

# **Model 348 Intercom Station**

## **User Guide**

Issue 8, July 2022

This User Guide is applicable for serial numbers M348-00251 and later with main firmware version **2.05** and later and STcontroller application version **3.08.00** and later.

Also applicable to units with serial numbers M348-00151 to 00250; see Appendix C for details.

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## Revision History

### **Issue 8, July 2022:**

- Documents new Tally Tone Dante transmitter (output) channel.

### **Issue 7, January 2022:**

- Adds Appendix C which documents differences in units with serial numbers 00151 to 00250.

### **Issue 6, December 2021:**

- Documents new Listen mode.

### **Issue 5, May 2021:**

- Documents that support is now included for two remote control inputs.
- Documents that a Dante receiver (input) channel can be used as a microphone input source. (In conjunction with this, Dante receiver (input) channel 16 renamed from “IFB Pgm 8” to “Aux In.”)
- Documents new Talk with Quindar Tones button mode.
- Miscellaneous corrections and improvements.

### **Issue 4, April 2021:**

- Documents that unit now enumerates itself as a class 3 PoE device.

### **Issue 3, February 2021:**

- Clarifies the Microphone Input – Source function in STcontroller.

### **Issue 2, August 2020:**

- Corrects errors in Issue 1.

### **Issue 1, January 2020:**

- Initial release of complete document.

# Model 348

## INTERCOM STATION

### Introduction

The Model 348 Intercom Station provides eight independent talk and listen channels that are compatible with Dante® audio-over-Ethernet networks. The desktop 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 348'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 348 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 the Model 348 user's ability to easily create monitor mixes from the eight input audio channels. This makes the unit a viable choice for listen-only scenarios.

Over a standard IP network, multiple Model 348 units can be used in party-line (PL) intercom applications with help from external Dante-enabled audio devices such as the Studio Technologies' Model 5421 or Model 5422A Dante Intercom Audio Engines. Model 348 units can also be used "point-to-point" or interfaced with Dante-compatible matrix intercom systems. The Model 348 includes two Neutrik etherCON RJ45 jacks which allow interfacing with single or redundant Dante Ethernet networks. The primary network connection can provide power to the unit using standard

Power-over-Ethernet (PoE). It can also be powered using a 12 volts DC source that is connected using a broadcast-standard 4-pin XLR connector.

The Model 348 supports connection of a broadcast- or intercom-style headset that use a dynamic or electret (DC powered) microphone. The unit provides both a 5-pin female XLR and a 3.5 mm TRRS connector allowing for a traditional "pro" or a contemporary gaming headset to be utilized. In addition, the Studio Technologies' GME-3-12 electret gooseneck microphone can be directly connected using the 1/4-inch jack located on the top of the unit's enclosure. 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.

A Dante receiver (input) channel can also be used as the talk audio source. This was specifically included to allow two Model 348 units to "work" together to support more than eight talk channels. A pushbutton switch allows users to directly select the active talk audio source. Choices include the headset mic, the gooseneck mic, or the Dante Aux In receiver (input) channel.

All Model 348 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



Figure 1. Model 348 Intercom Station front and back views

that are compatible with the Windows® and macOS® operating systems. STcontroller is a fast and simple means of configuring, revising, saving, and loading a unit's operating parameters.

The Model 348's front panel includes eight rotary controls ("encoders") which are used to adjust the level of the eight Dante monitor input signal sources. Using RGB (red-green-blue) LEDs, the knob of each encoder is illuminated and can display if a channel is muted, indicate if a signal is present on the associated audio input, and light when an in-band (20 kHz tone) call signal is detected. The user can monitor the Dante audio inputs by means of a headset, a built-in speaker, or two Dante transmitter (output) channels. Two additional rotary encoders are used to control the overall audio level and on or off (mute) status of the signals being sent to the headset and speaker outputs. A modern class-D amplifier integrated circuit drives the speaker efficiently while preserving audio fidelity.

Extensive configuration choices allow the operation of the eight pushbutton switches and associated 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. The buttons can also be configured to provide an "all-call" action associated with the talk and IFB functions.

A special button configuration mode supports the generation of talk channels that include Quindar Tones. These are short-duration "intro" and "outro" audio signals that were traditionally used in space programs to control the on and off status of transmitters. In recent years these tones have taken on the function of providing an audible indication of when Capsule Communicator (CapCom) transmissions are taking place. These ubiquitous "beeps" have become synonymous with ground-to-astronaut communications.

For performance confirmation an integrated sidetone function allows audio coming from the active talk audio source to be returned to the headset output. An audible alert, using the internal speaker, can be generated in response to a call signal. Provision has been made such that a technician can "customize" the Model 348's hardware. Option kits, purchased separately, can be added to support additional functions.

These include adding two remote control inputs which can be configured to mimic the action of talk buttons.

The Model 348's compact enclosure has overall dimensions of 6.5 inches wide (16.5 cm), 2.5 inches high (6.4 cm), and 4.6 inches deep (11.7 cm). Weighing 1.8 pounds (0.8 kg), the enclosure is made of steel to provide some "heft" to minimize the chance of inadvertent movement. The Model 348's main application firmware 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 and PoE**

The Model 348 connects to one or two local area networks (LANs) by way of two twisted-pair Ethernet interfaces. The 1000BASE-T Gigabit Ethernet (GigE) interconnections are made by way of Neutrik® etherCON RJ45 jacks. While compatible with standard RJ45 plugs, etherCON allows a ruggedized and locking interconnection for harsh or high-reliability environments. The two Ethernet interfaces can be configured, using the Dante Controller software applications, to serve in Switched or Redundant modes.

The Model 348's operating power can be provided by way of the Primary-PoE Ethernet interface using the 802.3af Power-over-Ethernet (PoE) standard. PoE allows fast and efficient interconnection with the associated data network. Alternately, an external source of nominal 12 volts DC can be connected to power the unit. If both are connected then PoE will be the active power source.

## **Dante Audio-over-Ethernet**

Audio data is sent to and received from the Model 348 using the Dante audio-over-Ethernet media networking technology. As a Dante-compliant device, the Model 348's 11 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, 16 in each direction. The digital audio's bit depth is up to 32 with a sample rate of 48 kHz. Bi-color LEDs, located on the unit's back panel, provide status indications of the Ethernet network and Dante interface performance.

The Model 348 is compliant with the AES67 interoperability standard. In addition, the unit is compatible with Audinate's® Dante Domain Manager™ (DDM) software application.

## Audio Quality

The Model 348'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 sampling rates of 48 kHz. A Dante receiver (input) channel can be used as an alternate talk source. The selected talk audio signal routes through a 32-bit micro-processor and on to the Dante interface section where it is packetized and prepared for transport over Ethernet. A total of 11 Dante transmitter (output) channels are provided: one each associated with the unit's eight channels, two monitor output channels, and one hot mic output channel.

Audio input signals arrive via 16 Dante receiver (input) channels and pass into the Model 348's 32-bit micro-processor. Eight input channels are associated with the monitor section while the other eight inputs are used as program sources for the IFB (talent cue) functions. One of the latter input sources can also serve as a talk audio source. All channel routing, headphone and monitor level control, IFB creation, and sidetone functionality is 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 and speaker outputs are sent to high-performance digital-to-analog converter circuitry and then on to robust driver circuitry.

## Future Capabilities and Firmware Updating

The Model 348 was designed so that its capabilities and performance can be easily enhanced in the future. A USB connector, located on the unit's back panel, allows the application firmware (embedded software) to be updated using a USB flash drive. The Model 348 uses the Broadway™ integrated circuit from Audinate

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

## Getting Started

### What's Included

Included in the shipping carton are a Model 348 Announcer's Console and instructions on how to obtain an electronic copy of this guide. As a device that can be Power-over-Ethernet (PoE) powered, no external power source is provided. This is because in most applications an Ethernet switch with PoE capability will be utilized. It's also possible to connect an external source of 12 volts DC to power the Model 348. If this is the case then a power supply would need to be provided separately.

### Connections

In this section, signal interconnections will be made using the connectors located on the back of the Model 348's enclosure. In addition, many applications will utilize the Studio Technologies' GME-3-12 gooseneck microphone which will be attached via the 1/4-inch jack located on the top surface of the unit.

One or two Ethernet connections will be made using either standard RJ45 patch cables or etherCON protected RJ45 plugs. The Ethernet data connection associated with the Primary-PoE RJ45 jack is compatible with Power-over-Ethernet (PoE). If desired, an Ethernet connection made to the Secondary Ethernet receptacle can provide access to a Redundant Dante network. Or it can be utilized as an active "loop through" connection associated with the Primary Ethernet connection. If PoE is not going to be utilized, or a redundant source of power is desired, a source of 12 volts DC can be connected by way of a 4-conductor XLR connector.

A dual-channel or single-channel (dual- or single-ear) headset can be connected using a cable-mounted 5-pin male XLR connector. Alternately, a "computer" headset with a 3.5 mm 4-conductor TRRS plug can be used. An electret gooseneck microphone that has an integrated 1/4-inch plug can be connected.

For special applications, the Model 348's internal circuit boards contain 3-pin "header" connectors that allow access to several functions. In addition, there's

one spare connector location on the Model 348's back panel. A technician can add a connector and wire it to the headers such that application-specific needs can be supported. For example, two contact closures can be interfaced to the Model 348's circuitry allowing external switches to activate two of the button functions. Refer to the Technical Notes section for details.

### **One or Two Ethernet Connections**

One 1000BASE-T Gigabit Ethernet (GigE) connection is required for Model 348 operation. If available and connected to the Primary-PoE RJ45 jack, this connection can provide both the Ethernet data interface and power for the Model 348's circuitry. A 100BASE-TX (100 Mb/s) connection may be adequate but not optimal. A 10BASE-T (10 Mb/s) connection is not sufficient.

A second 1000BASE-T Gigabit Ethernet (GigE) connection can be made if Redundant Dante is desired. The Model 348's network configuration must be set for Redundant for this functionality to be active. PoE is not supported on the Secondary Ethernet connection. The Secondary Ethernet interface can also be used as a "loop through" connection such as would be provided by an Ethernet switch. This requires that the Model 348's network configuration be set for Switched. Using the secondary 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 Ethernet connections are made by way of two Neutrik etherCON protected RJ45 jacks that are located on the back of the Model 348's enclosure. These allow connection by way of cable-mounted etherCON connectors or standard RJ45 plugs. The Model 348's Ethernet interfaces support auto MDI/MDI-X so that crossover cables are not required. The Model 348's Primary Ethernet connection enumerates itself as a class 3 device. As such, a PoE power-sourcing-equipment (PSE) port could be required to supply up to 12.94 watts of power.

### **External 12 Volts DC Input**

An external source of 12 volts DC can be connected to the Model 348 by way of the 4-pin male XLR connector which is located on the back panel. While the requirement for the external source is nominally 12 volts, correct operation will take place over a 10 to 18 volt range. The Model 348 requires a maximum

of 1.1 amperes at 12 volts DC for correct operation. The DC source should be terminated to a 4-pin female XLR connector with pin 1 negative (-) and pin 4 positive (+).

If an external power source is required, the PS-DC-02 power supply, available as an option from Studio Technologies, is directly compatible with the Model 348. Its AC mains input allows connection to 100-240 volts, 50/60 Hz with an output of 12 volts DC, 1.5 amperes maximum. Its DC output is terminated on a 4-pin female XLR connector.

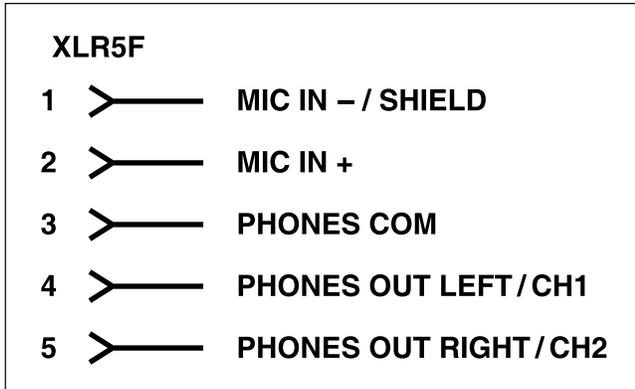
As previously discussed, an Ethernet connection that provides power-over-Ethernet (PoE) can serve as the Model 348's power source. Alternately, an external 12 volts DC source can be connected. For redundancy, both PoE and the external source can be connected at the same time. If both PoE and an external 12 volts DC source are connected, power will be drawn only from the PoE supply. If the PoE source becomes inoperative the 12 volts DC source will provide the Model 348's power. No interruption in operation will occur during a power source transition.

### **Headset Connections**

The Model 348 allows two different types of headsets to be connected. A 5-pin female XLR connector, located on the Model 348's back panel, allows connection of a standard broadcast- or intercom-style communications headset. A 3.5 mm 4-conductor TRRS jack, also located on the back panel, allows a computer gaming headset to be directly connected. The Model 348's two headset connectors are electrically wired in parallel. As such, only one type of headset should be connected at one time.

#### **Headset A**

The Model 348 provides a 5-pin female XLR connector that interfaces with the microphone and headphone connections of a single- or dual-ear intercom or broadcast-style headset. The connector is labeled Headset A. Refer to Figure 2 for connection details. The microphone input connections are compatible with most unbalanced dynamic or electret (low-voltage DC-powered) microphones. A balanced dynamic microphone should, in most cases, also function correctly if its signal - (low) is connected to Model 348's mic in -/shield connection. No support is provided for microphones that require P12 or P48 phantom power.



**Figure 2. Headset A connection pinout chart**

To allow users of stereo (dual-earpiece or “double-muff”) headsets to hear a monaural version of the two headphone output channels does not require special wiring of the 5-pin male XLR mating connector. The headset’s left headphone channel should always be wired to pin 4 and the right headphone channel to pin 5. Configuration choices using the STcontroller software application, as discussed in later sections, can be used to create the desired monaural output. It’s important not to connect together (short) pins 4 and 5 of the headset’s connector as damage to the Model 348’s output circuitry could result.

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

It’s possible that some Beyerdynamic headset interconnecting cable assemblies will terminate its earpiece’s left and right connections opposite from what the Model 348 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 a headset’s connector such that the left earpiece connects to pin 4 and the right earpiece to pin 5.

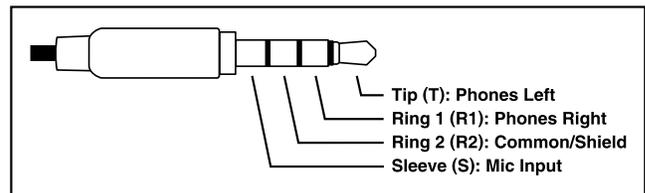
If a separate microphone and pair of stereo or monaural headphones need to be connected an adapter cable assembly must be fabricated. It would consist of a 5-pin male XLR connector wired to both a 3-pin female XLR connector for the microphone and a 3-conductor 1/4-inch or 3.5 mm TRS jack for the

headphones. In this scenario, the microphone would, in most cases, be a dynamic type as the Model 348 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.

### **Headset B**

The Model 348 also allows direct connection of gaming headsets that are ubiquitous in the personal computer world. The 3.5 mm 4-conductor TRRS jack, labeled Headset B, is compatible with the CTIA™/AHJ configuration standard which has the headphone left channel on the tip connection, the headphone right channel on the ring 1 connection, common on the ring 2 connection, and the microphone on the sleeve connection.

Compatible headsets are readily available, typically described as personal computer or gaming headsets. The microphones used in these headsets are electret type which require a low-voltage DC source for operation. The Model 348 is able to provide this power and requires only that the appropriate setting in the STcontroller software application be selected. Refer to Figure 3 for a detailed description of the compatible TRRS plug.



**Figure 3. Headset B (TRRS) connection pinout chart**

### **Gooseneck Microphone**

A threaded combination bushing/3-conductor 1/4-inch jack is incorporated into the top panel of the Model 348. 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 the gooseneck microphone are that it contain an electret microphone and the interconnection be in the form of a 1/4-inch 3-conductor plug with integrated threads that have a pitch 7/16-20 UNF.

The 3-conductor 1/4-inch jack associated with the Model 348'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 348's circuitry the ring and sleeve connections are connected together as well as being "tied" (connected) to the chassis.

The Model 348'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 348 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.

## Dante Configuration

For audio to correctly pass to and from the Model 348 requires, as a minimum, that several Dante-related parameters be configured. These configuration settings will be stored in non-volatile memory within the Model 348's circuitry. Configuration will typically be done with the Dante Controller software application which is available for download, free of charge, at [audinate.com](http://audinate.com). Versions of Dante Controller are available to support both the Windows and the macOS operating systems. The Model 348 uses the Broadway integrated circuit to implement the Dante functionality. The Model 348 is compatible with the Dante Domain Manager (DDM) software application.

## Audio Routing

The Model 348's 11 Dante transmitter (output) channels must be assigned to the desired Dante receiver (input) channels on associated equipment. This will route the Model 348's eight talkback, two monitor, and one hot mic 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 Broadway integrated circuit and, as such, the Model

348, is 16 so there's a minimal 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 Dante transmitter (output) channels will function in multicast; unicast is not supported.)

Using Dante Controller the desired audio sources need to be routed to the Model 348's 16 Dante receiver (input) channels. The exact number utilized will depend on the specific application. The first eight Dante receiver (input) channels are automatically assigned to the rotary encoders and can be used for listening to the associated intercom channels or as general-purpose audio channel monitoring. The second set of eight Dante receiver (input) channels are associated with the IFB (talent cue) functions. They will be utilized only with channels that have their IFB function enabled. The last Dante receiver (input) channel, labeled Aux In, can be used as both an IFB program source and a mic input.

## Unit and Channel Names

The Model 348 has a default Dante device name of **ST-M348-** along with a unique suffix. The suffix identifies the specific Model 348 that is being configured. The suffix's actual alpha and/or numeric characters relate to the MAC address of the unit's Broadway integrated circuit. The 16 Dante receiver (input) audio channels have default names of **Ch 1 – Ch 8, IFB Pgm 1 – IFB Pgm 7, and Aux In**. The 12 Dante transmitter (output) audio channels have default names of **Ch 1 – Ch 8, Mon A, Mon B, Hot Mic, and Tally Tone**. Using Dante Controller the default device name and channel names can be revised as appropriate for the specific application.

## Device Configuration

The Model 348 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 the default selection of *PCM 24* would be appropriate. Clocking and Device Latency can be adjusted if required but the default values are typically correct.

## Network Configuration – Dante Redundancy

The Model 348 allows connection of two Ethernet signals. Two RJ45 jacks are located on the unit's back panel and are labeled Primary-PoE and Secondary. In

the network configuration Dante Redundancy section of Dante Controller how these ports function can be selected. The choices are *Switched* or *Redundant*.

If *Switched* is selected (the factory default) then the Model 348 will be able to establish one connection with an Ethernet network. It doesn't matter which RJ45 jack is utilized, although for PoE powering the jack labeled Primary-PoE must be utilized. The other RJ45 jack can be used to interconnect with another piece of networked equipment. If the Model 348'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 348'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 Primary-PoE and Secondary RJ45 jacks. A personal computer that's running STcontroller will typically be associated with the network that is connected to the Primary-PoE RJ45 jack.

When the Model 348 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 Primary-PoE or the Secondary RJ45 jacks. If the network configuration has been configured for Redundant then separate IP addresses and related network parameters will be assigned to the Primary-PoE and Secondary Ethernet ports.

### **Network Configuration – Addresses**

By default, the Model 348'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. But in this case, it's highly recommended that every unit be physically marked, e.g., directly using a permanent marker or "console tape," with its specific static IP address. If knowledge of a Model 348's IP address

has been misplaced there is no reset button or other method to easily restore the unit to a default IP setting.

Note that if the Model 348'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 348 can be configured for AES67 operation. This requires the AES67 Mode to be set for Enabled. By default, AES67 mode is set for Disabled.

### **Model 348 Clocking Source**

While technically the Model 348 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 348 would not be enabled.

## **Model 348 Configuration**

The STcontroller software application from Studio Technologies is used to configure the way in which the Model 348 functions. No DIPswitch settings or other local actions are used to configure the unit. This makes it imperative that STcontroller be available for convenient use on a personal computer that's connected to the related LAN.

### **Installing STcontroller**

STcontroller is available free of charge on the Studio Technologies' website ([studio-tech.com](http://studio-tech.com)). Versions are available that are compatible with personal computers running selected versions of the Windows and macOS operating systems. If required, download and install STcontroller onto a designated personal computer. This personal computer must be on the same local area network (LAN) and subnet as the Model 348 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 348 units to be configured will appear in the device list. Use the *Identify* command to allow easy recognition of a specific Model 348 unit. Double-clicking on a device name will cause the associated configuration menu

to appear. Review the current configuration and make any changes that are desired.

Changes made using STcontroller will be immediately reflected in the unit's operation; no Model 348 reboot is required. Each time a change is made the eight buttons on the Model 348's front panel will flash orange in a distinctive pattern to indicate that a command from STcontroller has been received.

## General Menu Page

The following configuration selections are available in the General menu selections tab:

### Microphone Input – Source

Choices are *Headset*, *Gooseneck*, and *Dante Aux In*

The microphone associated with a connected headset, the gooseneck microphone, or the Dante Aux In channel can be selected as the Model 348's microphone (talk) audio source. STcontroller can be used to select the desired microphone source, as can the pushbutton switch located on the Model 348's front panel. All three sources are available for use in "real-time." This field provides two functions, displaying the active microphone source as well as allowing the selection of it.

### Microphone Input – Headset Mic Power

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

A headset can be connected by way of a 5-pin female XLR connector, labeled Headset A, or a 3.5 mm 4-conductor TRRS jack, labeled Headset B. Enable the headset microphone power check box if the connected headset has an electret microphone which requires a source of low-voltage DC for operation. In virtually all cases gaming or computer headsets that use a 3.5 mm TRRS plug will require microphone power. Most broadcast headsets that terminate on a 5-pin male XLR connector will incorporate a dynamic (non-powered) microphone. In this case, do not enable headset microphone power. The on/off status of the headset microphone power is displayed by way of an LED, red in color, that is located on the Model 348's back panel below the Headset A connector.

Note that the Model 348 cannot supply P12 or P48 phantom power that may be 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 for Model 348 applications.

### Microphone Input – Headset Mic Gain

Choices are *26 dB*, *32 dB*, *38 dB*, *44 dB*, and *50 dB*

To match the requirements of a microphone associated with a headset, the gain of the microphone preamplifier can be selected from among five choices. The selected gain is applied no matter if the headset is connected using the Headset A or the Headset B connector. The compressor active LED, located below the Headset A connector, can act as a guide when setting the microphone preamplifier gain. When the headset mic is selected as the Model 348's microphone source and a voice signal at a normal level is present on the connected headset's microphone the compressor active LED should light intermittently. If, for example, it rarely lights and the gain is set to 38 dB, it might be a good idea to change the setting to 44 dB. If the compressor active LED is lit fully during normal talking and the gain is set for 44 dB or 50 dB, a change to one of the lower values might be warranted. There's no "hard and fast" rule as to which gain setting is appropriate. But unless otherwise indicated, 38 dB is typically a good initial choice for a headset that uses a dynamic microphone while 32 dB would be appropriate for a headset that includes an electret microphone.

### Microphone Input – Gooseneck Mic Gain

Choices are *12 dB*, *18 dB*, *24 dB*, *30 dB*, and *36 dB*

When the gooseneck microphone is selected as the Model 348's microphone audio source the gain of the microphone preamplifier will operate from among five configurable choices. The compressor active LED, located adjacent to the Headset A connector, can act as a guide when setting the gooseneck preamp gain. When a voice signal at a normal level is presented to the gooseneck microphone the compressor active LED should light intermittently. If, for example, the LED rarely lights and the gain is set to 18 dB, it might be a good idea to change the setting to 24 dB or 30 dB. If the compressor active LED is lit fully during normal talking and the gain is set for 30 or 36 dB, a change to one of the lower values might be warranted.

### **Microphone Input – Dante Aux In Trim**

Choices are *-12 dB, -6 dB, 0 dB, 6 dB, and 12 dB*

When the Dante Aux In receiver (input) channel is selected as the Model 348's microphone audio (talk) source its level can be configured from among five choices. This allows the level of the signal associated with the Aux In Dante receiver (input) channel to be matched to the needs of the button 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 was provided to support situations where the 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.

### **Microphone Input – Dante Aux In as Mic In Source**

Choices are *Disabled* and *Enabled*

A configurable setting determines whether or not the Dante Aux In receiver (input) channel can be used as a microphone source. This configuration should only be selected for *Enabled* if an external source of talk audio, typically provided by a second Model 348 unit, is going to be implemented. However, in most cases, it will not be utilized and selecting *Disabled* would make the user experience most simple. In this case, pressing the microphone source select pushbutton switch on the Model 348's front panel will not allow the Aux In channel to be selected.

### **Headset – Sidetone Level**

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

As a user confidence signal, audio from the selected microphone source can be routed to the left and right headphone channels of the headset interface. Sidetone audio can be present whenever an applicable button function is active on any or all of the unit's eight channels. An applicable function is one that uses the headset's mic, the gooseneck microphone, or the Aux In. These include Talk, Talk with 18 kHz Tone, IFB, and Talk with Quindar Tones. There is no definitive sidetone level setting. One that provides the user with a sufficient amount of their own talk audio such that they are comfortable should be sufficient.

### **Headset – Dim**

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

This headset dim function allows the output of the two headset output channels to be "dimmed" (attenuated or reduced in level) in certain circumstances. The function is provided for special applications where the headset's left and right headphone outputs are connected to an external amplifier or set of amplified speakers. Normally, whenever a talk or IFB function is active on one or a combination of the eight channels the level of the headset's headphone output channels would not change. As such, the default dim value has been selected to be 0 dB. But if an adapter cable was fabricated and the headset's headphone output channels were connected to audio playback devices that presented audio energy in the same physical vicinity as the active microphone then acoustic feedback is possible. To prevent this from happening selecting a dim configuration of 6, 12, or 18 dB might be desirable.

### **Speaker – Source**

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

The Model 348 includes an internal loudspeaker of which an audio source can be selected from the two audio "mix" buses that are named Monitor A or Monitor B. These buses contain audio content that is specified in the individual configuration choices for the eight audio input channels. The speaker 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 output level of the Model 348's internal loudspeaker will be automatically "dimmed" (attenuated or reduced) whenever a talk or IFB function is active on any of the eight channels. This will help prevent audio from the loudspeaker from interfering with the operation of the selected microphone. Interference could be in the form of unwanted audio content or even acoustical feedback. It's typical for a user who listens at a higher output level to select a dim value that provides more reduction. In almost all cases a selection of other than 0 dB (no dim) would be appropriate.

### **Dante Monitor Outputs – Mode**

Choices are *Off*, *Pre-Fader*, and *Post-Fader*

The Model 348 provides two Dante transmitter (output) channels, Monitor A and Monitor B, that are intended for use by other pieces of equipment such as amplified speakers, audio consoles, and matrix intercom systems. These two channels 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 audio will be routed to them from the Model 348's circuitry.

**Pre-Fader:** In this mode, the audio level and on/off status of Dante monitor output channels will not be impacted by the Model 348's monitor output rotary encoder. To clarify, neither level adjustment or on/off control will occur. This mode is appropriate when the monitor output channels are going to be utilized by devices that incorporate, if required, level control and/or signal muting capability.

**Post-Fader:** In this mode, the audio level and on/off status of Dante transmitter (output) channels Monitor A and Monitor B will follow the action of the Model 348's monitor output rotary encoder. This mode is applicable if the device or devices utilizing the Dante monitor outputs require that the level of the source signals be adjusted and/or muted using the Model 348's resources.

### **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 348 will invoke a dim (attenuation) function. This is designed to help achieve maximum intelligibility and minimize the chance of acoustic feedback when loudspeakers are associated with either or both Dante monitor outputs 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!)

### **System – Level Control Position Display**

Choices are *Off* and *On*

For user assistance the orange LEDs contained within the eight pushbutton switches can be utilized in a “bar

graph” format to give a general indication of the settings of the ten rotary encoders. If enabled, whenever the setting of a rotary encoder is changed the LEDs eight buttons will momentarily light. In most cases it would be advantageous to enable this function.

### **System – Signal Present Display**

Choices are *Off* and *On*

The top surface of the ten rotary encoders can light as an indication of the level of the audio associated with a specific encoder and related function. This is accomplished by the incorporation of RGB (red-green-blue) LEDs located within each rotary encoder. The knob 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 rotary encoders will still display their normal and muted state using LED illumination.

### **System – LED Intensity**

Choices are *Low* and *High*

The eight pushbutton switches, ten rotary encoders, and mic source selection function have LED indicators associated with them. The LED intensity configuration choice allows the overall intensity of these LEDs to be selected. Typically, deciding which choice, low or high, is optimal will depend on the amount of ambient light present where the Model 348 is located.

### **System – Headset and Monitor Outputs Follow Mic Source**

Choices are *Off* and *On*

This function allows the muted/unmuted state of the headset's headphone outputs, the Dante monitor outputs (when configured for post-fader), and the speaker output to automatically be determined by the user's choice of which microphone is active. This is a sophisticated function that can prove useful for users who are frequently switching between the headset microphone, the gooseneck microphone, and/or the Aux in. When the function is enabled, whenever the microphone source selection changes from gooseneck or Aux In to headset the Dante monitor output channels (only when configured for post-fader) and the speaker will mute. And whenever the microphone source selection changes from headset to gooseneck or Aux In the headset's headphone outputs will mute.

This helps to ensure that unwanted audio isn't present as a specific microphone source is selected.

### **System – Hot Mic**

Choices are *Off* and *On*

A Dante transmitter (output) channel is available which provides a hot mic (always active) function. The source of the Hot Mic output channel will be the selected microphone source, either the headset microphone, the gooseneck microphone, or the Aux In Dante receiver (input) channel. This can be very useful but must be enabled only when an application explicitly requires that the hot mic output be active.

Note that even if the hot mic output is not enabled (function configured for *Off*) the Dante Hot Mic transmitter (output) channel will still be present. It will always appear in the list of available channels as shown in Dante Controller. But no audio will be present on the channel unless the output has been enabled (function configured for *On*).

### **System – Monitor A Call Tone Level**

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

The Model 348 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. The level range can be selected from among three choices as well as being selected for off (muted).

### **System – Monitor B Call Tone Level**

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

The Model 348 is capable of generating an audible alerting signal when a call signal is detected on a channel that is assigned to the Monitor B audio bus. This signal consists of repeating sequences of three short bursts of sine wave audio that are output by way of the speaker. The level range can be selected from among three choices as well as being selected for off (muted).

### **Remote Control Inputs – Overview**

The Model 348 provides two contact closure inputs that can be utilized in installer-implemented applications. They are physically located inside the Model 348's enclosure on the main printed circuit board and accessible using a 3-pin male "header" connector. A

technician will first install a connector in the Model 348's back panel and then make connections to the header. Refer to the Technical Notes section for details.

### **System – Remote Control Input 1**

Choices are *Off*, *Talkback 1 Button*, *Talkback 2 Button*, *Talkback 3 Button*, *Talkback 4 Button*, *Talkback 5 Button*, *Talkback 6 Button*, *Talkback 7 Button*, and *Talkback 8 Button*

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

### **System – Remote Control Input 2**

Choices are *Off*, *Talkback 1 Button*, *Talkback 2 Button*, *Talkback 3 Button*, *Talkback 4 Button*, *Talkback 5 Button*, *Talkback 6 Button*, *Talkback 7 Button*, and *Talkback 8 Button*

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

### **Channel Specific Menu Page**

The following configuration selections apply individually to Channels 1-8. 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 and the LEDs associated with the button will not be lit. Whenever a button is pressed the associated function will become active and its green LED will light.

**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 348 power up the button will be in its inactive state and its LEDs will not be lit.

**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 be 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 348 power up the button will be in its inactive state and its LEDs will not be lit.

### Button Function

Choices are *Talk*, *Talk with 18 kHz Tone*, *All Talk*, *Call*, *IFB*, *All IFB*, *18 kHz Tone*, *20 kHz Tone*, *Talk with Quindar Tones*, and *Disabled*

**Talk:** In this mode, whenever the function is active microphone audio will be sent out the associated Dante transmitter (output) channel. This mode will typically be used as part of an intercom or stage announce (SA) implementation. The sidetone function will be 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 microphone audio. It is intended for use in REMI/At-Home applications where a "pilot tone" needs to be sent along with 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 be active whenever the Talk with 18 kHz Tone function is active.

**All Talk:** In this mode, the associated button will activate all Model 348 channels that are configured for Talk or Talk with 18 kHz Tone.

**Call:** In this mode, pressing the associated button will cause a 20 kHz sine wave call tone to be sent out any Model 348 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 348 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 corresponding Dante receiver (input) IFB program channel will be routed to the corresponding Dante transmitter (output) channel. When the function is active the microphone (interrupt) audio will be combined (mixed or summed) with the IFB program audio source. The IFB program audio source will be attenuated, fully muted, or not changed, following the IFB Program Dim configuration. The sidetone function will be active whenever the IFB function is active.

**All IFB:** In this mode, pressing the associated button will cause all the channels configured for IFB to become active. Note that an audio source routed to the associated Dante receiver (input) IFB program channel will be continually routed to the channel's associated Dante transmitter (output) channel. This would typically be the non-interrupt audio source. 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.

**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 5422A Dante Intercom Audio Engine.

**Talk with Quindar Tones:** In this mode, enabling the talk function will cause a 2525 Hz sine-wave tone to be added to the Dante transmitter (output) channel for 250 mSec. This is called the intro tone. Then the selected microphone source will 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, 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 Dante receiver (input) source that is being used for program audio when the IFB function is active for this channel. (The program audio sources are IFB Pgm 1-7 and Aux In.) 0 dB will configure the channel to have no change in program audio level. The talk audio will simply be added (mixed or summed) with the program audio. When *Full Mute* is selected the IFB program audio source level will fully attenuate and be replaced by the talk (interrupt) audio. In most broadcast applications the default value of 15 dB will be appropriate.

### **Headset Routing**

Choices are *Off*, *Left*, *Right*, and *Left and Right*

The Dante receiver (input) audio associated with a Model 348 channel can be monitored using the headset's headphone outputs. The destination channel(s) can be configured as desired.

**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.

### **Monitor Routing**

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

The Dante receiver (input) audio associated with a Model 348 channel can be monitored using 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 the Monitor B output channels.

### **Listen Mode**

Choices are *Always* and *Channel 1 Active*

This configuration choice selects under which operating condition the audio source connected to Dante receiver (input) channel 1 will be routed to the headset's headphone and monitor output channels. This is a somewhat esoteric configuration but can prove useful in specialized applications. Note that this configuration will only apply to the specific channel that is being configured, i.e., Channel 1, Channel 2, Channel 3, etc.

**Always:** If this mode is selected, an audio source connected to Dante receiver (input) channel 1 can always be monitored using the headset's headphone and/or the monitor outputs. The state of the channel 1 function will not impact the ability to monitor this source.

**Channel 1 Active:** In this mode, the source connected to Dante receiver (input) channel 1 can only be monitored when the channel 1 function is active.

### **Call Indication**

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

A visual and audible indication can be provided whenever a call signal has been detected on a Model 348 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 348's internal loudspeaker and, if configured appropriately, Dante monitor outputs.

**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 in 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 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 348 operation to commence. In most cases an Ethernet connection with Power-over-Ethernet (PoE) capability will have been made to the Primary Ethernet connector. Alternately, a source of 12 volts DC may have been connected to provide power for the Model 348. A stereo or monaural headset will typically be interfaced using either the Headset A or Headset B connector. A GME-3-12 gooseneck microphone may have been installed into the bushing/connector assembly on the top of the Model 348's enclosure.

Using the Studio Technologies' STcontroller software application the Model 348's operating configuration should have been selected to meet the needs of the specific application. An extensive range of configurable parameters are available, making the way in which a specific Model 348 operates be quite unique.

Using the Dante Controller software application the Model 348's 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 eleven Dante transmitter (output) channels and sixteen Dante receiver (input) channels will have been routed, by way of Dante "subscriptions," to the receiver and transmitter channels on associated Dante-enabled equipment.

Eight of the Dante transmitter (output) channels are associated with the functioning of the eight pushbutton switches. Two additional Dante transmitter (output) channels are specified as monitor outputs. And the final Dante transmitter (output) channel provides a Hot Mic output function. Eight 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. Seven more of the Dante receiver (input) channels serve as IFB program inputs. An eighth Dante receiver (input) channel, Aux In, can serve as either an IFB program input or a microphone source. These eight inputs are used in conjunction with the eight pushbutton switches when they are configured for IFB operation.

## Initial Operation

The Model 348 will start to function as soon as a Power-over-Ethernet (PoE) or a 12 volts DC 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 mic source, rotary encoder, and pushbutton LEDs on front panel will light as the internal processors, Ethernet network, and Dante connections begin to function. The various LEDs will then become operational, displaying the status of their associated functions.

### Power Status LEDs

An LED labeled PoE is located below the Primary Ethernet connector on the Model 348's back panel. It will light green if an Ethernet signal that is providing PoE power is connected. An LED labeled DC is located below the 4-pin XLR connector that is provided for connection to a DC power source. It will light green if a source of 10 to 18 volts DC is connected. If both the PoE and DC LEDs are lit then the PoE Ethernet connection will be providing power to operate the Model 348. The DC power supply will be ready as a "hot standby" should the PoE source fail.

### Ethernet Status LEDs

A total of four Ethernet status LEDs are located below the two etherCON RJ45 jacks on the Model 348's back panel. A LINK ACT LED will light green whenever an active connection to an Ethernet network has been established. It will flash in response to Ethernet data packet activity on that interface. A GbE LED will light orange when a Gigabit Ethernet connection is present on that interface.

### Dante Status LEDs

The SYS and SYNC LEDs, also located on the back panel, display the operating status of the Dante interface and its associated network activity. After lighting red and green as part of the power-up sequence the SYS LED will light red to indicate that the Dante interface is not ready. After a short interval it will light green to indicate that it is ready to pass data with another Dante device. The SYNC LED will also be part of the power-up sequence and will light red when the Model 348 is not synchronized with a Dante network. It will light solid green when the Model 348 is synchronized with a Dante network and an external clock source (timing reference) is being received. It will slowly

flash green when this specific Model 348 is part of a Dante network and is serving as the Leader clock. It's possible that up to 30 or 40 seconds may be required for the SYNC LED to reach its final state.

## How to Identify a Specific Model 348

Functions within the Dante Controller and STcontroller software applications allow specific Model 348 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 348 unit. On that unit the red LEDs associated with the eight pushbutton switches will “flash” in a unique sequence four times; the actual on/off status of the buttons will not change. In addition, the LINK ACT and GbE status LEDs, located directly below the two RJ45 jacks on the back panel, will slowly flash. After a few seconds the LED identification patterns will cease and normal Model 348 pushbutton LED, and Ethernet status LED operation will resume.

## Headset Microphone Power Status LED

An LED indicator is located on the back panel adjacent to the Headset A connector. It is labeled MIC PWR and will light red whenever the headset's microphone electret power source is active and providing low-voltage DC power to the microphone connections on the Headset A and Headset B connectors.

## Compressor Active LED and Mic Preamp Gain

An LED indicator, orange in color, is located on the back panel adjacent to the Headset A connector. It is labeled COMP and displays the status of the microphone audio compressor function. This function controls the dynamic range of the audio signal associated with either the headset's microphone or the gooseneck microphone. The compressor active LED will light whenever the input level from either the headset mic or the gooseneck mic, along with the configured microphone preamplifier gain, is such that the dynamic range of the signal is being actively controlled. It's perfectly acceptable for this LED to light intermittently whenever a user is talking at a normal voice level into an associated microphone. But if the COMP LED lights solid while a user is talking

at a normal voice level this will typically indicate that the microphone preamplifier gain setting should be reduced. Conversely, if the COMP LED almost never lights when normal talking is taking place it's possible that changing the gain to a higher value would be beneficial. Note that if the Dante Aux In channel has been selected as the microphone source the COMP LED will never light.

## LED Intensity

On the Model 348's front panel there are LED indicators associated with the eight channel pushbutton switches, the mic source status display, and the ten 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 348's location is also low.

## Mic Source Selection

A small, round pushbutton switch located on the upper-left side of the front panel is used to select which microphone source is active. Pressing the button will change the source to the next available one. The selected audio source will be used by the Model 348's talk, sidetone, and IFB functions. The mic source choices are Headset, Gooseneck, and Aux In. Two green LEDs, adjacent to the pushbutton switch, indicate which microphone source is currently active. When the LED marked HEADSET is lit the microphone associated with a connected headset is serving as the Model 348's microphone (talk) audio source. When the LED marked GOOSENECK is lit the gooseneck microphone will serve as the talk audio source. When neither LED is lit the Dante Aux In receiver (input) channel will be serving as the talk audio source. A Model 348 power-down/power-up cycle will return the microphone source to its last selection.

A system configuration choice in STcontroller is used to select whether or not the Dante Aux In receiver (input) channel can serve as a microphone source. By default the choice is Off and the Aux In will not be able to be selected. In this case, the pushbutton

switch will alternate between the headset mic and the gooseneck mic.

Another STcontroller configuration allows the microphone source selection to impact the on/off status of the headset's headphone output and the monitor output channels. Named Headset and Monitor Outputs Follow Mic Source, this selection is provided to assist users who frequently change between using the headset's microphone, gooseneck microphone, and/or the Aux In channel. The default configuration is for this feature to be disabled (Off). When this configuration choice is enabled (On) and Gooseneck or Aux In is selected as the microphone source the headset's headphone outputs will mute. When the headset's microphone is selected as the source the monitor outputs and associated loudspeaker will also mute. In both cases the mute state that was automatically enabled can be overridden by pressing the knob on the applicable rotary encoder.

The headset and gooseneck microphone inputs have an independent preamplifier gain configuration parameter which is accessible by way of the STcontroller software application. And the Aux In channel has a configuration gain trim function. If switching between the three sources results in greatly different overall talk audio levels then the configuration choice for the headset and gooseneck microphone preamplifier gain and Aux In level trim should be reviewed and revised as appropriate.

## Hot Mic Output

A Dante transmitter (output) channel has been designated as a hot mic output. This output can be enabled or disabled using the STcontroller software application. The default setting is Disabled. When enabled the selected microphone source – headset, gooseneck, or Aux In – will connect to the Hot Mic Dante transmitter (output) channel. No pushbutton or rotary encoder operation is required for the audio associated with the selected microphone source to be active on the Hot Mic Dante transmitter (output). This can be a useful feature but it's important that user's be made aware that there is no means of turning off ("muting") this output. They must assume that other personnel will be continually monitoring audio associated with their selected talk source.

## Button Action

The action of each of the eight 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.

### 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. Upon Model 348 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. Upon Model 348 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 ten choices. A careful study of how each of these choice's function will highlight the variety of applications a Model 348 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 microphone 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. When the pushbutton is not pressed nor currently active no

audio will be present on the associated Dante transmitter (output) channel. The associated Dante IFB program input channel will not be utilized.

### **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 microphone 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. 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. The associated Dante IFB program input channel will not be utilized.

### **All Talk**

When a button function has been configured for *All Talk* and the pushbutton is pressed or the function is active then all other buttons that are configured for Talk or Talk with 18 kHz will become active. The LED in the pushbuttons configured for All Talk will light green whenever the function is active. The associated Dante transmitter (output) channel will not be utilized, nor will the associated Dante IFB program input channel.

### **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 configured for Call 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. The associated Dante transmitter (output) channel will not be utilized, nor will the associated Dante IFB program input channel.

### **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 associated Dante IFB program input source will be connected to

the associated Dante transmitter (output) channel. The Dante IFB program input 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 Dante IFB program input 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 microphone source will be added (summed) with the Dante IFB program input source and then routed to the associated Dante transmitter (output) channel. The pushbutton will light green when the function is active.

The IFB function creates a talent cue signal that is sometimes referred to as Interrupt, Program with Interrupt, or Program + Interrupt. The selected microphone source (headset, gooseneck, or Dante Aux In) serves as the interrupt source. Dante IFB program inputs 1-7 and Dante Aux In are considered to be the program audio sources. Note that there is no means provided within the Model 348 to adjust the level of the IFB program input sources. This should not be considered an operational limitation as typically an audio console will provide the program audio source at a nominal line level. As such, any needed adjustment of the signal level can be performed on the console.

### **All IFB**

When a button function has been configured for *All IFB* and the pushbutton is pressed or the function is active then all of the other buttons configured for IFB will become active. The LED in the pushbutton will light green whenever the function is active. 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 348’s IFB function will be matched in the All IFB signal path. In this way, the Model 348’s audio latency will essen-

tially be matched in the program with interrupt and program-only audio paths.

### **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.

### **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.

### **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 and the function enabled, a 2525 Hz sine-wave tone will be sent to the output for 250 milliseconds (1/4-second). Then audio from the selected microphone source will be connected to the output. Upon the function no longer being active a sine-wave tone of 2475 Hz, again for 250 milliseconds, will be sent to the output. This function is provided for activation of transmitters or an aural indication that communication between earth and space personnel is taking place.

### **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 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 348 there are ten rotary encoders. Eight of the rotary encoders are located above the channel pushbutton switches. They are associated with the Dante audio input channels. A single rotary encoder is associated with the level

of the headset's headphone outputs. And finally, a rotary encoder is associated with the monitor section, impacting the internal loudspeaker and, if configured for post-fader, the two Dante monitor output 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 counterclockwise 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 switch function that is used to mute the associate audio signal(s).

The top surface of each rotary encoder's knob is translucent and 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 348 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 has been enabled the rotary encoder's knob will remain dark blue.

A rotary encoder knob that is lit with a purple color indicates that its associated function has been muted. To mute or unmute a function simply requires that the associated rotary encoder knob be pressed and released ("tapped").

For user assistance, the LEDs associated with the eight channel pushbutton switches can be configured to indicate the approximate position of each of the rotary encoders. For this to be active the Level Control Position Display configuration within STcontroller must be On (it is by default). There are two means of observing the level setting associated with each rotary encoder. One is to press and hold a rotary encoder's knob. One or more of the eight pushbutton switches will light orange. If a function is muted (minimum level) then pushbutton 1 will flash orange. If a function is at full (maximum) level then pushbuttons 1 through 7 will light orange and pushbutton 8 will flash orange. The

display of the level will continue until the rotary encoder's knob is no longer pressed. The second method of displaying a rotary encoder's level setting is to rotate an encoder knob at least one step in the clockwise or counterclockwise direction. The pushbutton switches will light orange to display the approximate level and then hold for approximately one second past when the last rotary encoder change is made.

As previously mentioned, 32 encoder steps (1 and 1/3 full rotations) are required to move between the minimum and maximum levels. Each pushbutton switch will light orange in response to a rotary encoder being within a group of four steps. So pushbutton 1 will light when a rotary encoder has been set to steps 1-4, pushbuttons 1 and 2 will light when a rotary encoder has been set to steps 5-8, etc. Step 1 is considered to be mute and causes pushbutton switch 1 to flash orange. Step 32 is the maximum level and causes pushbuttons 1 through 7 to light orange and pushbutton 8 to flash orange.

The RGB (red-green-blue) LEDs within the rotary encoders can shine through the end of the associated knobs and provide a visual indication of the level of signal associated with the rotary encoders' functions. For the signal level to be displayed on the knob ends requires that the Signal Present Display configuration in STcontroller be selected for On. This is the default condition and is appropriate for most applications.

The rotary encoder knobs labeled 1 through 8 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. And the knob will light red when the signal has a level that meets or exceeds  $-5$  dBFS.

The rotary encoder knob associated with the headset's headphone output and the rotary encoder knob associated with the monitor function will also light at the same level thresholds as the eight Dante receiver (input) channels. But there's a major difference as their function's will be post-encoder (also known as

"post-fader"). In this way, the level indication on these two rotary encoder knobs will reflect the setting of their associated encoder. This will prove useful when adjusting the rotary encoders to achieve the desired level settings.

If a rotary encoder is placed in its mute state by pressing the rotary encoder's knob then the knob cap will light purple and the level display will not occur. Also, when mute is active any changes to a rotary encoder's position will not be recognized. To clarify, if a rotary encoder knob is lit purple then any rotations of the knob will not be recognized.

## Headset Operation

A headset with either a 5-pin XLR plug (male) or a 4-pin 3.5 mm TRRS plug can be connected with one of the headset connectors on the Model 348's back panel. The connectors are labeled Headset A and Headset B.

## Headset Microphone

On Headset A and Headset B the electrical connections for the microphone input and two headphone output channels are internally wired together ("multi-ed" or connected in parallel). As such, only one headset should be connected at a time. 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. The red LED, label MIC PWR and located adjacent to the 5-pin XLR connector, will be lit to indicate that low-voltage DC has been applied to the microphone connections on both headset connectors A and B.

## Headset Headphone Outputs

Settings within STcontroller select which of the eight Dante receiver (input) channels are routed, by way of rotary encoders 1 through 8, to the headset's headphone left and right output channels. The rotary encoder labeled HEADSET on the front panel adjusts the level of both headphone output channels. As previously discussed, the headset's headphone output can be muted by pressing the headset 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 monoaural 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.

### **Sidetone**

A sidetone function is available for assisting headset users in hearing audio from the currently selected microphone 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 is configured from among five values as well as mute.

By default, sidetone is enabled at the medium audio level. Refer to Appendix A for details. Once configured in STcontroller the sidetone level is fixed and cannot be changed by the user. This is implemented in this manner such that a user will always be provided with a reference level as to how much microphone audio signal, headset, gooseneck, or Aux In is being sent out the Dante transmitter (output) channels.

### **Headset Headphone Output Dim**

Following an STcontroller configuration setting the headset's headphone output level can reduce in level ("dim" or be attenuated) when one or more of the eight button functions are active. Enabling the headphone dim configuration is provided for the rare situation where the headset's headphone output channels are being used as line-level analog outputs. This could be useful, for example, when connecting to the analog inputs on amplified loudspeakers. If a headset is being used and the headset dim function is enabled then it's probably incorrectly configured and needs to be revised in STcontroller.

### **Headset Headphone Output Automatic Mute**

As previously discussed, a setting in STcontroller allows the headset's headphone output channels to automatically mute when the microphone source is selected for Gooseneck or Aux In. (By default, this function is not enabled.) This can be useful for users who frequently change from using a headset and associated microphone to using gooseneck or Aux In. The unneeded output, either the headset's headphone

output or internal speaker/post-fader monitor output channels, will automatically mute as the microphone source is switched. It's simple to observe this action by noting that the headset rotary encoder's knob will turn purple when the gooseneck microphone or Aux In is selected as the source. (Conversely, the monitor rotary encoder knob will turn purple when the microphone source is selected for Headset.) The muting of the headset's headphone outputs can be temporarily overridden by simply pressing the headset rotary encoder knob.

### **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 Output**

The Model 348's monitor section consists of a rotary encoder, two Dante audio output channels, and an internal loudspeaker. These resources allow a wide range of listening scenarios to be implemented.

### **Monitor Sources and Rotary Encoders**

Settings within STcontroller select which of the eight Dante receiver (input) channels are routed, by way of the eight 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 both the internal loudspeaker and, if configured for post-fader (level following the setting of the rotary encoder), the Dante monitor output channels.

As previously discussed, the 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 348's monitor section. Several configuration settings in STcontroller impact the way in which the monitor output channels function. Eight independent configuration choices select which of the eight Dante audio inputs are routed to either or both of the monitor output channels. Another configuration setting determines if the level of the monitor output channels will be impacted by the monitor rotary encoder. The Dante monitor outputs can be configured for post-fader making their signal level respond to the setting of the Model 348's monitor rotary encoder. If configured for pre-fader 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 capability. Such devices would include audio consoles, matrix intercom systems, and amplified loudspeakers that contain integrated level controls.

Another STcontroller configuration setting allows the monitor output channels to be automatically dimmed (attenuated) when any of the functions associated with the eight 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 selected microphone.

### **Loudspeaker Output**

The Model 348 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 Monitor A or Monitor B. Another configuration selection allows the loudspeaker level to automatically be dimmed (attenuated) when any of the functions associated with the eight 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 microphone. 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 post-fader monitor outputs) as desired.

### **Monitor Output Automatic Mute**

As previously discussed twice, a configuration setting in STcontroller allows the loudspeaker and post-fader monitor output channels to automatically mute when the microphone source is selected for Headset (by default, this function is not enabled). This can be useful for user's who frequently change from using a headset and associated microphone to using a gooseneck microphone and internal loudspeaker and/or monitor output channels. The unneeded output, either the headset's headphone outputs or the internal loudspeaker/post-fader monitor output channels, will automatically mute as the microphone source is switched. It's simple to observe this action by noting that the monitor rotary encoder's knob will light purple when the microphone source is selected for Headset. The muting of the loudspeaker and post-fader monitor output channels can be temporarily overridden by pressing the monitor rotary encoder knob.

### **Monitor 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.

### **Call Indication**

The Model 348 can be configured to respond to call signals that are present in any of the eight 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.

## Additional Capabilities

An installer may have implemented additional Model 348 capabilities. A competent technician can easily add several functions, such as supporting remote control inputs or providing a 3-conductor 1/4-inch headphone output. From the factory the Model 348 includes an unused connector location on the enclosure's back panel. Internally, the Model 348 includes a number of 3-pin "header" connectors which provide access to various points in the unit's circuitry. These resources allow the simple installation of application-specific connectors and associated wiring.

Connections can be made to the two remote control inputs which are typically interfaced using a 3- or 4-pin XLR connector. 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 inputs to mimic the action of two out of the eight pushbutton switches.

## Technical Notes

### Interconnecting Two Model 348 Units

Features have been included in the Model 348 to allow two units to function together. This allows support for additional talk and IFB channels without the need for redundant microphones to be connected. (But it's important to note that the two units cannot be easily configured such that their source monitoring can be easily interconnected.) For descriptive purposes, this text will refer to one Model 348 as the Leader and a second Model 348 as the Follower. The Leader will be used to provide the microphone source for both Model 348 units. A headset with integrated microphone and a gooseneck microphone can be connected to the Leader. The Follower does not need a headset mic or a gooseneck mic to be connected. Using STcontroller, the Hot Mic Dante transmitter (output) channel on the Leader will be enabled. On the Follower STcontroller will be configured to allow the Dante Aux In receiver (input) channel to be used as a microphone (talk) input source. Using the Dante Controller application the Hot Mic Dante transmitter (output) channel on the Leader will be routed (subscribed) to the Aux In Dante receiver (input) channel on the Follower. Finally, to use this implementation requires that the microphone (talk) source on the Follower be selected

for Aux In. This is easily accomplished by pressing the microphone source button on the front panel of the Follower unit until neither the HEADSET nor the GOOSENECK LED is lit.

### IP Address Assignment

By default, each of the Model 348'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 known in the Microsoft® world as Automatic Private IP Addressing (APIPA). It is also sometimes referred to as auto-IP (PIPPA). 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 correctly acquire unique IP addresses and be able to communicate with each other.

As previously discussed, the Model 348'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 348'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 348. 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 ([audinate.com](http://audinate.com)) for details on how to optimize a network for Dante applications.

## Button Labeling

The Model 348 provides eight pushbutton switches that are associated with the eight 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.

## Additional Connector Location

A spare connector location, labeled A, is provided on the Model 348's back panel. From the factory it contains a blank plate that can be removed and replaced with a variety of XLR connectors. The spare connector location is included so that a Model 348 can be customized to meet specific needs that may arise in broadcast and related audio applications. The expected use for this location is to allow support for two remote control inputs. Other uses include adding a 1/4-inch 3-conductor "stereo" headphone output or adding a 3-pin female XLR microphone input. A number of interface cable assemblies, along with some special function kits, are available from Studio Technologies. Please refer to the website for details on what is available.

The spare connector location is compatible with the Neutrik DL-series of connectors. For flexibility XLR versions are available that provide from three to seven contacts. For example, a compatible 3-pin female connector would be Neutrik part number NC3FD-L-1. Another female connector with the unique Switchcraft® 6-pin arrangement, the NC6FDS-L-1, is often used to support headsets. Other connectors, such as the etherCON protected RJ45 jack and 3-conductor 1/4-inch jack, can be also be installed. The 4-40 UNC

thread pitch hardware that secures the blank plate to the Model 348's back panel is also intended to be used to secure the selected connector.

The Model 348's enclosure must be disassembled prior to installing a connector in the spare location. Six 4-40 UNC flathead machine screws, one on each side of the enclosure, two on the bottom front of the enclosure, and two on the back panel, must be removed (the machine screw directly above the Headset B connector should not be removed). These screws function best when a #1 Phillips-head screwdriver is utilized. Once the six screws are removed the cover can then be carefully separated from the chassis. The cover will remain attached by means of a flexible cable assembly. This "flex-cable" assembly links the main printed circuit board assembly with the button and rotary encoder board assembly. Ensure that the flex cable is not damaged while the Model 348 is being customized.

If a connector is installed in the Model 348's spare connector location adding a label to it can be helpful. For a good look it is recommended that a Brother® P-Touch 1/4-inch (6 mm) label be created. Tape material that prints white text on a black background would be effective for use with the Model 348. The Brother label cassette number TX-3151, white on black, is appropriate for use with many of their printers.

## 3-Position Headers

As previously discussed provision has been made to allow a competent technician to implement additional Model 348 functionality. The most common addition will be support for two remote control input functions. Adding these additional functions can be accomplished by interfacing with male "header" connectors located on the Model 348's main and analog circuit boards. These 3-position, 0.1-inch center headers allow "no solder" solutions which makes customizing a Model 348 unit a relatively simple process. The headers are Molex® part number 22-23-2031. They mate with Molex housing number 22-01-3037.

To make the interconnection, separate crimp terminals are attached to three loose wires and then "snapped" into the housing. Molex part number 08-50-0114 specifies crimp terminals that are appropriate for 22 to 30 gauge wires. These terminals are available worldwide from sources such as Digi-Key ([digikey.com](http://digikey.com)).

To make the process of connecting to the Model 348's headers an easy task an interface cable kit, Studio Technologies' part number 31087, is available. Each kit includes five cable assemblies and a length of heat-shrinkable tubing. Each cable assembly consists of a mating connector with three color-coded wires attached. These wires, approximately 12 inches in length, allow convenient soldering to a connector selected to be installed in a spare location on the Model 348's back panel. For reference, the wire color for pin 1 is gray, pin 2 is yellow, and pin 3 is blue. The heat-shrinkable tubing is provided so that the connector terminals or "solder cups" can be insulated from each other. The tubing will also provide some strain relief to the solder joints. Be certain to slip the desired length of tubing over the wire prior to soldering a connection!

For details on each header's reference designator and functionality please refer to Appendix B.

## Application Firmware Version Display

The STcontroller software application is used to display the version numbers of the Model 348's three firmware (embedded software) components. These are the main firmware, the secondary firmware, and the FPGA firmware. The main firmware is used by the main microcontroller integrated circuit to implement most of the Model 348's general operating actions. The secondary 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 348 unit to a network. Connect an external source of 12 volts DC if a PoE Ethernet connection has not been made. The unit will power up and begin to function. Start STcontroller, review the list of identified devices, and select the specific Model 348 from which you want to determine its application firmware versions. Then select **Version** under the **Device** tab. A dialog will then display that will provide a host of useful information. This will include the firmware versions as well as details on the Dante interface firmware.

## Application Firmware Update Procedure

It's possible that updated versions of the three firmware (embedded software) files that are utilized by the Model 348'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. The Model 348 implements a USB host function and provides access by way of a type A receptacle located on the back panel. The Model 348 updates its firmware using files named **M348.bin** for the main firmware, **M348sec.bin** for the secondary firmware, and **BWY.bit** for the FPGA firmware.

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 firmware the file name must be **M348.bin**. For the secondary firmware the file name must be **M348sec.bin**. And for the FPGA firmware the file name must be **BWY.bit**. 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 348, the name of the zip file itself will include the file's version number. For example, a file named **M348v2r05MCU.zip** would indicate that version 2.05 of the main MCU firmware (**M348.bin**) is contained within this zip file.

Once the USB flash drive is inserted into the USB interface, located on the back panel, the unit must be powered off and again powered on. At this point the file(s) will automatically load. The precise steps required will be highlighted in the next paragraphs.

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

1. Remove power from the Model 348. This will entail either removing the Ethernet connection from the RJ45 jack labeled Primary-PoE or removing the external source of 12 volts DC. (Both must be disconnected if for some reason dual-power has been implemented.)
2. Locate the USB connector on the Model 348's back panel, labeled Firmware Update. Directly below the USB connector is a small hole that provides visual access to a green LED indicator.
3. Insert the prepared USB flash drive into the USB connector.
4. Apply power to the Model 348. Power can be provided by Power-over-Ethernet (PoE) associated with an Ethernet signal connected to Primary-PoE or from an external 12 volts DC source.
5. After a few seconds the Model 348 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 below the USB connector, will flash slowly. It's also possible that the ten 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 348 will restart using the newly saved main firmware.
6. At this time the Model 348 is functioning with the newly loaded firmware and the USB flash drive can be removed. But to be conservative, remove the power source first and then remove the USB flash drive.
7. Confirm that the desired firmware has been loaded and that the Model 348's three 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 power being applied to the Model 348 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 below the USB connector, 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 application firmware will begin.

## Broadway Firmware Update

As previously discussed, the Model 348 implements Dante connectivity using the Broadway integrated circuit from Audinate. The Dante Controller software application can be used to determine the version of the firmware (embedded software) that resides in Broadway. The STcontroller software application can also be used to identify the firmware version. (Use the **Version** selection under the **Device** tab.) The Dante Firmware Update Manager (FUM) application program has traditionally been used to update the Broadway firmware. The Dante Controller software application also includes an automated method of updating Broadway firmware. Both applications are available, free of charge, on the Audinate website ([audinate.com](http://audinate.com)).

## Restoring Factory Defaults

A command in the STcontroller software application allows the Model 348's default configuration selections to be reset to the factory values. From STcontroller select the Model 348 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 348's factory default values.

## Specifications

**Applications:** Dante-based intercom, broadcast IFB (talent cue) master station, audio monitor mixer, aerospace (including capsule communicator (CapCom)), and specialized tone generation

**Power Sources:**

**Power-over-Ethernet (PoE):** class 3 mid-power, ≤12.94 watts per IEEE® 802.3af

**DC Input:** 10 to 18 volts DC, 1.1 A maximum at 12 volts DC (can be powered by optional PS-DC-02)

**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

**Dante Receiver (Input) Channels:** 16

**Dante Transmitter (Output) Channels:** 12

**Dante Audio Flows:** 32; 16 transmitter, 16 receiver

**Internal Digital Audio Processing:** 32-bit, fixed

**Input-to-Output Audio Processing Latency:** <200 µSec

**Nominal Input and Output Level:** –20 dBFS

**Network Interfaces:** 2, Primary-PoE and Secondary

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

**Power-over-Ethernet (PoE):** per IEEE 802.3af (applicable to Primary-PoE network interface only)

**Microphone Input – Headset:**

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

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

**Type:** unbalanced

**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:** 5 volts DC via 4.99 k resistor

**Impedance:** 3.3 k ohms, nominal

**Gain:** 12, 18, 24, 30, 36 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)

**Slope:** 2:1

**Status LED:** compressor active

**Dante Receivers (Inputs) – Monitor 1-8:**

**Frequency Response:** not applicable, sources are Dante receivers which pass data through to Dante transmitters

**Dante Receivers (Inputs) – IFB Program 1-7, Aux In:**

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

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

**Level Trim (Aux In):** –12, –6, 0, 6, and 12 dB, adjustable

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

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

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#### **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 ohm 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:** 1.3-inch (32 mm) diameter

**Maximum Power:** 4 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%

#### **Quindar Tones Support:**

**Intro:** 2525 Hz sine wave

**Outro:** 2475 Hz sine wave

**Duration:** 250 milliseconds

**Level:** −28 dBFS

#### **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 the talkback buttons

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

#### **Connectors:**

**Headset A:** 5-pin female XLR

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

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

**Ethernet:** 2, Neutrik NE8FBH etherCON RJ45 jacks

**DC Input:** 4-pin male XLR (pin 1 negative, pin 4 positive)

**USB:** type A receptacle (used only for updating firmware)

**Remote Control Inputs:** 3-pin header located on the main “Broadway” circuit board

**Headset Microphone Input:** 3-pin header located on the analog circuit board

**Headset Phones Output:** 3-pin header located on the analog circuit board

**Configuration:** requires Studio Technologies’ STcontroller software application

#### **Environmental:**

**Operating Temperature:** 0 to 50 degrees C (32 to 122 degrees F)

**Storage Temperature:** −40 to 70 degrees C (−40 to 158 degrees F)

**Humidity:** 0 to 95%, non-condensing

**Altitude:** not characterized

#### **Spare Connector Location: 1**

Allows a Studio Technologies’ cable assembly or option module to be installed. Also compatible with Neutrik NC\*D-L-1 connectors (\*=3F, 3M, 5M, 6F, 6FS, etc.).

#### **Dimensions (Overall):**

6.5 inches wide (16.5 cm)

2.9 inches high (7.4 cm)

4.9 inches deep (12.5 cm)

**Deployment:** intended for tabletop applications

**Weight:** 2.1 pounds (0.95 kg)

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

## **Appendix A–STcontroller Default Model 348 Configuration Values**

### **General Menu Page:**

Microphone Input – Source: Headset  
Microphone Input – Headset Mic Power: Off  
Microphone Input – Headset Mic Gain: 38 dB  
Microphone Input – Gooseneck Mic Gain: 24 dB  
Microphone Input – Dante Aux In Trim: 0 dB  
Microphone Input – Dante Aux In as Mic In Source: Disabled  
Headset – Sidetone Level: Medium  
Headset – Dim: 0 dB  
Speaker – Source: Monitor A  
Speaker – Dim: 6 dB  
Dante Monitor Outputs – Mode: Off  
Dante Monitor Outputs – Dim: 0 dB  
System – Level Control Position Display: On  
System – Signal Present Display: On  
System – LED Intensity: High  
System – Headset and Monitor Outputs Follow Mic Source: Off  
System – Hot Mic: Off  
System – Monitor A Call Tone Level: Off  
System – Monitor B Call Tone Level: Off  
System – Remote Control Input 1: Off  
System – Remote Control Input 2: Off

### **Channel Specific Menu Page (all parameters identical for Channels 1-8):**

Button Mode: Hybrid  
Button Function: Talk  
IFB Program Dim: 15 dB  
Headset Routing: Left and Right  
Monitor Routing: Monitor A  
Listen Mode: Always  
Call Indication: Visual Only

## Appendix B—3-Pin Header Connector Details

The following list provides details on the 3-pin header connectors located on the Model 348's printed circuit boards. Shown are both reference numbers and associated functions.

### Header on Main (“Broadway”) Board:

#### **P7: Remote In 1, Remote In 2**

Pin 1: Common (–)

Pin 2: Remote Input 1 (+)

Pin 3: Remote Input 2 (+)

**Note:** Inputs pulled up to 3.3 volts DC via 3.4 k ohm resistors.

### Headers on Analog Board:

#### **P2: Headset Microphone Input**

Pin 1: Common / Shield (–)

Pin 2: High (+)

Pin 3: No connection

**Note:** These pins are electrically in parallel with pins 1 and 2 respectively on the back panel 5-pin female XLR headset connector. This is an unbalanced input.

#### **P5: Headset Phones Output**

Pin 1: Common (–)

Pin 2: Left Channel (+)

Pin 3: Right Channel (+)

**Note:** These pins are electrically in parallel with the headphone connections respectively on the back-panel 5-pin female XLR headset connector.

## Appendix C—Differences between Model 348 Units as Noted by Serial Number Range

There are several differences between Model 348 units with serial numbers M348-00151 to 00250 and Model 348 units with serial numbers M348-00251 and later. In most cases, the differences will not impact using a unit in typical applications. However, it may be important to note the differences for specialized or unique applications.

### PoE Enumeration

Model 348 units with serial numbers M348-00151 to 00250 do not enumerate with a Power-over-Ethernet (PoE) class. As such, an associated PoE port on power sourcing equipment (PSE) would consider the Model 348 to be a class 0 (classification unimplemented) device. Beginning with serial number M348-00251, Model 348 units will enumerate as PoE class 3 (mid-power) devices. Both class 0 and class 3 consider the load to be  $\leq 12.94$  watts per the IEEE 802.3af standard. The change to add support of enumeration simply allows a PSE to have more precise knowledge about a connected Model 348.

### Remote Control Inputs

Model 348 units with serial numbers M348-00251 and later provide two remote control input functions. These allow support for one or two switch or contact closures which can activate selected Model 348 functions. The exact functions will be selected using the STcontroller software application. Appendix B provides connection details.

### Headers on Analog Board

Appendix B also provides details on the two header connectors that are located on the analog printed circuit board utilized by Model 348 units for all serial numbers. These 3-pin header connectors provide access to the headset microphone input and headset phones output.

