. Double-clicking on a specific 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 5312 reboot is required. Each time a change is made the 12 pushbutton switches on the Model 5312's front panel will flash orange in a distinctive pattern to indicate that a command from STcontroller has been received. Configuration changes will be stored approximately five seconds after the last change has been made.

General Menu Page

The following configuration selections are available in STcontroller's General menu selections tab.



Talk Audio – Source

Choices are *Headset*, *Gooseneck*, *Dante Aux In A*, *Dante Aux In B*, *Dante Aux In C*, and *Dante Aux In D*.

The talk audio source for the Model 5312 can be selected from six sources: the microphone associated with a connected headset, the gooseneck microphone, or one of the four Dante Aux In receiver (input) channels. STcontroller can be used to select the desired talk audio source, as can the pushbutton switches located on the right side of the Model 5312's front panel. All six sources are available for use in "real-time." The source field in STcontroller provides two functions, displaying the active talk source as well as allowing its selection. Note that selecting one of the four Dante Aux inputs will typically only be used if an external source of talk audio, often provided by a second Model 5312 unit, is going to be used.

Talk Audio – Headset Mic Power

Choices are *Off* and *On*.

A headset can be connected by way of the 5-pin female XLR connector located on the Model 5312's front panel. If the connected headset has an electret microphone which requires a source of low-voltage DC for operation the headset mic power should be enabled (*On*). Most broadcast headsets that terminate on a 5-pin male XLR connector will incorporate a dynamic (non-powered) microphone. In this case, power will not be required and, as such, does not enable headset microphone power.

Note that the Model 5312 cannot supply P12 or P48 phantom power that is typically required by balanced condenser (capacitor) microphones. This should not pose an issue as phantom-powered microphones are

essentially never associated with communications- or intercom-style headsets that would be used with the Model 5312.

Talk Audio – Headset Mic Gain

Choices are *22 dB*, *28 dB*, *34 dB*, *40 dB*, and *46 dB*.

To match the performance of a microphone associated with a headset, the gain of the microphone preamplifier can be selected from among five choices. This action can be performed using STcontroller or the buttons and associated display on the unit's front panel. When the headset mic is selected as the Model 5312's talk audio source and a voice signal at a normal level is present on the connected headset's microphone the level on an active Dante talk channel should be approximately –20 dBFS. This level can be confirmed by measuring the actual level on the Dante channel or by way of the level meter function on the unit's front-panel display.

There's no "hard and fast" rule as to which of the five gain settings would be appropriate. But unless otherwise indicated, 40 dB is typically a good initial choice for a headset that incorporates a dynamic microphone while 34 dB would be appropriate for a headset that incorporates an electret microphone.

Talk Audio – Gooseneck Mic Gain

Choices are *22 dB*, *28 dB*, *34 dB*, and *40 dB*.

When the gooseneck microphone is selected as the Model 5312's talk audio source the gain of the microphone preamplifier will operate from among five configurable choices. This gain selection can be performed using either STcontroller or the buttons and associated display on the right side of the unit's front panel. When the gooseneck mic is selected as the Model 5312's talk audio source and a voice signal at a normal level is present on the gooseneck microphone the level on an active Dante talk channel should be approximately –20 dBFS. This level can be confirmed by measuring the actual level on the Dante channel or by way of the level meter function on the unit's front-panel display.

Talk Audio – Dante Aux In Trim

Choices are *–12 dB*, *–6 dB*, *0 dB*, *6 dB*, and *12 dB*.

When one of the four Dante Aux In receiver (input) channels is selected as the Model 5312's talk audio source its level for the talk function can be configured from among five choices. This allows the level of the signal to be matched to the needs of the talk functions. Two of the configurable settings allow the signal level to be reduced, one setting maintains the input level as is, while the other two allow an increase in the signal level. In most cases, selecting *0 dB*, neither subtracting nor adding gain, will be appropriate. This setting is provided when the selected Dante Aux In channel has a nominal level of –20 dBFS. But this may not always occur and the configuration choice should be changed as required to achieve optimal operation. This level can be confirmed by measuring the actual level on the Dante channel or by way of the level meter function on the unit's front-panel display.

Monitor Outputs – Destination

Choices are *Follows Mic Input Source*, *Headset*, *Speaker*, and *Dante Monitor Outputs*.

The two channels associated with the Model 5312's monitor output can be routed to the headset's headphone outputs, the internal speaker, and/or the two Dante monitor output channels. The *Follows Mic Input Source* configuration choice allows the monitor output channels to be automatically routed to a destination associated with the talk audio source. When the headset's microphone is selected as the talk audio source then the monitor outputs will be routed to the headset's headphone outputs. When the gooseneck microphone is selected as the talk source the monitor outputs will be routed to both the speaker and the Dante monitor outputs. When the destination is selected for *Headset* the monitor outputs will always be routed to the headset's headphone outputs. When the destination is selected for *Speaker* the monitor outputs will always be routed to the loudspeaker on the unit's front panel. When the destination is selected for *Dante Monitor Outputs* the monitor outputs will be routed to the Dante monitor outputs.

Monitor Outputs – Channel Solo

Choices are *Off*, *6 dB*, *9 dB*, *12 dB*, *15 dB*, and *Full Mute*.

This configuration choice allows an audio console monitor "solo" function to be available to Model 5312 users. When selected for *Off* the solo function is disabled. When one of the five other solo modes has been selected pressing one of the 12 rotary controls associated with the talk channels will cause the solo

mode to be enabled. The level of the monitor audio signal associated with the "soloed" channel will remain the same. However, the monitor audio level of any signal associated with the other talk channels will be reduced in level by either 6, 9, 12, or 15 dB or fully muted.

Monitor Outputs – Monitor A Call Tone Level

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

The Model 5312 is capable of generating an audible alerting signal when a call signal is detected on a channel that is assigned to the Monitor A audio bus. This signal consists of repeating sequences of three short bursts of sine wave audio that are output by way of the speaker and/or the Dante monitor outputs. The level range can be selected from among three choices as well as being selected for off (muted).

Monitor Outputs – Monitor B Call Tone Level

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

This function is identical to that designated for monitor channel A but instead generates as audio alerting signal on monitor channel B when a call signal is detected.

Headset – Sidetone Level

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

As a user confidence signal, audio from the selected talk audio source can be routed to the Model 5312's left and right output channels of the headset's headphone output. Sidetone audio can be present whenever an applicable button function is active on any or all of the unit's 12 talk channels. An applicable button function is one that uses the headset microphone, the gooseneck microphone, or one of the Dante Aux In channels as the talk audio source. These functions include Talk, Talk with 18 kHz Tone, IFB, and Talk with Quindar Tones. There is no "correct" sidetone level setting but only depends on user preference. A setting that provides the user with a comfortable amount of their own talk audio is typically appropriate.

Speaker – Source

Choices are *Off*, *Monitor A*, and *Monitor B*.

The Model 5312 includes a small power amplifier and associated loudspeaker, located on the right side of the front panel, whose audio source can be selected from the two audio "mix" buses that are named Monitor A and Monitor B. These buses contain audio content that is specified in the individual configuration choices for the unit's 12 channels. The loudspeaker can be designated to monitor either of these buses or to not be active.

Speaker – Dim

Choices are *0 dB*, *6 dB*, *12 dB*, and *18 dB*.

The Model 5312's loudspeaker can be automatically "dimmed" (attenuated or reduced in level) whenever a talk or IFB function is active on any of the 12 channels. This will help prevent loudspeaker audio from interfering with the selected talk audio source. Interference could be in the form of unwanted audio content or even acoustical feedback. In almost all cases, a value of other than 0 dB (no dim) would be appropriate. It's typical for a user who listens to the loudspeaker at a higher level (SPL) to select one of the larger dim values, providing more level reduction when a talk function is active.

Speaker – Dim Using Aux In D

Choices are *Off* and *On*.

This configuration choice allows a high-frequency tone that becomes present on the Dante Aux Input D receiver (input) channel to activate the speaker dim function. This is provided to support applications where two Model 5312 units are connected together to provide more than 12 talk channels. Implementing this function simply requires that the secondary unit's channel active Dante transmitter (output) channel be subscribed (routed) to the primary unit's Dante Aux In D.

System – Signal Present Display

Choices are *Off* and *On*.

The top surface of the knobs associated with the Model 5312's 13 rotary encoders can light as an indication of the audio level associated with each specific encoder and related function. This is accomplished by the incorporation of RGB (red-green-blue) LEDs located within each rotary encoder. A knob end will

light green when signal levels are in the normal range, yellow when the signal level is greater than normal, and red when the signal level is at risk of degrading audio performance. Note that even if the Signal Present Display function is disabled (Off), the knobs' top surface will still display their normal (not muted), muted, and solo states by LEDs illumining them with a solid color.

System – LED Intensity and Action

Choices are *High – Off when Inactive*, *Low – Off when Inactive*, *High – Red when Inactive*, *Low – Red when Inactive,* and *High – Low when Inactive*.

The 12 pushbutton switches and 13 rotary encoders have LED indicators associated with them. The LED Intensity and Action configuration choice allows the overall intensity and operation of these LEDs to be selected. Typically, deciding which choice, high or low, is optimal will depend on the amount of ambient light present where the Model 5312 is located. The action part of this configuration choice refers only to the LEDs in the 12 pushbutton switches. When an associated pushbutton function is inactive these LEDs can either be off, lit green, or lit red.

High – Off when Inactive: When active, the intensity of all the Model 5312's LEDs will be at the unit's high value. The LEDs in the 12 pushbutton switches will not light when their associated function is inactive.

Low – Off when Inactive: When active, the intensity of all the Model 5312's LEDs will be at the unit's low value. The LEDs in the 12 pushbutton switches will not light when their associated function is inactive.

High – Red when Inactive: When active, the intensity of all the Model 5312's LEDs will be at the unit's high value. The LEDs in the 12 pushbutton switches will light red when their associated function is inactive.

Low – Red when Inactive: When active, the intensity of all the Model 5312's LEDs will be at the unit's low value. The LEDs in the 12 pushbutton switches will light red when their associated function is inactive.

High – Low when Inactive: When active, the intensity of all the Model 5312's LEDs will be at the unit's high value. The LEDs in the 12 pushbutton switches will light in their low intensity when their associated function is inactive.

System – Hot Mic

Choices are *Off, Always On,* and *On when Any Channel Active*.

A Dante transmitter (output) channel is available providing a hot mic function. When enabled, audio from the selected talk audio source be will output on the Dante transmitter (output) hot mic channel. The actual audio source for the hot mic output channel will be the selected talk audio source, either the headset microphone, the gooseneck microphone, or one of the four aux Dante receiver (input) channels. If *Off* is selected talk audio will not be present on the Dante transmitter (output) hot mic channel. But the channel will still appear in the list of Dante transmitter (output) channels associated with the Model 5312.

If *Always On* is selected, audio associated with the selected talk audio source will always be present on the hot mic Dante transmitter (output) channel. If *On when Any Channel Active* is selected then audio associated with the talk audio source will be present on the hot mic Dante transmitter (output) channel whenever one or more of the 12 talk functions is active.

System Remote Control Inputs – Overview

The Model 5312 provides two contact closure inputs that can be utilized in installer-implemented applications. They are accessible by way of a 3-conductor 3.5 mm TRS jack located on the back panel of the Model 5312's enclosure.

System – Remote Control Input 1

Choices are *Off*, *Channel 1*, *Channel 2*, *Channel 3*, *Channel 4*, *Channel 5*, *Channel 6*, *Channel 7*, *Channel 8*, *Channel 9*, *Channel 10*, *Channel 11*, and *Channel 12*.

The action performed when Remote Control Input 1 is enabled will follow the configuration selected from among 13 choices. When *Off* is selected no action will be associated with Remote Control Input 1. When *Channel 1*, for example, is selected activating Remote Control Input 1 will provide the same function as pressing button 1. The precise action of this remote-control input function will be identical to how the associated button is configured. Separate configuration choices allow the action of the buttons to be selected.

System – Remote Control Input 2

Choices are *Off*, *Channel 1*, *Channel 2*, *Channel 3*, *Channel 4*, *Channel 5*, *Channel 6*, *Channel 7*, *Channel 8*, *Channel 9*, *Channel 10*, *Channel 11*, and *Channel 12*.

The configuration choices and actions for Remote Control Input 2 are the same as those provided for Remote Control Input 1.

Dante Monitor Outputs – Mode

Choices are *Off*, *Pre-Fader without Mute*, *Pre-Fader with Mute*, and *Post-Fader with Mute*.

The Model 5312 provides two Dante transmitter (output) channels, Monitor A and Monitor B, that are intended for use by other audio devices such as amplified speakers, audio consoles, and matrix intercom systems. The two Dante monitor output channels, A and B, can be configured as a group to function from among three choices.

Off: In this mode, the two Dante monitor output channels, Monitor A and Monitor B, will not have audio present on them. The Dante Controller software application will still indicate that the channels are present but no Model 5312 audio will be routed to them.

Pre-Fader without Mute: In this mode, the audio level and mute (on/off) status of Dante monitor output channels will not be impacted by the Model 5312's monitor output rotary encoder. To clarify, neither level adjustment or mute (on/off) control will occur. This mode is appropriate when the monitor output channels are going to be utilized by a device that incorporates level control and signal muting capability.

Pre-Fader with Mute: In this mode, the audio level of Dante monitor output channels will not be impacted by the Model 5312's monitor output rotary encoder. However, the mute (on/off) action of the rotary encoder will be active. To clarify, level adjustment will not occur but mute (on/off) control will occur. This mode is appropriate when the monitor output channels are going to be utilized by a device that incorporates level controls but no muting capability.

Post-Fader with Mute: In this mode, the audio level and mute (on/off) status of Dante transmitter (output) channels Monitor A and Monitor B will follow the action of the Model 5312's monitor output rotary encoder. This mode is applicable if the device utilizing the Dante monitor output channels requires that the level of the signals be adjusted and/or muted using the Model 5312's rotary encoder.

Dante Monitor Outputs – Dim

Choices are *0 dB*, *6 dB*, *12 dB*, and *18 dB*.

Whenever a talk or IFB function is active the Model 5312 can invoke a dim (attenuation) function on the monitor output channels. This is designed to help achieve maximum intelligibility and minimize the chance of acoustic feedback when loudspeakers are associated with either or both of the Dante monitor output channels (Monitor A or Monitor B). A dim setting of *0 dB* means that the signal level on the Dante monitor outputs will remain unchanged. (The signal will be attenuated by 0 dB which is no attenuation!)

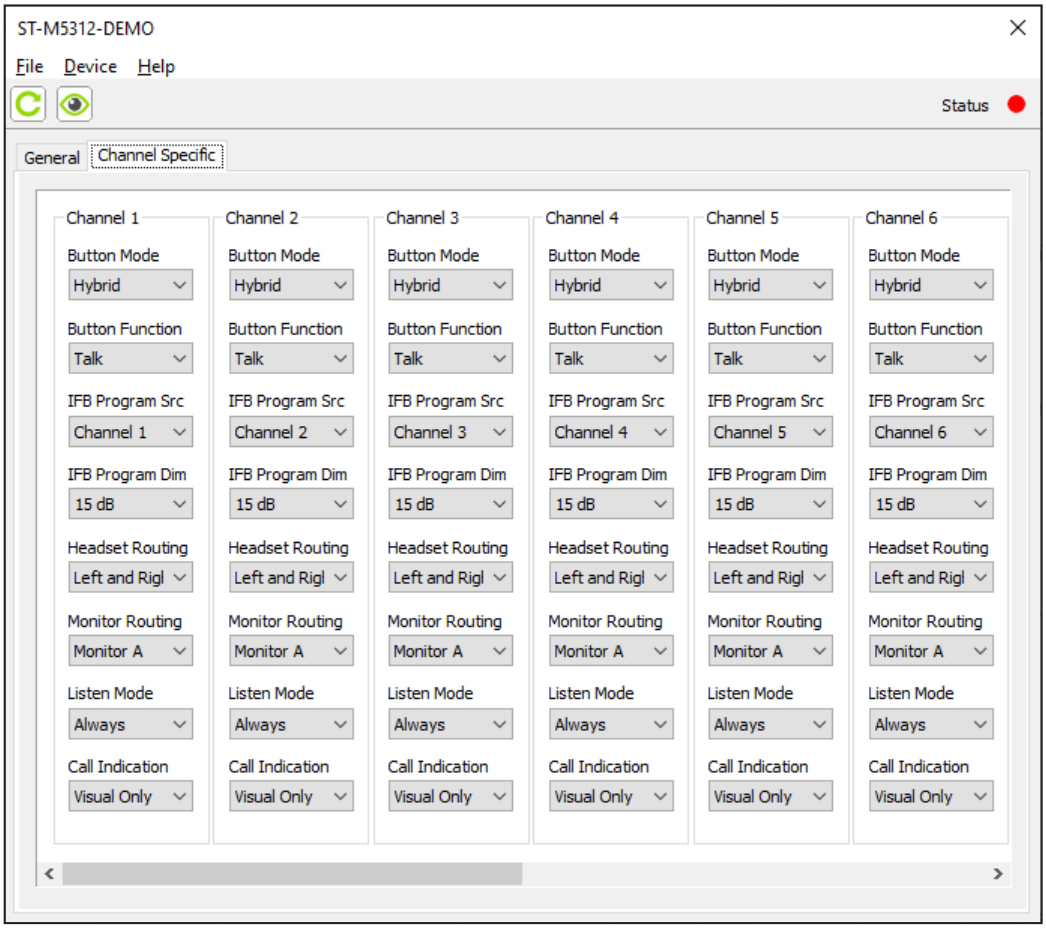
Dante Monitor Outputs – Dim Using Aux In D

Choices are *Off* and *On*.

This configuration choice allows a high-frequency tone that becomes present on the Model 5312's Dante Aux Input D receiver (input) channel to activate the Dante Monitor Outputs dim function. This is provided to support applications where two Model 5312 units are connected together to support more than 12 talk channels. Implementing this function simply requires that the secondary unit's channel active Dante transmitter (output) channel be subscribed (routed) to the primary unit's Dante Aux In D channel.

Channel Specific Menu Page

The following STcontroller configuration selections apply individually to Channels 1-12. They are available in each Channel Specific menu tab.



Button Mode

Choices are *Momentary*, *Latching*, and *Hybrid*.

The manner in which a button functions can be configured from among three choices.

Momentary: If this mode is selected, a button's function will normally be inactive. Whenever the button is pressed the associated function will become active and its green LED will light. The function will become inactive when the button is no longer pressed.

Latching: If this mode is selected, the button's function will alternate between its active and inactive states whenever the button is pressed. The button's green LED will be lit whenever the associated function is active. Upon Model 5312 power up the button will be in its inactive state.

Hybrid: This mode is a combination of the Momentary and Latching modes. It's similar to the way in which pushbutton switches often function on user stations associated with broadcast or production intercom systems. If the button is pressed and held the associated function will become active. It will stay active until the button is released. If the button is momentarily "tapped" the status of the function will change, either from inactive-to-active or from active-to-inactive. The button's green LED will be lit whenever the function is active. Upon Model 5312 power up the button will be in its inactive state.

Button Function

Choices are *Talk*, *Talk with 18 kHz Tone*, *All Talk – Unlatch Muted Channels*, *All Talk – Don't Unlatch Muted Channels,* *Call, IFB, All IFB – Unlatch Muted Channels*, *All IFB – Don't Unlatch Muted Channels*, *18 kHz Tone*, *20 kHz Tone*, *Talk with Quindar Tones*, and *Disabled*.

Talk: In this mode, whenever a button function is active the selected talk audio source will be sent out its associated Dante transmitter (output) channel. This mode will typically be used as part of an intercom channel or stage announce (SA) implementation. The sidetone function will become active whenever the talk function is active.

Talk with 18 kHz Tone: This mode is similar to the Talk mode except that an 18 kHz sine wave tone is added (mixed or summed) with the selected talk audio source. It is intended for use in REMI/At-Home applications where a "pilot tone" needs to be sent along with the talk audio. This capability was specifically provided for use with the tone-activated (TOX) IFB function in the Studio Technologies' Model 5422A Dante Intercom Audio Engine product or the IFB (talent cue) function in the Models 232, 234, and 236 Announcer's Consoles. The sidetone function will become active whenever the Talk with 18 kHz Tone function is active.

All Talk – Unlatch Muted Channels: In this mode, the associated button will activate all Model 5312 channels that are configured for Talk or Talk with 18 kHz Tone. All listen encoders associated with the talk channels that are currently in their muted state will automatically unmute. They will remain in their unmuted state when the talk function is no longer active.

All Talk – Don't Unlatch Muted Channels: In this mode, the associated button will activate all Model 5312 channels that are configured for Talk or Talk with 18 kHz Tone. All listen encoders associated with the talk channels that are currently in their muted state will remain in their muted state.

Call: In this mode, pressing the associated button will cause a 20 kHz sine wave tone to be sent out any Model 5312 channels that are both configured for the Talk or the Talk with 18 kHz Tone modes and are currently active.

IFB: In this mode, the Model 5312 channel will be used to create a broadcast-type IFB (interrupted foldback or talent cue) source. When the function is not active audio from the selected program source (either the Dante input associated with this channel, Aux In A, Aux Input B, Aux In C, or Aux In D) will be routed to the corresponding Dante transmitter (output) channel. This is referred to as the IFB program audio source. When the IFB function is active the talk audio source will be combined (mixed or summed) with the IFB program audio source. The IFB program audio source will either remain at the same level, be attenuated, or be fully muted following the IFB Program Dim configuration. The sidetone function will be active whenever the IFB function is active.

All IFB – Unlatch Muted Channels: In this mode, pressing the associated button will cause all the channels configured for IFB to become active. All listen encoders associated with the IFB channels that are currently in their muted state will automatically unmute. Note that the selected IFB program audio source will be routed continuously to the channel's associated Dante transmitter (output) channel. This would typically serve as the non-interrupt audio source. This is provided such that a timing match can be made between the interrupt (IFB) and non-interrupt output channels.

All IFB – Don't Unlatch Muted Channels: In this mode, pressing the associated button will cause all the channels configured for IFB to become active. All listen encoders associated with the IFB channels that are currently in their muted state will remain in their muted state. Note that the selected IFB program audio source will be routed continuously to the channel's associated Dante transmitter (output) channel. This is provided such that a timing match can be made between the IFB and non-interrupt output channels.

18 kHz Tone: In this mode, an 18 kHz sine wave tone will be sent out the associated Dante transmitter (output) channel. This function can be useful for triggering other functions associated with devices such as the Model 5422A Dante Intercom Audio Engine. (The Model 5422A can use an 18 kHz tone to activate its IFB functionality.)

20 kHz Tone: In this mode, a 20 kHz sine wave tone will be sent out the associated Dante transmitter (output) channel. This function can be useful for triggering other functions associated with devices such as the Model 391 Dante Alerting Unit or Model 392 Visual Indicator Unit.

Talk with Quindar Tones: In this mode, upon enabling the talk function a 2525 Hz sine wave tone will be added to the Dante transmitter (output) channel for 250 mSec. This is called the intro tone. The selected talk audio source will then be connected. Upon the talk function no longer being active a sine wave tone of 2475 Hz will be sent out the Dante transmitter (output) channel for 250 mSec. (This is called the outro tone.)

Disabled: In this mode, the button will not perform a function. Pressing it will cause the button's red LED to flash momentarily indicating that it has been disabled.

IFB Program Dim

Choices are *0 dB*, *5 dB*, *10 dB*, *15 dB*, *20 dB*, and *Full Mute*.

This value determines the amount of attenuation that will be applied to the selected audio source that is being used for program audio when the IFB function is active for this specific channel. If *0 dB* is selected there will be no change in the level of the program audio. The talk audio will simply be added (mixed or summed) with the selected program audio. Selecting one of the four non-zero values will cause the selected program audio source to attenuate (dim) by the configured amount. When *Full Mute* is selected the IFB program audio source level will fully attenuate. Only talk audio would be present in this case. In most broadcast applications a value of 10 dB or 15 dB will be appropriate.

Headset Routing

Choices are *Off*, *Left*, *Right*, *Left and Right*, and *Dual Channel*.

The Dante receiver (input) audio source associated with a Model 5312 channel can be monitored using the headset's 2-channel (stereo) headphone output. The destination channel(s) can be configured as desired. A special mode, called *Dual Channel*, allows two audio input channels to be monitored as a dual-channel (stereo) pair.

Off: In this mode, the input audio will not be sent to either the left or right headphone output channels.

Left: In this mode, the input audio will be sent to only the left headphone output channel.

Right: In this mode, the input audio will be sent to only the right headphone output channel.

Left and Right: In this mode, the input audio will be sent to both the left and right headphone output channels.

Dual Channel: In this mode, the rotary encoder will control two audio input channels. The Dante receiver (input) channel associated with this channel will be sent to the left headphone output. The selected IFB program audio associated with this channel will be sent to the right headphone output. As an example, audio associated with Dante receiver (input) channel 1 would be routed to the left headphone output. Audio associated with the Dante Aux In A receiver channel could be routed to the right headphone output.

Monitor Routing

Choices are *Off*, *Monitor A*, *Monitor B*, and *Monitor A and B*.

The Dante receiver (input) audio source associated with a Model 5312 channel can be monitored using either or both of the Dante monitor output channels. The destination channel(s) can be configured as desired.

Off: In this mode, the input audio will not be sent to either of the monitor output channels.

Monitor A: In this mode, the input audio will be sent only to the Monitor A output channel.

Monitor B: In this mode, the input audio will be sent only to the Monitor B output channel.

Monitor A and B: In this mode, the input audio will be sent to both the Monitor A and Monitor B output channels.

Listen Mode

Choices are *Always*, *Channel Active,* and *Channel Active Unlatches Mute*.

This configuration choice selects under which operating condition the audio source connected to

the Dante receiver (input) channel that's associated with this talk channel will be routed to the headset's headphone and/or monitor output channels. This is a somewhat esoteric configuration but can prove useful in specialized applications.

Always: If this mode is selected, an audio source connected to the associated Dante receiver (input) channel can always be monitored using the headset's headphone and/or the monitor outputs. The state of the channel's talk function will not impact the ability to monitor this source. Pressing the knob associated with the channel's encoder will control the mute state of the input.

Channel Active: In this mode, the source connected to the associated Dante receiver (input) channel can only be monitored when the channel's talk function is active. When the channel's talk function is no longer active the input channel will automatically return to its muted state.

Channel Active Unlatches Mute: If this mode is selected and the rotary encoder associated with its Dante receiver (input) channel is in its muted state, pressing the channel's talk button will cause the mute mode to automatically turn off. When subsequently the channel's talk button is released or the channel's talk function is disabled, the input will continue to be in its non-muted state. Only by again pressing the rotary encoder's knob will the mute state again become active.

Call Indication

Choices are *Off*, *Visual Only*, and *Visual and Audible*.

Visual and audible indications can be provided whenever a call signal has been detected on a Model 5312 input channel. The visual indication is provided by the LED indicators associated with each rotary encoder. The audible indication is provided by way of the Model 5312's internal loudspeaker and, if configured appropriately, Dante monitor outputs. The audible indication is not sent to the headset output.

Off: In this mode, no visual or audible indication in response to a call signal will be generated.

Visual Only: In this mode, when a call signal is detected on an input channel the LED in the associated rotary encoder will flash orange.

Visual and Audible: In this mode, when a call signal is detected on an input channel the LEDs in the associated rotary encoder will flash orange and sequences of audio tones will be output by way of the monitor loudspeaker. The audio tones will also be sent to the Monitor A and/or Monitor B Dante transmitter (output) if the channel's audio input has been so configured.

Operation

At this point, all connections and configuration steps should have been completed and everything should be ready for Model 5312 operation to commence. A Studio Technologies' GME-3-12 gooseneck microphone may have been installed into the bushing/connector assembly which is located on the unit's front panel. A stereo or monaural headset will often be interfaced using the 5-pin XLR connector on the front panel.

Using the Studio Technologies' STcontroller software application, the Model 5312's operating configuration should have been selected to meet the needs of the specific application. An extensive range of configurable parameters are available, allowing the way in which a specific Model 5312 operates to be unique.

Using the Dante Controller software application, the Model 5312's Dante network interface and audio channel configuration should have been made. In this way, the operational characteristics of the unit's two Ethernet interfaces will have been selected. In addition, some or all of the 16 Dante receiver (input) channels and 16 Dante transmitter (output) channels will have been routed, by way of Dante subscriptions, to the receiver and transmitter channels on associated Dante-enabled equipment.

Twelve of the Dante receiver (input) channels are assigned to the monitor section. Each of these receivers (inputs) has an associated rotary encoder to adjust its signal level. Four additional Dante receiver (input) channels can serve in a variety of functions, including as IFB program inputs or a talk audio source.

Twelve of the Dante transmitter (output) channels are associated with the functioning of the 12 pushbutton switches. Two Dante transmitter (output) channels are specified as monitor outputs. Another Dante transmitter (output) channel provides a hot mic output function. And finally, a Dante transmitter (output) channel provides a tally tone function.

Initial Operation

The Model 5312 will start to function as soon as an AC mains power source is connected. However, it may take up to 30 or 40 seconds for full operation to commence. Upon initial power up the various status LEDs, located on the back panel, and the rotary encoder, pushbutton LEDs, and graphics display on front panel will light as the internal processors, Ethernet network, and Dante connections begin to function. The various LEDs and graphics display will then become operational, indicating the status of their associated functions.

Ethernet Status LEDs

Four Ethernet status LEDs are located on the Model 5312's back panel, two associated with each of the RJ45 jacks. The LINK LEDs will light orange whenever an active connection to an Ethernet network has been established. The LEDs labeled ACT will flash green in response to Ethernet data packet activity on a specific interface. It's possible that up to 30 or 40 seconds may be required for the Ethernet status LEDs to reach their final states.

How to Identify a Specific Model 5312

Functions within the Dante Controller and STcontroller software applications allow specific Model 5312 units to be identified. Each application provides an "eyeball" icon that when clicked will activate the identify function. When Identify is selected it will send a command to a specific Model 5312 unit. On that unit the red LEDs associated with the 12 pushbutton switches will "flash" in a unique sequence three times; the actual on/off status of the buttons will not change. In addition, the LINK and ACT status LEDs, located on the two RJ45 jacks on the unit's back panel, will slowly flash. After approximately ten seconds the LED identification pattern will cease and normal Model 5312 Ethernet status LED functionality will resume.

LED Intensity and Action

On the Model 5312's front panel there are LED indicators associated with the 12 pushbutton switches and the 13 rotary encoders. Using the STcontroller software application, the intensity of these LEDs, as a group, can be configured from among two choices, low or high. If during operation the LED intensity isn't perceived to be optimal the configuration choice in STcontroller should be checked and revised if necessary. In most cases, the default intensity, high, will be applicable. However, the low LED intensity configuration choice may be superior in applications where the ambient light in the Model 5312's location is also low.

The action of the LEDs in the 12 pushbutton switches can be configured using STcontroller. This configuration will also determine if the switch's LEDs will light red, light at a low intensity, or not light at all, when the function associated with a switch is not active.

Talk Source Selection

Five small pushbutton switches along with a graphics display, all located on the right side of the front panel, can be used to select which talk audio source is active. The selected audio source will be used by the Model 5312's talk, IFB (talent cue), and sidetone functions. The talk source choices are *Headset*, *Gooseneck*, and the four auxiliary inputs. The STcontroller application can also be used to observe the selected talk audio source as well as selecting the desired one. A Model 5312 power-down/power-up cycle will restore the talk audio source to its last selected choice.

The headset and gooseneck microphone inputs have an independent preamplifier gain configuration parameter which is accessible by way of a front-panel menu as well as the STcontroller software application. When one of the Aux In channels has been selected as the talk audio source, there is a gain trim function. If switching between the three sources results in greatly different overall talk audio levels, the configuration choice for the headset and gooseneck microphone preamplifier gain as well as the Aux In level trim should be reviewed and revised as appropriate.

Hot Mic Output

A Dante transmitter (output) channel has been designated to provide a hot mic function. This channel can be disabled or enabled using the STcontroller software application. When enabled to *Always On* the selected talk audio source will be always be present on the hot mic Dante transmitter (output) channel. No pushbutton or rotary encoder operation will be required for the audio associated with the selected talk audio source to be present on the hot mic Dante transmitter (output) channel. If enabled to *On when Any Channel Active*

the selected talk audio source will be routed to the hot mic Dante transmitter (output) channel whenever one or more of the 12 talk functions are active.

The hot mic function can be useful but it's important that Model 5312 users be made aware of it and that there is no means of turning off (muting) the hot mic output. They must assume that other personnel with be monitoring audio associated with the Model 5312's talk audio source.

Tally Tone

A tally tone function is provided by means of a Dante transmitter (output) channel. This function is always active and does not have an STcontroller setting associated with it. Whenever one or more of the 12 talk functions is active an 18 kHz sine wave tone, at a level of –20 dBFS, will be present on the tally tone output channel. It's possible that the tally tone will be used as part of a remote production (REMI) configuration, as a trigger signal for controlling the muting of monitor loudspeakers, as an indication to enable a microphone-active indicator, or for use in other specialized functions.

Button Action

The action of each of the 12 pushbutton switches can be individually configured using STcontroller. There are three button action choices available and a description of them follows:

Momentary: If this mode is selected, the pushbutton's associated function will become active whenever the button is pressed and held. When the function is active the pushbutton's green LEDs will be lit. Depending on the Model 5312's configuration, when the function is not active its associated pushbutton switch will either light red, light green at a low intensity, or not light at all.

Latching: If this mode is selected, the function associated with the button will alternate between its active and inactive states whenever the pushbutton is momentarily pressed ("tapped"). The pushbutton's green LEDs will be lit whenever the function is active. Depending on the Model 5312's configuration, when the function is not active the associated pushbutton switch will either light red, light green at a low intensity, or not light at all. Upon Model 5312 power up the button's associated function will be in its inactive state.

Hybrid: This mode is a combination of the momentary and latching actions. If the pushbutton is pressed and held the associated function will become active until the pushbutton is released. If the pushbutton is momentarily pressed ("tapped") the function will change state. The pushbutton's green LEDs will be lit whenever the function is active. Depending on the Model 5312's configuration, when the function is not active the associated pushbutton switch will either light red, light green at a low intensity, or not light at all. Upon Model 5312 power up the pushbutton's associated function will be in its inactive state.

Button Function

The button function configuration is used to select the overall manner in which a specific pushbutton channel operates. Each pushbutton can be independently configured from among 12 choices. A careful study of how each of these choices function will highlight the variety of applications a Model 5312 can support. While the product's title includes the text "Intercom Station," that far from covers all the applications in which the unit can provide value.

Talk: When a button function has been configured for *Talk* and the pushbutton is pressed or the function is active then audio from the selected talk audio source will be connected to the associated Dante transmitter (output) channel. The LED in the pushbutton switch will light green whenever the function is active. Depending on the unit's configuration, when the function is inactive its LEDs can either light red, light green at a low intensity, or not light at all. When the pushbutton is not pressed nor currently active no audio will be present on the associated Dante transmitter (output) channel.

Talk with 18 kHz Tone: When a button function has been configured for *Talk with 18 kHz Tone* and the pushbutton is pressed or the function is active then audio from the selected talk audio source, mixed with an 18 kHz sine wave tone at a level of –20 dBFS, will be connected to the associated Dante transmitter (output) channel. The LED in the pushbutton switch will light green whenever the function is active. Depending on the unit's configuration, when the function is inactive its LEDs can either light red, light green at a low intensity, or not light at all. When the pushbutton is not pressed nor the function is active no

audio (voice or tone) will be present on the associated Dante transmitter (output) channel.

All Talk – Unlatch Muted Channels: When a button function has been configured for *All Talk – Unlatch Muted Channels* and the pushbutton is pressed or the function is activated, all other buttons that are configured for Talk or Talk with 18 kHz will become active. The LED in the pushbutton switch will light green whenever the function is active. The associated Dante transmitter (output) channel will not be utilized. Depending on the unit's configuration, when the function is inactive its LEDs can either light red, light green at a low intensity, or not light at all. All listen encoders associated with the talk channels that are currently in their muted state will automatically unmute.

All Talk – Don't Unlatch Muted Channels: When a button function has been configured for *All Talk – Don't Unlatch Muted Channels* and the pushbutton is pressed or the function is activated, all other buttons that are configured for Talk or Talk with 18 kHz will become active. The LED in the pushbutton switch will light green whenever the function is active. The associated Dante transmitter (output) channel will not be utilized. Depending on the unit's configuration, when the function is inactive its LEDs can either light red, light green at a low intensity, or not light at all. All listen encoders associated with the talk channels that are currently in their muted state will remain in their muted state.

Call: When a button function has been configured for *Call* and the pushbutton is pressed or the function is active then all other pushbuttons that are both configured for Talk or Talk with 18 kHz and are active will have a 20 kHz sine wave tone at a level of –20 dBFS added to their associated Dante transmitter (output) channels. The LED in the pushbutton switch will light orange whenever the function is active. (The buttons that are configured for Talk or Talk with 18 kHz that are active will flash orange.) When the function is not active, its LEDs will either be lit orange at a low intensity or off. The associated Dante transmitter (output) channel will not be utilized.

IFB: When a button function has been configured for *IFB* a broadcast-type IFB (interrupted foldback, interruptible foldback, or a talent cue) signal will be created. When the pushbutton is not pressed or active the selected IFB program source will be connected to the associated Dante transmitter (output) channel. The selected IFB program source is connected to the Dante transmitter (output) channel at unity level (no gain or attenuation will be applied to the signal). When the pushbutton is pressed or the function is active then two things will occur. The first is that the selected Dante IFB program source will be acted on following the configuration for the IFB program dim value. This will result in the signal level either staying the same, dropping in level (being attenuated) by one of four values, or completely muting. The second action is that the selected talk audio source will be added (summed) with the selected Dante IFB program audio source and then routed to the associated Dante transmitter (output) channel. The pushbutton will light green when the function is active. Depending on the unit's configuration, when the function is inactive its LEDs can either light red, light green at a low intensity, or not light at all.

The IFB function creates a talent cue signal that is sometimes referred to as Interrupt, Program with Interrupt, or Program + Interrupt. The selected talk audio source (headset, gooseneck, or one of the four Dante Aux In channels) serves as the interrupt source. An STcontroller configuration choice is used to select the IFB program audio source. Note that there is no means provided within the Model 5312 to adjust the level of the IFB program audio sources. This should not be considered an operational limitation as typically an audio console will provide the IFB program audio sources at a nominal level. As such, any needed adjustment of the signal level can be performed on the console.

All IFB – Unlatch Muted Channels: When a button function has been configured for *All IFB – Unlatch Muted Channels* and the pushbutton is pressed or the function is activated, all of the other buttons configured for IFB will become active. The LED in the pushbutton switch will light green whenever the function is active. Depending on the unit's configuration, when the function is inactive its LEDs can either light red, light green at a low intensity, or not light at all. All listen encoders associated with IFB channels that are currently in their muted state will automatically unmute.

The Dante IFB program audio input will continuously be connected to the associated Dante transmitter (output) channel. This is provided as a Program or

Program Only audio signal for use in a dual-channel IFB implementation. Typically, the first channel of a dual-channel IFB signal or "feed" is referred to as Interrupt or Program with Interrupt while the second channel is referred to as Program or Program Only. Using this Dante input-to-output loop-through arrangement can be valuable as any latency (time delay) that occurs within the Model 5312's IFB function will be matched in the All IFB – Unlatch Muted Channels signal path. In this way, the Model 5312's audio latency will essentially be matched in the program with interrupt and program-only audio paths. The reality is that the audio latency in the Model 5312 is very, very small. As such, this functionality is more to address a theoretical, rather than actual, issue.

All IFB – Don't Unlatch Muted Channels: When a button function has been configured for *All IFB – Don't Unlatch Muted Channels* and the pushbutton is pressed or the function is activated then all of the other buttons configured for IFB will become active. The LED in the pushbutton switch will light green whenever the function is active. Depending on the unit's configuration, when the function is inactive its LEDs can either light red, light green at a low intensity, or not light at all. All listen encoders associated with IFB channels that are currently in their muted state will remain in their muted state.

The selected IFB program audio source will continuously be connected to the associated Dante transmitter (output) channel. This is provided as a Program or Program Only audio signal for use in a dual-channel IFB implementation. Typically, the first channel of a dual-channel IFB signal or "feed" is referred to as Interrupt or Program with Interrupt while the second channel is referred to as Program or Program Only. Using this Dante input-to-output loop-through arrangement can be valuable as any latency (time delay) that occurs within the Model 5312's IFB function will be matched in the All IFB – Don't Unlatch Muted Channels signal path. In this way, the Model 5312's audio latency will essentially be matched in the program with interrupt and program-only audio paths. As previously stated, the audio latency in the Model 5312 is very, very small so this functionality is more to address a theoretical issue.

18 kHz Tone: When a button function has been configured for *18 kHz Tone* the channel's operation is very simple. When the pushbutton is pressed or the function is active an 18 kHz sine wave tone at –20 dBFS is connected to the associated Dante transmitter (output) channel. No voice or IFB program audio is connected to the associated Dante transmitter (output) channel. The LED in the pushbutton switch will light orange whenever the function is active. Depending on the unit's configuration, when the function is inactive its LEDs can either light red, light orange at a low intensity, or not light at all.

20 kHz Tone: When a button function has been configured for *20 kHz Tone* the operation is very simple. When the pushbutton is pressed or the function is active a 20 kHz sine wave tone at –20 dBFS is connected to the associated Dante transmitter (output) channel. No voice or IFB program audio is connected to the Dante transmitter (output) channel. The LED in the pushbutton switch will light orange whenever the function is active. Depending on the unit's configuration, when the function is inactive its LEDs can either light red, light orange at a low intensity, or not light at all.

Talk with Quindar Tones: When a button function has been configured for *Talk with Quindar Tones* a simple sequence will always take place at the beginning and ending of function activity. Upon the pushbutton switch being pressed or the function being enabled, a 2525 Hz sine wave tone will be sent to the Dante output for 250 milliseconds (1/4-second). Then audio from the selected talk audio source will be connected to the Dante output. Upon the function no longer being active a sine wave tone of 2475 Hz, again for 250 milliseconds, will be sent to the Dante output. This function is provided for activation of transmitters or an aural indication that communication between earth and space personnel is taking place. The reality is that contemporary applications use Quindar Tones only so that listeners will perceive that communication between earth and humans in outer space is taking place. The LED in the pushbutton switch will light green whenever the function is active. Depending on the unit's configuration, when the function is inactive its LEDs can either light red, light green at a low intensity, or not light at all.

Disabled: When a button function has been configured for *Disabled* no audio action will take place. If the pushbutton is pressed it will flash red four or five

times to indicate that this specific button is disabled. No voice, tone, or IFB program audio is connected to the Dante transmitter (output) channel.

Using the Rotary Encoders

On the front panel of the Model 5312 are 13 rotary encoders. Twelve of the rotary encoders are located above the channel pushbutton switches. They are associated with the Dante audio input channels and how they are routed to the left, right, or left and right monitor channels. A single rotary encoder is associated with the level of the signal as it is sent to the headset's two headphone output channels, the speaker output, and the Dante monitor outputs. The 13th rotary encoder is associated with the overall level of both monitor channels. Each rotary encoder has 24 steps ("clicks" or "detents") for each 360 degrees of rotation. Turning a rotary encoder knob clockwise by 1 and 1/3 rotations (32 steps or 480 degrees) is required to change from audio minimum to audio maximum. (As expected, the same action occurs in reverse: when rotating a rotary encoder counter-clockwise by 32 steps the audio level will change from maximum to minimum.) Pressing on the top of a rotary encoder's knob will activate a momentary mute function that is used to mute the associated audio signal(s). It is also used for the solo function which is discussed in a later section.

The top surface of each rotary encoder's knob is translucent. RGB (red-green-blue) LEDs within each rotary encoder can display a wide range of colors. A rotary encoder knob that is dimly lit with a dark blue color indicates that its associated function is active. This provides a physical identification of each rotary encoder's location when a Model 5312 is being used in an environment where the ambient light is very low or nonexistent. A rotary encoder knob that's lit dark blue could be considered as being in its default state. It's important to note that there could be a signal present on the associated Dante audio input but unless the Signal Present Display configuration in the STcontroller software application has been enabled the rotary encoder's knob will remain dark blue.

A rotary encoder knob that is lit purple indicates that its associated Dante receiver (input) channel has been muted. How it functions in various operating scenarios will depend on the STcontroller configuration of that specific channel's Listen mode. There are three modes that can be individually selected for each channel. In the Always mode (the default), to mute or unmute an input channel simply requires that the associated rotary encoder knob be pressed and released ("tapped"). When the Listen mode has been configured for Channel Active, the associated Dante receiver (input) channel will be in its muted state unless that specific talk channel is active. Pressing the encoder's knob will not cause any action. As previously explained, the rotary encoder's knob will light purple when the input is muted. When the Listen mode has been configured for Channel Active Unlatches Mute, if an input channel has been placed in its muted state by pressing the encoder button, activating the channel's talk function will cause the input to automatically unmute. The input will stay in its unmuted state until the encoder's knob is again pressed. Once again in its muted state, it can be unmuted by pressing the knob or activating the talk function.

The graphics display on the front panel will assist the user in displaying a rotary encoder's level setting. Simply observe the graphics display when a rotary encoder is turned (CW or CCW) and a level indication will automatically be displayed. As previously mentioned, 32 encoder steps (1 and 1/3 full rotations) are required to move between the minimum and maximum levels.

The RGB (red-green-blue) LEDs within the rotary encoders can shine through the end of the associated knobs to provide a visual indication of the level of signal associated with the rotary encoders' functions. For the signal level to be displayed on a knob requires that the signal present display configuration in STcontroller be selected for *On*. This would be appropriate for most applications. The rotary encoder knobs labeled 1 through 12 will light in response to the level of signals connected to the associated Dante receiver (input) channels. As such, they are pre-encoder (also known as pre-fader), which means that the LEDs will respond to input signal levels prior to any gain or loss that may be selected by adjusting the associated rotary encoder. A rotary encoder's knob will light green to indicate that a signal is present on the associated Dante receiver (input) channel with a level of –40 dBFS to –16 dBFS. The knob will light yellow when the signal has a level of –15 dBFS to –5 dBFS. The knob will light red when the signal has a level that meets or exceeds –5 dBFS.

If an input channel has been placed in its muted state either by pressing the associated rotary encoder's knob or because of the Listen mode's configuration, then the top of the knob will light purple and the level display will not occur. Whenever mute is active any changes to the rotary encoder's position will not be recognized. To clarify, if a rotary encoder's knob is lit purple then any rotation of that knob will not be recognized.

Headset Operation

As previously discussed, a headset with a 5-pin male XLR connector can be mated with the female connector on the Model 5312's front panel. If power for an electret microphone that's part of the connected headset is required it should have been selected in the STcontroller software application.

Headset Headphone Outputs

Settings within STcontroller select which of the 12 Dante receiver (input) channels are routed, by way of rotary encoders 1 through 12, to the headset's headphone left and right output channels. As previously discussed, the headset's headphone output can be muted by pressing the monitor rotary encoder knob. The knob will light purple to indicate that both headphone output channels are muted. If the signal present function is enabled in STcontroller the rotary encoder's knob, when it is not muted, will light green, yellow, or red to indicate the overall headset headphone output channel level. (It will follow a monaural version of the left and right headset headphone outputs.) It's acceptable that the knob lights yellow on occasion but lighting red would indicate that either or both headphone output channels are at risk for signal clipping (distortion due to insufficient audio headroom to handle the signal level). This would indicate that distortion may be present due to insufficient audio headroom.

When a channel's Dual Channel mode has been selected, the rotary encoder associated with that channel will control the two audio channels as they are sent to the left and right channels of the headphone output.

Sidetone

A sidetone function is available for assisting headset users in hearing audio from the currently selected talk audio source. The sidetone function will be active whenever one or more buttons configured for Talk, Talk with 18 kHz, IFB, or Talk with Quindar Tones functions are active. Using STcontroller, the sidetone level can be configured from among five values as well as being muted.

The STcontroller is used to set the sidetone level to a fixed value. Sidetone is implemented in this manner such that a user will always be provided with a reference level as to how much of the talk audio signal, headset, gooseneck, or one of the Dante Aux receiver (input) channels, is being sent out the Dante transmitter (output) channels.

Solo Operation

The Model 5312 offers a solo function similar to that found on audio consoles. This is provided to assist a user in monitoring a single audio signal in "real time." A setting in STcontroller is used to enable the solo mode. The knob associated with a Dante receiver (input) channel's rotary encoder will enable the solo function for that input. The level and headphone output channel assignment will be maintained. (The solo action maintains the left-only, right-only, or both left and right channel routing; sometimes called solo in place.) When the solo function is active the knobs associated with the non-soloed Dante receiver (input) channels will be lit light blue. When one or more channels have entered the solo mode, the level of the non-soloed channels may be reduced by an amount configured in STcontroller. Choices include 6 dB, 9 dB, 12 dB, 15 dB, and full mute. If the solo function has been enabled, more than one channel can be soloed at any one time. However, in most cases, only one channel will be soloed at any one time

Headset Headphone Output and Listen Mode

Configuration settings in STcontroller allow the Dante receiver (input) channels to only be active when the associated channel button's function is active. If this configuration choice has been selected then a rotary encoder for a channel will display purple (indicating that the mute condition is active) when the same channel's button function is not active.

Monitor Outputs

The Model 5312's monitor section consists of a rotary encoder, a 2-channel headset output, an internal

loudspeaker, and a 2-channel Dante audio output function. These resources allow a wide range of listening scenarios to be implemented.

Monitor Sources and Rotary Encoders

Settings within STcontroller select which of the 12 Dante receiver (input) channels are routed, by way of the 12 rotary encoders, to the two monitor output channels. Mixing (summing) of the selected sources creates the two monitor audio signal buses. The rotary encoder, labeled Monitor, on the right side of the front panel, adjusts the level of the monitor output channels as they are sent to the headset's headphone outputs and the monitor loudspeaker. It will also adjust the level of the signals going to the Dante monitor output channels if configured for post-fader using STcontroller.

As previously discussed, the headphone, loudspeaker and post-fader monitor output channels can be muted by pressing the monitor rotary encoder's knob. The knob will light purple to indicate that mute is active. If the signal present function is enabled in STcontroller the rotary encoder's knob, when it is not muted, will light green, yellow, or red to indicate the overall monitor output level. (It will respond to a monoaural version of the two monitor channels.) During normal operation it's acceptable that the knob lights yellow on occasion. But frequently lighting red would indicate that the level of either or both monitor output channels is too high and presents a risk that signal clipping will occur.

Dante Monitor Output Channels

As previously discussed, two Dante audio output channels are associated with the Model 5312's monitor section. Several configuration settings in STcontroller impact the way in which the monitor output channels function. Twelve independent configuration choices select which of the12 Dante audio inputs are routed to either or both of the monitor output channels.

Another configuration setting determines if the Dante monitor output channels will be impacted by the monitor rotary encoder. If configured for post-fader, their signal level will respond to the setting of the monitor rotary encoder. If configured for pre-fader without mute the level of the monitor output channels will not be impacted by the action of the rotary encoder. This is provided for applications where the monitor output channels will be routed to devices that include level control and muting capability. If configured for pre-fader with mute, the level of the output signals will not change as the rotary encoder is turned but will respond to pressing the rotary encoder to mute the channels. This is provided for applications where the monitor output channels are routed to devices that contain level controls but no muting capability.

Another STcontroller configuration setting allows the monitor output channels to be automatically dimmed (attenuated) when any of the functions associated with the 12 pushbutton switches are active. This can help to ensure that audio signals being reproduced by externally connected amplified speakers don't interfere with audio that's being picked up by the selected talk audio source.

Speaker Output

The Model 5312 contains a small loudspeaker which is located on the right side of the front panel. A configuration setting in STcontroller selects the audio source or sources that are to be sent to the loudspeaker. The choices are Off, Monitor A, or Monitor B. Another configuration selection allows the loudspeaker level to automatically be dimmed (attenuated) when any of the talk or IFB functions associated with the 12 pushbutton switches are active. This can help to ensure that audio signals being reproduced by the loudspeaker don't interfere with audio being picked up by the selected talk audio source. Use the monitor rotary encoder knob to adjust the level of the loudspeaker. Push the rotary encoder's knob to mute or unmute the loudspeaker (and monitor outputs configured for pre-fader with mute and post-fader) as desired.

Monitor Output and Listen Mode

Configuration settings in STcontroller allow a Dante receiver (input) channel to only be active when its associated channel button's function is active. If this configuration choice has been selected then a rotary encoder for a channel will display purple (indicating that the mute condition is active) when the associated channel's button function is not active.

Call Indication

The Model 5312 can be configured to respond to a call signal that is present on one or more of the 12 Dante receiver (input) channels. A 20 kHz tone that's

in-band (part of the audio content in a channel) will be detected as a call signal. Any channel that is configured for Talk or Talk with 18 kHz Tone will respond to a call signal using either a visual-only indication or by way of both a visual and an audible (audio tone) indication. The visual indication is displayed by the associated rotary encoder knob's flashing orange. The audible indication is created by sending a continuous 3-burst sequence of 524 Hz sine wave tone to both the Dante monitor output channels and the internal loudspeaker. Using STcontroller, there are individual configuration choices that allow the overall level of the call tones to be independently selected for Monitor A and Monitor B.

Remote Control Inputs

It's possible that external devices can control two of the unit's 12 channels. Connections can be made to the two remote control inputs using a 3-conductor 3.5 mm TRS plug. The remote-control inputs are voltage, current, and ESD protected, allowing direct connection to external devices such foot switches or contact closures. Configuration selections in STcontroller allow these two inputs to mimic the action of any two of the 12 pushbutton switches.

Front-Panel Menu Descriptions

The following paragraphs provide information about the Model 5312's front-panel menu pages. There are three rows of menu pages which are referred to as row one, row two, and row three. Additional details about many of the page's specific configuration parameters can be found in the Model 5312 configuration section. In addition, refer to Appendix D for a front-panel menu structure diagram.

Row One

There are three menu pages associated with the top row which is referred to row one. These menu pages relate to the talk audio source, talk audio source gain, and the monitor output destination.

Talk Audio Source: This menu allows viewing and, if desired, changing the talk audio source. The choices are *Headset*, *Mic*, *Aux In A*, *Aux In B*, *Aux In C*, and *Aux In D*. This selection can also be viewed and changed using the STcontroller software application.

Talk Audio Source Gain: This menu allows viewing and, if desired, changing of the gain that is applied to the selected talk audio source. This selection can also be viewed and changed using the STcontroller software application.

Monitor Outputs Destination: This menu allows viewing and, if desired, changing the monitor output destination. The choices are *Follows Mic Source*, *Headset*, *Speaker*, and *Dante Monitor Outputs*. This selection can also be viewed and changed using the STcontroller software application.

Row Two

Row two has a total of six menu pages. They provide information that relates to the operation of the Dante primary and Dante secondary interfaces. Some menu pages are display-only while others allow changes to be made.

Dante Device Name: This display-only menu shows the unit's Dante device name. This name can be revised using the Dante Controller software application.

Dante Primary IP Address and Dante Secondary IP Address: This display-only menu page shows the IP addresses that are actively associated with the Dante primary and Dante secondary interfaces. The standard dot-decimal notation is used to show the IP addresses. If no Ethernet connection has been made to an RJ45 jack then the text **No Link** will show for that interface.

Dante Pri IP Configuration: This menu page will display the active method and allow changing the method that the Model 5312's Dante primary Ethernet interfaces will utilize to obtain its IP address. The choices are *Automatic* and *Manual.* Information about each method is covered in later paragraphs. To change the method, press the Enter pushbutton switch on the front panel. Then use the up and down arrow pushbutton switches to select the desired method. Once the desired method has been selected, press the Enter button to store it. To instruct the unit to use the new method requires that the Dante interface be rebooted (restarted). This can be performed using the reboot Dante front-panel menu page. Alternately, rebooting the Model 5312 by means of another front-panel menu can be used. A power cycle (removing and then re-connecting AC mains power) can also be utilized to cause the revised method to be used.

Viewing and selecting the method used to obtain both the Dante primary and Dante secondary IP addresses can be performed using the Dante Controller software application. Once a change has been made in this manner, the Dante interface will need to be rebooted, a function that can also be performed using a command in Dante Controller.

Selecting *Automatic* by way of the front-panel menu will cause the Dante primary interface to use DHCP to obtain its IP address. If DHCP is not available on the network connection, the IPv4 link-local protocol will be used to establish the IP address. An IP address that has a format of 169.254.x.x is one that was assigned to the Dante primary interface using the IPv4 link-local protocol. (The format of 172.31.x.x is used by the Dante secondary interface if link-local is active and utilized.) It's important to note that even if an IP address was established using link-local, the DHCP protocol will remain active. In this case, the Dante primary interface will continue to check for the presence of a DHCP server. If one becomes available, an IP address will be requested and, when obtained, will automatically replace the IP address that was previously established by way of link-local.

The *Manual* setting allows the Dante primary IP address and associated subnet mask value to be manually entered by way of another menu page. Alternately, the Dante Controller software application can be utilized for this task. Selecting *Manual* can be useful when a fixed or static addressing scheme is desired. In this way, a designated IP address and subnet mask value can be entered. To cause the Model 5312's Dante primary Ethernet interface to use a manually entered IP address configuration method requires that the Dante interface be rebooted (restarted) or the entire unit rebooted. This can be performed using the Dante reboot front-panel menu page, using the reboot device front-panel menu page, or by power cycling (restarting) the Model 5312.

Manual Primary IP Address and Manual Primary Subnet Mask: This menu page is display-only when *Automatic* has been selected to establish the Dante primary IP address. When *Manual* has been selected, this menu will allow changes to be made to the Dante primary interface's IP address and subnet mask values. The Dante interface must be rebooted for revised manual IP address and subnet mask values to take effect. These values can be changed and the interface rebooted using the Dante Controller software application.

Dante Product Version and Dante Firmware Version: This menu page shows the Studio Technologies' version number of the Dante interface firmware version as well as the actual firmware version that's stored in and is being utilized by the Brooklyn module. The latter is incorporated into the Dante firmware file (with a file extension of .dnt) that is released by Studio Technologies specifically for the Model 5312. This firmware, part of the Brooklyn module's firmware, can be updated by way of an Ethernet connection using a standard web browser.

Reboot Dante: This menu page allows the Model 5312's Dante interface to be rebooted (restarted). This can be useful for assisting in factory troubleshooting or to force the unit to utilize revised Dante interface configuration changes. Technically, the reboot function will cause the unit's Brooklyn module to be restarted. To start the process of rebooting the Dante interface, press the Enter pushbutton on the unit's front panel. This will lead to a confirmation page being shown. Use the left and right arrow pushbutton switches to select the desired action. The choices are to cancel or to confirm. Press the Enter pushbutton switch to select the highlighted action. The Model 5312 will then immediately commence the selected action. After performing a Dante reboot (restart), a period of up to 30 seconds may be required for the Model 5312's Dante operation to fully restore.

Row Three

Row three contains four menu pages. Three of the menu pages are display-only and provide general information about the Model 5312 including the unit's serial number along with the version numbers of the main MCU, secondary MCU, and FPGA firmware (embedded software). A fourth menu page allows the system to be rebooted (restarted).

Product Name & Serial Number: This menu page shows the name of the product (Model 5312) and the hardware serial number. This name and serial number (along with the two MAC addresses associated with the unit's Ethernet interfaces) are assigned at the factory and cannot be changed.

Main MCU and Secondary MCU Firmware Versions: This display-only menu page shows the version numbers of the Model 5312's main MCU and secondary MCU firmware. These firmware files can be updated using a USB flash drive. Update details are provided in the Technical Notes section.

FPGA Firmware Version: This menu page shows the version number of the Model 5312's FPGA (field-programmable-gate-array) firmware. This firmware can be updated using a USB flash drive. Update details are provided in the Technical Notes section.

Reboot Device: This menu page allows the Model 5312 to be rebooted (restarted). This can be useful to force the Model 5312 to utilize revised configuration values. It will also cause the Dante interface to reboot. An arrow icon may show in the upper-right corner of this menu. To start the process of rebooting the Model 5312, press the Enter pushbutton on the unit's front panel. This will lead to a confirmation page being shown. Use the left and right arrow pushbutton switches to select the desired action. The choices are to cancel or to confirm. Press the Enter pushbutton switch to select the highlighted action. The Model 5312 will then commence the selected action. After performing a system reboot (restart), a period of up to 30 seconds may be required for Model 5312 operation to fully restore.

Technical Notes

Interconnecting Two Model 5312 Units

Features have been provided such that two Model 5312 units can function together. This allows support for more than 12 channels without the need for two talk audio sources. (It's important to note that the two units cannot be easily configured such that their monitoring functions can be interconnected.) For descriptive purposes, this text will refer to one Model 5312 as the Leader and a second Model 5312 as the Follower. The Leader will be used to provide the talk audio source for both Model 5312 units. The talk audio source for the Leader unit can be a headset with an integrated microphone, a gooseneck microphone, or an external source of talk audio. The Model 5312 unit designated as Follower would utilize the Leader unit's hot mic output function as its talk audio source.

The required configuration is very simple. Using the STcontroller application, the hot mic function on the Leader unit will be enabled. On the Follower unit, STcontroller would be configured to allow one of the four Dante Aux In receiver (input) channels to be used as the talk audio source. Using the Dante Controller application, the hot mic Dante transmitter (output) channel on the Leader unit would be subscribed (routed) to the applicable aux in Dante receiver (input) channel on the Follower unit. Finally, to use this implementation requires that the talk audio source on the Follower unit to be selected for the applicable aux in channel. This final action can be performed using either STcontroller or the front-panel buttons.

IP Address Assignment

By default, each of the Model 5312's Ethernet interfaces 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 also known as auto-IP, PIPPA, or APIPA.) When using link-local Dante primary will randomly assign a unique IP address in the IPv4 range of 169.254.x.x. (Dante secondary will use 173.31.x.x.) 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 acquire unique IP addresses and be able to communicate with each other.

As previously discussed, the Model 5312's IP address(es) and related network parameters can be manually set for a fixed (static) configuration using the Dante Controller software application. In the unfortunate event that a specific Model 5312'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 5312. 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 (voice-over-Internet-protocol quality of service) capability is recommended. This can typically 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 for details on how to optimize a network for Dante applications.

Button Labeling

The Model 5312 provides 12 pushbutton switches that are associated with the 12 talk functions. The button covers are clear with a white translucent lens underneath. As of the time of writing this guide the factory doesn't have a recommended method as to how to install custom labels underneath the button caps. We have observed units where this has been successfully implemented but exactly how it was executed is not known. It's possible that a button cap can be removed using a gentle prying force on its bottom edge using a straight-blade screwdriver. An Xcelite® "greenie" screwdriver, ubiquitous to the audio and broadcast industry, might be appropriate. Once a cap is removed a custom label could be inserted between it and the translucent lens. Then the cap could be "snapped" back onto the body of the switch.

Firmware Version Display

The STcontroller software application is used to display the version numbers of the Model 5312's three firmware (embedded software) components. These are the main MCU firmware, the secondary MCU firmware, and the FPGA firmware. The main MCU firmware is used by the main microcontroller integrated circuit to implement most of the Model 5312's general operating actions. The secondary MCU firmware is used by a second, less-sophisticated microcontroller integrated circuit that controls and reports on the actions of the rotary encoders, the pushbutton switches, and the LEDs associated with them. The FPGA firmware is used by the field-programmable-gate-array integrated circuit in which all audio processing is performed.

To observe the firmware version numbers, begin by connecting the Model 5312 unit to an active LAN. AC mains power will also have to be connected by way of the IEC 320 C14-compatible connector on the back panel. As soon as AC mains power is applied, the unit will start up and begin to function. Run the STcontroller application and review the list of identified devices. Select the specific Model 5312 from which you want to determine its firmware versions. Then select **Version** under the **Device** tab. A dialog will display that will provide a host of useful information. This will include the main MCU, secondary MCU, and FPGA firmware version numbers as well as details on the Dante interface firmware.

Firmware Update Procedure

It's possible that updated versions of the three firmware (embedded software) files that are utilized by the Model 5312's two microcontroller and one FPGA (field-programmable-gate-array) integrated circuit will be released to add features or correct issues. Refer to the Studio Technologies' website for the latest firmware files. The unit has the ability to load revised files into non-volatile memory by way of a standard USB flash drive (memory stick). The Model 5312 implements a USB host function and provides access by way of a type A receptacle located on the back panel. The Model 5312 updates its firmware using files named **M5312vXrXX.stm** for the Main MCU firmware, **M5312vXrXX.sts** for the Secondary MCU firmware, and **M5312vXrXX.stf** for the FPGA firmware, where *XrXX* represents the actual version numbers.

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. One, two, or all three of the firmware files can be automatically loaded at the same time. In the root directory, save the desired new firmware file(s), ensuring that the required name or names are specified. For the Main MCU firmware the file name must be **M5312vXrXX.stm**. For the Secondary MCU firmware the file name must be **M5312vXrXX.sts**. And for the FPGA firmware the file name must be **M5312vXrXX.stf**. Be certain to use the eject command to ensure that the desired files are correctly stored on the USB flash drive. Studio Technologies will supply each firmware file inside a .zip archive file. While the firmware file inside of the zip file will adhere to the naming convention required by the Model 5312, the name of the zip file itself will include the file's version number. For example, a file named

M5312v1r04MCU.zip would indicate that version 1.04 of the Main MCU firmware (**M5312v1r04.stm**) is contained within this zip file.

Once the USB flash drive is inserted into the USB receptacle, located on the back panel, the unit must be powered off and again powered on. At this point the file(s) will automatically load.

To install one, two, or all three firmware files follow these steps:

1. Remove AC mains power from the Model 5312.
2. Locate the USB receptacle on the Model 5312's back panel, labeled Firmware Update. Adjacent to the USB receptacle is a small hole that provides visual access to a green LED indicator.
3. Insert the prepared USB flash drive into the USB receptacle.
4. Apply AC mains power to the Model 5312.
5. After a few seconds the Model 5312 will run a "boot loader" program that will automatically load and save the new firmware file(s) that are present on the USB flash drive. The update process can range from approximately 15 seconds to approximately 45 seconds, depending on which combination of the three files are going to be updated. While the files are being loaded the green LED, located adjacent to the USB receptacle, will flash slowly. It's also possible that the 13 knobs associated with the rotary encoders will light red to indicate that normal activity is not taking place. Once the entire loading process has completed the Model 5312 will restart using the newly saved firmware.
6. At this time the Model 5312 is functioning with the newly loaded firmware and the USB flash drive can be removed. To be conservative, remove the AC mains power source first and then remove the USB flash drive.
7. Confirm that the desired firmware has been loaded and that the Model 5312's main MCU, secondary MCU, and FPGA firmware files are as you desire. This is accomplished using the STcontroller software application. (Use the **Version** selection under the **Device** tab.)

Note that upon AC mains power being applied to the Model 5312, if the USB flash drive doesn't have the correct file(s) in its root folder no harm will occur. Upon power up the green LED, located adjacent the USB receptacle, will flash on and off rapidly for a few seconds to indicate that a valid file has not been found and then normal operation using the unit's existing firmware will begin.

Dante Firmware Update

As previously discussed, the Model 5312 implements Dante connectivity using the Brooklyn module from Audinate. The Dante Controller software application can be used to determine the version of the firmware (embedded software) that resides in the Brooklyn module. The STcontroller software application can also be used to identify this firmware version. (Use the **Version** selection under the **Device** tab.) The Dante Updater software application that's provided as part of the Dante Controller software application is an automated method of updating the Brooklyn module's firmware. The application is available, free of charge, on the Audinate website.

Restoring Factory Defaults

A command in the STcontroller software application allows the Model 5312's default configuration selections to be reset to their factory values. From STcontroller select the Model 5312 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 5312's factory default values.

Five-Second Delay in Storing Values

The values associated with an operational or configuration change made to the Model 5312 will be stored in the Model 5312's non-volatile memory five seconds after the last change is made. This delay is implemented in the unit's firmware (embedded software) to limit the number of memory "writes" that have to be performed. As such, a user should not expect a change made in the unit's operation, followed immediately by disconnection of the AC mains source, to be stored. A minimum of five seconds between these two actions would be required for the value(s) associated with the change(s) to be stored and used at the time of the next unit start-up.

Specifications

Applications: Dante-based broadcast, theater, industrial, and aerospace intercom; broadcast IFB (talent cue) master station; audio monitor mixer

Network Audio Technology:

Type: Dante audio-over-Ethernet

AES67-2018 Support: yes, selectable on/off

Dante Domain Manager (DDM) Support: yes

Ethernet Interface Configuration: Switched or Redundant

Bit Depth: 16, 24, or 32

Sample Rate: 48 kHz

Number of Dante Receiver (Input) Channels: 16

Number of Dante Transmitter (Output) Channels: 16

Number of Dante Flows: 32 receiver, 32 transmitter

Internal Digital Audio Processing: 32-bit, fixed

Input-to-Output Audio Processing Latency: <200 uSec

Nominal Input and Output Level: –20 dBFS

Network Interfaces: 2, primary (PRI) and secondary (SEC)

Type: 1000BASE-T Gigabit Ethernet (GbE) per IEEE 802.3ab (10 and 100 Mb/s not supported)

Microphone Input – Headset:

Compatibility: 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

Type: unbalanced

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: 26, 32, 38, 44, 50 dB, selectable

Frequency Response: –4 dB at 30 Hz, –2.6 dB at 40 Hz, –1.8 dB at 50 Hz, –2.4 dB at 10 kHz, –3.8 dB at 20 kHz

Distortion (THD+N): <0.09%, measured at –20 dBFS, 22 Hz to 22 kHz bandwidth, 38 dB of gain

Dynamic Range: >93 dB, A-weighted, 26 dB gain

Microphone Input – Gooseneck:

Compatibility: Studio Technologies' GME-3-12

Microphone Power: 3.3 volts DC via 2.49 k resistor

Impedance: 2.0 k ohms, nominal

Gain: 12, 18, 24, 30, 36, 42 dB, selectable

Frequency Response: –3.0 dB at 40 Hz, –2.0 dB at 50 Hz, –2.0 dB at 16 kHz, –3.0 dB at 20 kHz

Distortion (THD+N): <0.04%, measured at –20 dBFS, 22 Hz to 22 kHz bandwidth, 36 dB of gain

Dynamic Range: >97 dB, A-weighted, 12 dB gain

Compressor:

Application: applies to headset and gooseneck microphone audio

Threshold: 1 dB above nominal Dante transmitter (output) level (–19 dBFS) (–13 dBFS when goose-neck mic gain selected for 42 dB)

Slope: 2:1

Dante Receivers (Inputs) – Monitor 1-12:

Frequency Response: not applicable, sources are Dante receivers (inputs) which pass data through to Dante transmitters (outputs)

Dante Receivers (Inputs) – Auxiliary 1-4:

Applications: configurable as IFB program audio sources and auxiliary talk input

Frequency Response (Call Detect Disabled): not applicable, sources are Dante receivers (inputs) which pass data through to Dante transmitters (outputs)

Frequency Response (Call Detect Enabled): 20 Hz to 12 kHz, +0/–3 dB, nominal

Level Trim: –12, –6, 0, 6, and 12 dB, adjustable

Dante Transmitters (Outputs) – Monitor Outputs 1-2:

Dim (Attenuation): 0, 6, 12, 18 dB, configurable

Dante Transmitter (Output) – Tally Tone:

Frequency: 18 kHz sine wave

Level: –20 dBFS

Headset Headphone Output:

Type: 2-channel (stereo)

Compatibility: intended for connection to stereo (dual-channel) or monaural (single-channel) headsets with a nominal impedance of 50 ohms or greater

Maximum Output Voltage: 3.0 Vrms, 1 kHz, 150 ohms load

Frequency Response: 20 Hz to 20 kHz, +0/–1 dB

Distortion (THD+N): <0.02%

Dynamic Range: >93 dB

Dim (Attenuation): 0, 6, 12, 18 dB, configurable

Speaker Monitor Output:

Type: single-channel (monaural)

Speaker: 1.5-inch (37 mm) diameter

Maximum Power: 5 watts RMS, nominal

Frequency Response: 150 Hz to 20 kHz, ±3 dB

Dim (Attenuation): 0, 6, 12, 18 dB, configurable

18 kHz and 20 kHz Tone Outputs:

Type: sine wave

Level: –20 dBFS

Frequency Accuracy: <10 ppm

Distortion: <0.0001%

Call Function:

Receive Frequency: 20 kHz, ±800 Hz, within audio channel

Receive Level: –27 dBFS minimum

Send Frequency: 20 kHz

Send Level: –20 dBFS

Audible Alert: 3-burst sequence, 524 Hz, sine wave, selectable level range

Remote Control Inputs: 2

Function: configurable, can mimic the action of two talk buttons

Type: active low, 1 mA maximum, input pulled up to 3.3 volts DC via 3.4 k ohm resistors

AC Mains Power Source: 100 to 240 V, 50/60 Hz; 30 W maximum

Connectors:

Headset: 5-pin female XLR

Gooseneck Microphone: 3-conductor ¼-inch with 7/16-20 UNF threaded bushing; 4-40 UNC hex head socket set screw allows microphone to be secured into bushing

Ethernet: 2, RJ45 jacks

Remote Control Inputs: 3-conductor 3.5 mm TRS jack

USB: type A receptacle (used or updating main MCU, secondary MCU, and FPGA firmware)

AC Mains Input: 3-blade, IEC 320 C14-compatible (mates with IEC 320 C13)

Configuration: requires Studio Technologies' STcontroller software application

Software Updating: USB flash drive supports updating of main MCU, secondary MCU, and FPGA firmware (embedded software); Dante interface firmware updated via Ethernet interface

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):

19.0 inches wide (48.3 cm)

1.72 inches high (4.4 cm)

5.3 inches deep (13.5 cm)

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

Weight: 2.4 pounds (1.1 kg)

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

Appendix A–STcontroller Default Configuration Values

General Menu Page:

Talk Audio – Source: Headset

Talk Audio – Headset Mic Power: Off

Talk Audio – Headset Mic Gain: 34 dB

Talk Audio – Gooseneck Mic Gain: 28 dB

Talk Audio – Dante Aux In Trim: 0 dB

Monitor Outputs – Destination: Follow Mic Input Source

Monitor Outputs – Channel Solo: Full Mute

Monitor Outputs – Monitor A Call Tone Level: Medium

Monitor Output – Monitor B Call Tone Level: Medium

Headset – Sidetone Level: Medium

Speaker – Source: Monitor A

Speaker – Dim: 6 dB

Speaker – Dim using Aux In D: Off

System – Signal Present Display: On

System – LED Intensity and Action: High – Off when Inactive

System – Hot Mic: Off

System – Remote Control Input 1: Off

System – Remote Control Input 2: Off

Dante Monitor Outputs – Mode: Off

Dante Monitor Outputs – Dim: 6 dB

Dante Monitor Outputs – Dim using Aux In D: Off

Channel Specific Menu Page (all parameters identical for Channels 1-12):

Button Mode: Hybrid

Button Function: Talk

IFB Program Source: Channel 1

IFB Program Dim: 15 dB

Headset Routing: Left and Right

Monitor Routing: Monitor A

Listen Mode: Always

Call Indication: Visual Only

Appendix B–Dante Interface Default Values

Dante Interface Default Values

Device Config, Sample Rate: 48k (fixed, can’t be changed.)

Device Config, Sample Rate Pull-up: none supported (fixed, can’t be changed)

Device Config, Encoding: PCM 24

Device Config, Clocking, Unicast Delay Requests: Disabled

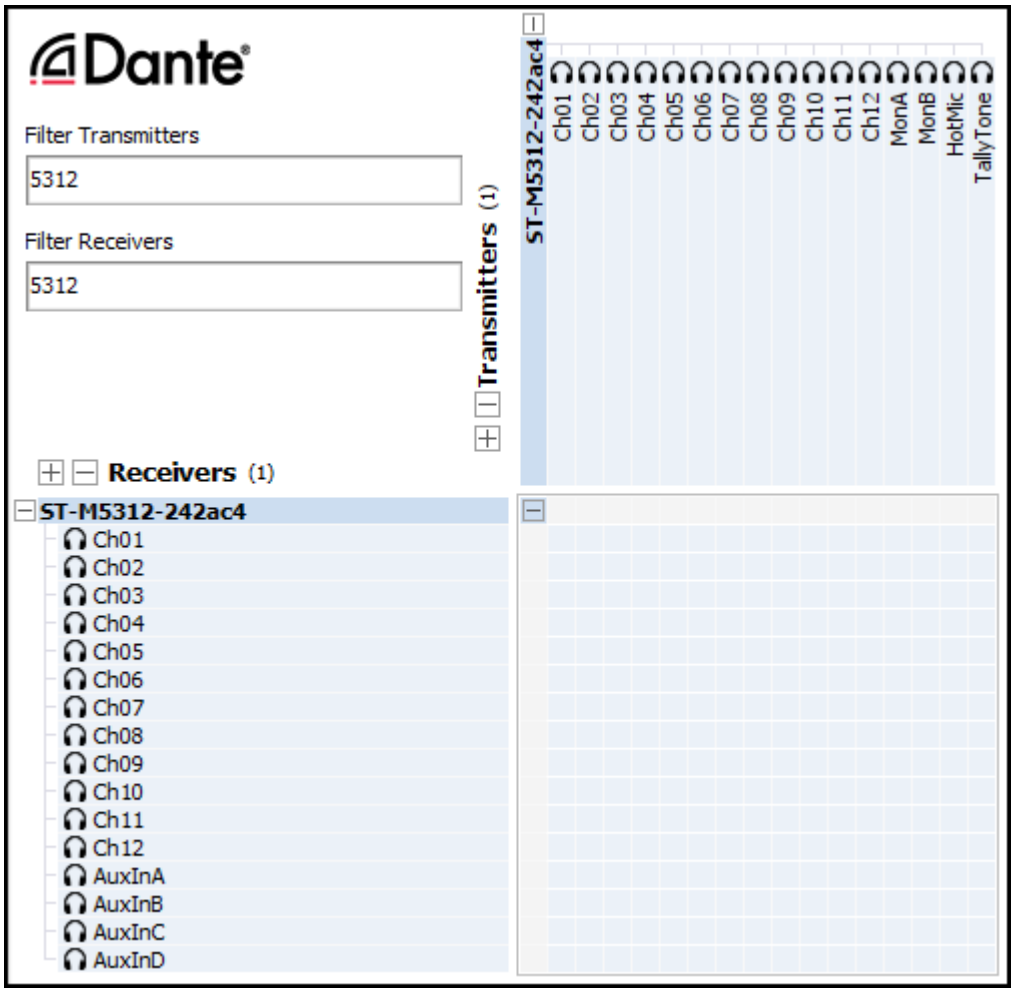
Device Config, Device Latency: Latency: 1.0 msec

Network Config, Dante Redundancy, Current: Switched

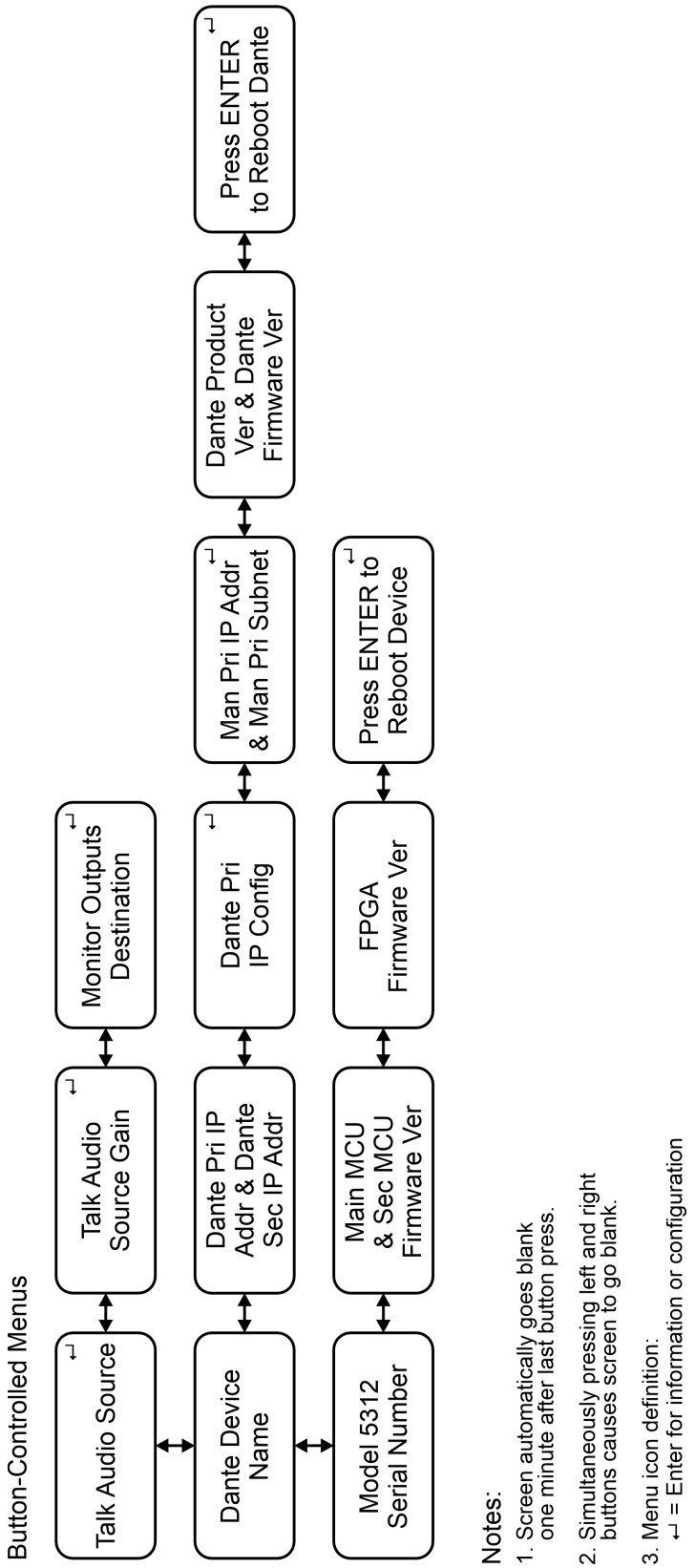
Network Config, Addresses: Obtain an IP Address Automatically

AES67 Config, AES67 Mode, Current: Disabled

Appendix C–Dante Controller Unit and Channel Name Details



Appendix D–Model 5312 Front-Panel Menu Structure



Notes:

1. Screen automatically goes blank one minute after last button press.
2. Simultaneously pressing left and right buttons causes screen to go blank.
3. Menu icon definition:
   ↵ = Enter for information or configuration