Model 380 On-Air Beltpack

User Guide

Issue 1, September 2016

This User Guide is applicable for serial numbers
M380-00151 to 01000 with application firmware 1.3 and later
and Dante firmware 2.0 (Ultimo 3.10.1.12) and later

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Revision History

Issue 1, September 2016:

1. Initial release.

Introduction

The Model 380 On-Air Beltpack offers a unique combination of audio resources, providing main and talkback outputs, talent cue (IFB) input capabilities, and essential user controls in a compact, portable package. Optimized for broadcast sports and live entertainment events, news-gathering, and streaming broadcast applications, the unit allows incredibly simple deployment while maintaining "pro" audio quality and an intuitive user experience. The Model 380 integrates directly into both Dante audio-over-Ethernet and standard analog audio environments. With just a Power-over-Ethernet (PoE) connection, a dynamic microphone, and a pair of headphones or an earpiece, a complete broadcast "stand-up" on-air position can be created. And by using the Model 380's microphone output a direct connection to an analog microphone-level input on an associated camera, camcorder, or audio console is also supported. Key features can be easily configured including microphone preamplifier gain, talkback button operation, headphone signal routing, and sidetone operation.

The Model 380's audio quality is excellent, with low distortion, low noise, and high headroom. Careful circuit design and rugged components ensure long, reliable operation. A wide range of applications can be supported, including sports and entertainment TV and radio events, streaming broadcasts, corporate and government AV installations, and post-production facilities. By providing the main (on-air) audio signal in two forms, Dante digital audio and analog microphone level, the Model 380 makes integration into a wide range of environments easy to accomplish. And with the talkback audio available as a Dante output channel, routing it to inputs on a variety of devices, such as matrix intercom systems, audio consoles, and monitor loudspeaker systems, is simple and flexible.

Applications

The Model 380 on its own can provide an "all-Dante" solution for one on-air talent location. Two Dante audio input channels supply the user with their talent cue (IFB) signals. Should the cue signal be "mix-minus" an integrated sidetone function can provide the user with a microphone

Figure 1. Model 380 On-Air Beltpack top and bottom views

confidence signal. Two Dante audio output channels, one designated as main (for on-air) and the other talkback, are routed via an associated local-area network (LAN) to inputs on Dante-compatible devices. A pushbutton switch, located on the Model 380's top panel, provides a combination talkback and "cough" (user-controlled audio mute) function. When talkback is not active audio from the output of the unit's microphone preamplifier is routed to the Dante main output channel; the Dante talkback output channel is muted. When the talkback function is active audio is muted on the Dante main output channel and activated on the Dante talkback output channel. The audio switching is performed in the digital domain and is virtually "click-free."

Other applications may benefit from not utilizing the Model 380's Dante main output channel. This typically won't be an issue of inadequate audio quality but rather a need to match work-flow requirements. For example, for lip-sync or transmission purposes it may be optimal to have the on-air audio transported as an embedded signal along with the associated camera video. Alternately, all on-air audio sources may need to connect to inputs on an audio console or console-related I/O unit. Supporting these scenarios is not a problem as the Model 380 supplies a microphone output connection that's specifically intended for this purpose. Simply connect the unit's microphone output connection to the desired analog input, such as the mic/line input on an ENG-style camera—that's it!

The circuitry associated with the Model 380's microphone output is very simple, essentially a passive path that routes a

signal connected to the microphone input connector directly to the microphone output connector. A solid-state circuit, in series with the mic in-to-mic out path, allows muting of the signal on the microphone output connector whenever the talkback function is active. And it's important to note that using the microphone output connection doesn't impact the normal functioning of the Dante main and talkback output channels. This can be valuable, such as when utilizing the Dante main output channel as a back-up, secondary, or redundant on-air audio signal.

Setup and Operation

Set up and operation of the Model 380 is simple. An etherCON® RJ45 jack is used to interconnect with a standard twisted-pair Ethernet port associated with a PoE-enabled network switch. This connection provides both power and bidirectional digital audio. A handheld ("stick") microphone or broadcast stereo or monaural headset with a dynamic microphone can be directly connected to the unit's 3-pin XLR input connector. Stereo headphones, the headphone connections from a stereo or monaural headset, or even a monaural earpiece are connected to the phones output jack.

Three "push-in/push-out" rotary level controls make it easy to set the level of the talent cue ("IFB") and sidetone levels being sent to the 2-channel headphone output. The Model 380's enclosure is made from an aluminum alloy which offers both light weight and ruggedness. A stainless steel "belt clip," located on the back of the unit, allows direct attachment to a user's clothing.

Dante Audio-over-Ethernet

Audio data is sent to and received from the Model 380 using the Dante audio-over-Ethernet media networking technology. As a Dante-compliant device, the Model 380's two output (Dante transmitter) and two input (Dante receiver) audio channels can be assigned to other devices (routed) using the Dante Controller software application. The Dante transmitter and receiver channels are limited to supporting four Dante flows, two in each direction. The digital audio's bit depth is up to 24 with a sampling rate of 44.1 or 48 kHz. Two bi-color LEDs provide an indication of the Dante connection status.

Audio Quality

The Model 380's performance is completely "pro" with capabilities not expected in something of such diminutive proportions. A low-noise, wide dynamic-range microphone preamplifier and associated voltage-controller-amplifier (VCA) dynamics controller (compressor) ensures that mic input audio quality is preserved while minimizing 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 44.1 and 48 kHz with a bit depth of up to 24. The audio signal, now in the digital domain, routes through the processor and on to the Dante interface section where it is packetized and prepared for transport over Ethernet.

Audio input signals arrive via the Dante receiver channels and pass into the Model 380's processor. The sampling rate will be 44.1 or 48 kHz with a bit depth of up to 24. Channel routing, headphone level control, and sidetone creation are performed within the digital domain. This provides flexibility, allows precise control, and keeps the three level potentiometers (two for audio inputs and one for sidetone) from having to directly handle analog audio signals. The two audio channels destined for the phones outputs are sent to a high-performance digital-to-analog converter and then on to robust driver circuitry. High signal levels can be provided to a variety of headsets, headphones, and earpieces.

Configuration Flexibility

Several configuration choices are available, allowing the Model 380 to meet the needs of specific applications and user preferences. Five DIP switches, located under the belt clip, facilitate selection of key parameters including microphone preamplifier gain, audio routing to the headphone output, talkback button mode, and sidetone operation. Two of the DIP switches are used to select the gain of the microphone preamplifier from among four choices. This allows the Model 380 to match the output sensitivity of a range of handheld and headset-associated microphones. In the dual-channel mode the two input audio sources will be routed independently to the left and right headphone output channels while sidetone will be sent to both left and right. In the mono mode the two input audio sources, along with sidetone, will be combined and sent to only the left headphone output channel. These choices allow support for a dual-channel (two independent channels of talent cueing (IFB)) or a single-channel monaural listening experience.

The pushbutton switch, located on the Model 380's top panel, can be configured to operate in either a momentary or latching mode. While the functional differences

are somewhat subtle, the two modes allow distinct applications to be supported. In the momentary mode the button can provide a combination talkback function. This would be applicable for on-air sports applications where the microphone signal typically remains active. In the latching mode the button could be considered as serving as a microphone-on/off control. This would be useful in applications where talent requires local control of their microphone on and off status. The integrated sidetone function can be enabled or disabled as required. This is important as different applications may, or may not, provide "mix-minus" talent cue signals. In the case where no mix-minus signal is present, providing a Model 380 user with sidetone is an important means of confirming their local microphone audio.

Ethernet Data and PoE

The Model 380 connects to an Ethernet data network using a standard 100 Mb/s twisted-pair Ethernet interface. The physical interconnection is made by way of a Neutrik® etherCON RJ45 connector. While compatible with standard RJ45 plugs, etherCON allows a ruggedized and locking interconnection for harsh or high-reliability environments. An LED displays the status of the network connection.

The Model 380's operating power is provided by way of the Ethernet interface using the 802.3af Power-over-Ethernet (PoE) standard. This allows fast and efficient interconnection with the associated data network. To support PoE power management, the Model 380's PoE interface reports to the power sourcing equipment (PSE) that it's a class 1 (very low power) device. If a PoE-enabled Ethernet port

can't be provided by the associated Ethernet switch a low-cost PoE midspan power injector can be utilized.

Future Capabilities and Firmware Updating

The Model 380 was designed so that its capabilities and performance can be enhanced in the future. A USB connector, located on the unit's main circuit board (underneath the unit's cover), allows the application firmware (embedded software) to be updated using a USB flash drive.

The Model 380 uses Audinate's Ultimo™ integrated circuit to implement the Dante interface. The firmware in this integrated circuit can be updated via the Ethernet connection, helping to ensure that its capabilities remain up to date.

Getting Started

What's Included

Included in the shipping carton are a Model 380 On-Air Beltpack and a printed copy of this guide. As a device that is Power-over-Ethernet (PoE) powered, no external power source is provided. Should a PoE midspan power injector be required it must be purchased separately.

Connections

In this section signal interconnections will be made using the four connectors located on the bottom of the Model 380's enclosure. An Ethernet data connection with Power-over-Ethernet (PoE) capability will be made using either a standard RJ45 patch cable or an etherCON protected RJ45 plug. A microphone will be connected

using a cable-mounted 3-pin male XLR connector. A set of headphones or an earpiece will be connected by way of a ¼-inch 2- or 3-conductor plug. And, depending on the application, the Model 380's microphone-level output may be interfaced with other equipment using a cable terminated with a standard 3-pin female XLR connector.

Ethernet Connection with PoE

A 100BASE-TX Ethernet connection that supports Power-over-Ethernet (PoE) is required for Model 380 operation. This one connection will provide both the Ethernet data interface and power for the Model 380's circuitry. A 10BASE-T connection is not sufficient and a 1000BASE-T ("GigE") connection is not supported unless it can automatically "fall back" to 100BASE-TX operation. The Model 380 supports Ethernet switch power management, enumerating itself as a PoE class 1 device.

The Ethernet connection is made by way of a Neutrik etherCON protected RJ45 connector that is located on the bottom of the Model 380's enclosure. This allows connection by way of a cable-mounted etherCON connector or a standard RJ45 plug. The Model 380's Ethernet interface supports auto MDI/MDI-X so that a "crossover" or "reversing" cable will never be required.

Ethernet Connection without PoE

As previously discussed in this guide, the Model 380 was designed such that the Ethernet connection will provide both data and Power-over-Ethernet (PoE) power. There may be situations where the associated Ethernet switch does not provide PoE power. In such cases an external

PoE midspan power injector can be used. If the selected midspan power injector is 802.3af-compatible it should function correctly. Midspan units are available from a variety of sources, including many online retailers.

Microphone Input

The Model 380 provides a 3-pin female XLR connector that allows a balanced dynamic microphone to be connected. The microphone can be a stand-alone handheld ("stick") type or can be part of a broadcast-style headset. The Model 380's microphone input is directly compatible with balanced dynamic microphones. A microphone should be connected such that pin 1 is common, pin 2 is signal high (+), and pin 3 is sign low (−).

It's possible to connect a microphone that requires P12 or P48 phantom power for operation. In this case power must be provided externally by way of a compatible signal connection made to the Model 380's microphone output connector. It's expected that the microphone output connector would interface with the microphone input on a broadcast camera, audio console, microphone mixer, or similar equipment. Inputs on these devices would typically offer phantom power and they should be enabled. Phantom power present on the Model 380's microphone output will "pass through" to the Model 380's microphone input and then on to the connected microphone. The Model 380's microphone input circuitry will not be damaged by the presence of phantom power. It will still function properly, offering the same performance as if a dynamic microphone was connected to the Model 380's microphone input.

Headphone Output

The Model 380 provides a 2-channel headphone output by way of a 3-conductor ¼-inch phone jack. Devices such as stereo headphones or stereo ("dual-muff") broadcast-style headsets can be directly connected using a 3-conductor ¼-inch plug. Following the usual convention the left channel should be terminated on the tip lead, the right channel on the ring lead, and common on the sleeve lead.

It's also possible to use a monaural ("single-muff") headset or broadcast-type single earbud but some care must be taken. If a 3-conductor ¼-inch plug is used by the device it should be wired to the tip and sleeve leads; the plug's ring lead should be left unconnected. But it's also very likely that the monaural device will be terminated on a 2-conductor ("tip and sleeve") plug. When the plug is inserted into the Model 380's headphone jack the Model 380's right headphone output channel will be shorted; the ring lead will be directly shorted to the sleeve lead. This can lead to stress on the right channel headphone output circuitry as well as extra current draw. To prevent this condition the headphone output mode configuration choice (DIP switch 3) should be set for monaural. This disables the right headphone output channel and sends the listen audio sources only to the left output channel. Refer to the Configuration section later in this guide for details on setting the headphone audio routing.

Microphone Output

A 3-pin male XLR connector provides a microphone-level output that's directly related to the microphone input. Technically the output is identical to the signal that's connected to the microphone input but with a solid-state muting circuit in series

with the interconnection. When the Model 380's Dante main output channel is active the microphone signal passes through to the Model 380's microphone output. When the main output channel is muted (and the Dante talkback channel is active) the microphone signal does not pass through to the microphone output; it's is muted in an essentially click-free manner. Refer to Appendix A, located at the end of the guide, for a block diagram of the microphone input and microphone output circuitry. Studying this diagram can help illuminate one of the more unique Model 380 features.

The microphone output can be connected to a balanced (differential) analog microphone-level input on a variety of devices. When the Model 380 was designed the primary target devices were portable ENG-style video cameras that included microphone inputs. The mic inputs on these cameras are typically amplified and then embedded with the video signal into an SDI output. This would ensure that "lip sync" would be maintained since the audio and video would travel on the same digital stream. The Model 380's Dante main output channel would not be used or would only be used as a backup path. The microphone output can also be connected to mic inputs on audio consoles or to console remote I/O interfaces, e.g., Calrec® Hydra2®.

No preamplifier or other active circuitry impacts the path from the Model 380's microphone input connector to the Model 380's microphone output connector. The signal does pass through a 200 ohm resistor in each "leg" (pin 2 and pin 3) along with connecting to a solid-state relay contact. The result is that the source

impedance of a connected microphone will be 400 ohms greater when presented to the microphone output. This will slightly raise the theoretical noise floor of the microphone signal vis-a-vis the microphone output but shouldn't have any impact on real-world applications.

As previously discussed, if the connected microphone requires P12 or P48 phantom power it must be provided by way of a connection made to the Model 380's microphone output connector. The phantom power will "pass through" to the Model 380's microphone input connector and on to a connected microphone. The state of the muting circuitry (muted or not muted) will not impact the phantom power source. The series resistance (approximately 200 ohms in each leg of the balanced signal) should also not impact the phantom power being provided to a connected microphone.

Dante Configuration

For audio to pass to and from the Model 380 requires that several Dante-related parameters be configured. These configuration settings will be stored in non-volatile memory within the Model 380's circuitry. Configuration will typically be done with the Dante Controller software application which is available for download free of charge at www.audinate.com. Versions of Dante Controller are available to support Windows® and OS X® operating systems. The Model 380 uses the Ultimo 2-input/2-output integrated circuit to implement the Dante architecture.

The two Dante transmitter (Tx) channels associated with the Model 380's Dante interface must be assigned to the desired receiver channels. This achieves routing the Model 380's two output audio channels to the device (or devices) that will be "listening" to them. Within Dante Controller a "subscription" is the term used for routing a transmitter flow (a group of output channels) to a receiver flow (a group of input channels). The number of transmitter flows associated with an Ultimo integrated circuit is limited to two. These can either be unicast, multicast, or a combination of the two. If the Model 380's transmitter channels need to be routed to more than two flows it's possible that an intermediary device, such as a rack-mounted digital signal processor unit with more available flows, can be used to "repeat" the signals.

The two Dante receiver (Rx) channels associated with the Model 380's audio inputs also need to be routed to the desired Dante transmitter channels. These two audio signals will be sent to the Model 380's 2-channel headphone output.

The Model 380 supports audio sample rates of 44.1 and 48 kHz with a limited selection of pull-up/pull-down values available. In most cases the default will be used and a pull-up or pull-down rate will not be selected. The Model 380 can serve as the clock master for a Dante network but in most cases it will be configured to "sync" to another device.

The Model 380 has a default Dante device name of **ST-M380** and a unique suffix. The suffix identifies the specific Model 380 that is being configured. The suffix's actual alpha and/or numeric characters relate to the MAC address of the unit's Ultimo integrated circuit. The two Dante transmitter

(Tx) channels have default names of **Main** and **Talkback**. The two Dante receiver (Rx) channels have default names of **Headphone Ch1** and **Headphone Ch2**. Using Dante Controller the default device name and channel names can be revised as appropriate for the specific application.

Model 380 Configuration

The Model 380 provides five DIP switches which are used to configure four operating functions. These allow the unit to be optimized to match the needs of specific applications. Two of the switches allow the gain of the microphone preamplifier to be adjusted. One switch selects how incoming audio and sidetone audio are routed to the headphone output channels. The fourth switch selects the mode of the talkback button. The fifth switch selects the on/off status of the sidetone function. Physically the switches are accessible from the back of the Model 380's enclosure through a rectangular opening that is located under the top of the belt clip.

The DIP switches are connected to the Model 380's logic circuitry which responds to changes by way of the application firmware; no audio passes directly through the switches. Changes made to a DIP switch will immediately be reflected in the unit's operation.

Accessing the Configuration Switches

To access the five configuration DIP switches requires that the belt clip be rotated. Normally the belt clip is secured to the back of the enclosure using one rivet (non-removable) and one machine screw that has a thread pitch of 6-32. To allow the belt clip to rotate, remove the machine screw using a #1 Phillips head screw driver. The

belt clip should now be able to rotate in either direction. Save the screw so that it can be re-installed once the desired configuration choices have been made. Note that the threaded fastener within the back of the Model 380's chassis has an internal locking mechanism (a plastic bushing) that prevents the belt clip's 6-32 machine screw from vibrating loose. So no additional method of thread locking, such as a lock washer or chemical compound, is necessary.

Microphone Preamp Gain

Switches SW1 and SW2 allow the gain of the Model 380's microphone preamplifier to be selected. When SW1 and SW2 are in their down (off) position 35 dB of gain is selected. Placing SW1 to its up (on) position while leaving SW2 in its down (off) position selects the 43 dB gain setting. Leaving SW1 to its down (off) position while placing SW2 in its up (on) position selects the 52 dB gain setting. Placing SW1 and SW2 to their up (on) positions selects the gain to be 59 dB.
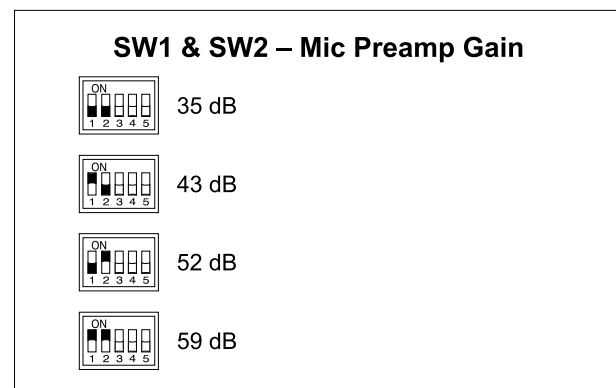

Figure 2. Microphone preamplifier gain configuration switches

The compressor active LED, visible on the bottom of the Model 380's enclosure adjacent to the headset connector, can act as a guide when setting the preamp gain. During normal talk operation the compressor active LED should light intermittently. If, for example, it rarely lights and the gain is set to 43 dB, it might be a good idea to change to setting to 52 dB. If the LED is lit fully during normal talking and the gain is set for 52 or 59 dB, changing it to one of the lower values might be warranted. There's no "hard and fast" rule about which gain setting is appropriate. But unless otherwise indicated, 43 dB is typically a good initial choice.

Headphone Output Mode

Switch SW3 is used to configure how the audio signals are routed to the 2-channel headphone output. In the dual-channel mode channel 1 of the Dante audio input is routed to the left channel of the headphone output. Channel 2 of the Dante audio input is routed to the right channel of the headphone output. And sidetone, if enabled, is sent to both the left and right headphone output channels. In the monaural mode Dante channels 1 and 2 and sidetone audio are combined and sent to the left headphone output channel; no signal is sent to the right headphone output. This mode is specifically provided when a 2-conductor ¼-inch plug is inserted into the Model 380's headphone output connector. This prevents potential stress on the right channel headphone output circuit when it is presented with a short circuit condition.
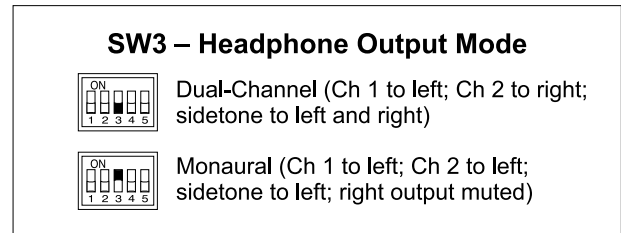

Figure 3. Headphone output mode configuration switch

Talkback Button Mode

Switch SW4 is used to configure the talkback button mode to be either momentary or latching. In the momentary mode the Dante main output channel and microphone output will be active and the button's green LED will be lit. When the button is pressed and held the LED will turn orange, the Dante main output channel and microphone output will mute, and the Dante talkback output channel will become active. When the button is released the function will return to the original state. When selected for the latching mode tapping (momentarily pressing) the button will cause the function to change states, moving between the Dante main output channel and microphone output being active and the Dante talkback output channel being active.
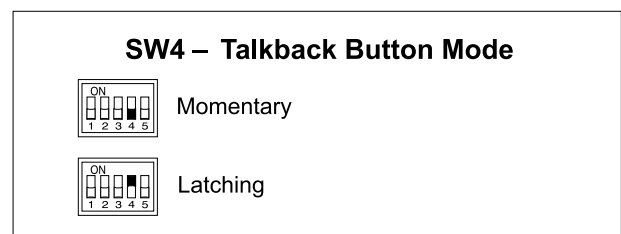

Figure 4. Talkback button mode configuration switch

Sidetone

Switch SW5 allows the sidetone function to be enabled or disable as desired. Selecting the on or off mode for sidetone will depend on the needs of the application. If a "full mix" is being provided to the Model 380 then locally provided sidetone won't need to be provided. The user will hear themselves by way of the audio signals being routed to the Dante input audio channels. But if a "mix-minus" is being supplied to the Model 380 then having sidetone enabled will be important as a user confidence monitor.
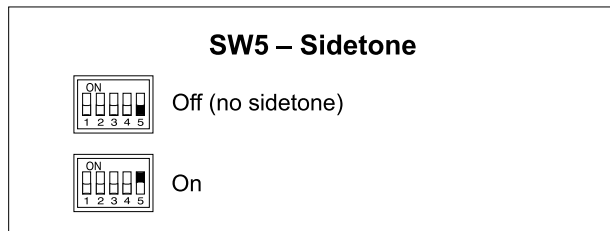

Figure 5. Sidetone function configuration switch

Operation

At this point everything should be ready and Model 380 operation can commence. An Ethernet connection with Power-over-Ethernet (PoE) capability should have been made. Alternately, a midspan power injector, in "series" with the Ethernet connection, should have been put into place. A microphone and headphones or earbud should have been connected. Alternately, a broadcast-style headset should be connected. If desired, a connection to the microphone output should have been made.

The Model 380's Dante configuration settings should have been selected using the Dante Controller software application. In this way the unit's two audio output channels (Dante transmitter channels) and two audio input channels (Dante receiver channels) should have been routed to the receiver and transmitter channels on associated equipment. The Model 380's configuration switches should have been set to meet the needs of the specific application.

Initial Operation

The Model 380 will start to function as soon as a Power-over-Ethernet (PoE) power source is connected. However, it may take 20 to 30 seconds for full operation to commence. Upon initial power up the three status LEDs located on the bottom panel below the RJ45 jack will begin to light as network and Dante connections are established. The green and orange LED backlights within the talkback pushbutton switch will light in a quick test sequence to indicate that the main operating firmware (embedded software) has started. Once the sequence has completed and the Dante connection has been established full operation will begin.

Ethernet and Dante Status LEDs

Three status LEDs are located below the etherCON RJ45 connector on the Model 380's bottom panel. The LINK ACT LED will light green whenever an active connection to a 100 Mb/s Ethernet network has been established. It will flash in response to Ethernet data packet activity. The SYS and SYNC LEDs display the operating status of the Dante interface and associated network. The SYS LED will light red upon Model 380 power up to indicate that the Dante interface is not ready. After a short interval it will light

green to indicate that it is ready to pass data with another Dante device. The SYNC LED will light red when the Model 380 is not synchronized with a Dante network. It will light solid green when the Model 380 is synchronized with a Dante network and an external clock source (timing reference) is being received. It will slowly flash green when the Model 380 is part of a Dante network and is serving as a clock master. It's possible that up to 30 seconds may be required for the SYNC LED to reach its final state.

How to Identify a Specific Model 380

The Dante Controller software application offers an identify command that can be used to help locate a specific Model 380. When identify is selected it will send a command to a single Model 380 unit. On that specific unit the talkback push-button's orange LED will flash on and off approximately eight times. (The on/off status of the button will not change.) In addition, the SYS and SYNC status LEDs, located directly below the etherCON RJ45 connector on the bottom panel, will slowly flash green. After a few seconds the LED identification pattern will cease and normal Model 380 button LED and Dante status LED operation will resume.

Headphone Listen Level

Three rotary potentiometers ("pots"), located on the Model 380's top panel, allow adjustment of the level of the two audio input signals and sidetone as they are sent to the 2-channel headphone output. How the pots function will depend on how the headphone output has been configured. In the dual-channel mode

channel 1 audio will be sent to the left channel and channel 2 audio will be sent to the right channel. Sidetone audio will be sent to both the left and right headphone output channels. In the monaural mode the two audio inputs and the sidetone audio are summed (mixed) and sent to only the left channel of the headphone output. No signal will be present on the right channel output.

The pots are "push-in/push-out" type which allow their associated knobs to be in their "out" position to be adjusted and their "in" position when protection from an unwanted change is desired. When a pot is in its fully counterclockwise position the associated audio signal is fully muted.

Users should find the headphone output audio quality to be excellent, with high maximum output level and low distortion. Analog audio signals do not pass directly through the level pots. The position of the pots is recognized by the Model 380's processor which then adjusts the signal level within the digital domain.

Compressor Active LED

A red LED indicator is located on the bottom panel adjacent to the headset connector. Labeled COMP, the LED displays the status of the microphone audio compressor function. It will light whenever the input level from the microphone, along with the configured mic preamp gain, is such that the dynamic range of the talk signal is being controlled. It's perfectly acceptable for this LED to light intermittently whenever a user is talking at a normal voice level into the associated microphone. But if the COMP LED lights solid while a user is talking at a normal voice level this will typically indicate that the mic

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 due to the design of the circuitry the compressor active LED will function whether or not any of the four talk channels are active.

Talkback Button

One pushbutton switch is used to select the status of the two Dante audio output channels and the microphone output connector. Labeled TALKBACK, the button really provides both an output mute and a talkback enable function. When "talkback" is active audio is no longer sent out the Dante main output channel but instead is routed to the Dante talkback output channel. In this way the "on-air" channel is muted and the talkback channel is active. And whenever the Dante main output channel is muted the microphone output, provided on the 3-pin XLR connector, will also be muted. How the talkback button will specifically function will depend on the configuration of the Model 380.

Momentary

When the talkback button has been configured for momentary operation how it functions is pretty self-explanatory. Press and hold the button to enable the talkback function. When talkback is enabled microphone audio will be sent out the Dante talkback output channel; the Dante main output channel and the microphone output will both be muted. When the talkback button is pressed the button's orange LED will light. When the talkback button is not pressed the button's green LED will be lit.

Latching

If the talkback button has been configured for the latching mode its operation is a bit different. Momentarily pressing ("tapping") the button will cause the talkback function to change states: off-to-on or on-to-off. Whenever microphone audio is being sent out the Dante main output channel and the microphone output is active the button's green LED will be lit. The button's LED will light orange when the talkback function is enabled and microphone audio is being sent out the Dante talkback output channel while both the Dante main output channel and microphone output are muted.

Sidetone Function

The Model 380 includes a sidetone function that sends microphone audio to the headphone output whenever the microphone audio is being sent to the Dante main output channel and the microphone output. Sidetone audio will never be provided when the talkback function is active. Sidetone audio quality should be excellent and will provide the Model 380 user with a confidence signal that they are active or "on-air." A configuration choice allows the sidetone function to be enabled or disabled as desired for the application. In a nutshell, if a mix-minus cue signal is being provided to the user by way of the audio inputs then sidetone will typically want to be enabled.

Whether sidetone audio will be sent to the left and right headphone output channels or only the left headphone output channel will depend on the configuration of the headphone output. As expected, when the Model 380 is configured for dual-channel sidetone audio will be sent to the left and right headphone output channels. When configured for monaural sidetone audio will

be sent to only the left headphone output channel.

The level of sidetone audio being sent to either the left and right headphone output channels or only the left headphone output channel is adjusted using the rotary level control ("pot") that is located on the top of the Model 380's enclosure. Typically providing a precise sidetone level is not important and most users will not be concerned about setting it to a specific value. But setting the sidetone level to something reasonable is important. Setting the level too low will encourage a user to speak too loudly; setting it too high and the user will be tempted to speak hesitantly. Audio does not pass directly through the sidetone pot. The pot's position is monitored by the Model 380's processor which then controls the level within the digital audio domain.

Technical Notes

IP Address Assignment

By default the Model 380's Ethernet interface will attempt to automatically obtain an IP address and associated settings using DHCP (Dynamic Host Configuration Protocol). If a DHCP server is not detected an IP address will automatically be assigned using the link-local protocol. This protocol is known in the Microsoft® world as Automatic Private IP Addressing (APIPA). It is also sometimes referred to as auto-IP (PIPPA). Link-local will randomly assign a unique IP address in the IPv4 range of 169.254.0.1 to 169.254.255.254. In this way multiple Dante-enabled devices can be connected together and automatically function, whether or not a DHCP server is active on the LAN. Even two Dante-enabled devices that are directly inter-connected using an RJ45

patch cord will, in most cases, correctly acquire IP addresses and be able to communicate with each other.

An exception does arise when trying to directly interconnect two Dante-enabled devices that use Ultimo integrated circuits to implement Dante. The Model 380 uses the Ultimo "chip" and, as such, a direct one-to-one interconnection to another Ultimo-based product is not supported. An Ethernet switch linking the two units is required to successfully interconnect two Ultimo-based devices. The technical reason that a switch is required relates to the need for a slight latency (delay) in the data flow; an Ethernet switch will provide this.

Using the Dante Controller software application the Model 380's IP address and related network parameters can be set for a fixed (static) configuration. While this is a more involved process than simply letting DHCP or link-local "do their thing," if fixed addressing is necessary then this capability is available. 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 380's IP address has been misplaced there is no reset button or other method to easily restore the unit to a default IP setting.

In the unfortunate event that a device's IP address is "lost," the Address Resolution Protocol (ARP) networking command can be used to "probe" devices on a network for this information. For example, in Windows OS the **arp –a** command can be used to display a list of LAN information that includes MAC addresses and corresponding IP addresses. The simplest means of identifying an unknown IP address is to create a "mini" LAN with a small

PoE-enabled Ethernet switch connecting a personal computer to the Model 380. Then by using the appropriate ARP command the required "clues" can be obtained.

Optimizing Network Performance

For best Dante audio-over-Ethernet performance a network that supports VoIP QoS capability is recommended. 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 (www.audinate.com) for details on optimizing networks for Dante applications.

Application Firmware Version Display

As part of the Model 380's power-up sequence the unit's application firmware (embedded software) version number can be displayed. This is useful when working with factory personnel on application support and troubleshooting. Before connecting the PoE-enabled Ethernet cable, press and hold the talkback button. Then connect the Ethernet cable. Upon application of PoE power the Model 380 will not go through its normal power-up sequence but instead will display the firmware version. The LED associated with the talkback button will "flash" green in color to display the major version number and then "flash" orange to display the minor version number. Then the LED will remain off until the talkback button is released. Once the button has been released normal operation will then take place. As an example of what would be a typical firmware display, if the talkback button's LED "flashes" green once followed by

the LED "flashing" orange thrice it would indicate that application firmware version 1.3 is present in the Model 380.

Application Firmware Update Procedure

It's possible that updated versions of the application firmware (embedded software) that is utilized by the Model 380's processor (microcontroller or MCU) integrated circuit will be released to add features or correct issues. Refer to the Studio Technologies website for the latest application firmware file. The unit has the ability to load a revised file into the MCU's non-volatile memory by way of a USB interface. The Model 380 implements a USB host function that directly supports connection of a USB flash drive. The Model 380's MCU updates its firmware using a file named **m380.bin**.

The update process begins by preparing a USB flash drive. The flash drive doesn't have to be empty (blank) but must be in the personal-computer-standard FAT32 format. Save the new firmware file in the root directory with a name of **m380.bin**. Studio Technologies will supply the application 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 380, the name of the zip file itself will include the file's version number. For example, a file named **m380v1r3MCU.zip** would indicate that version 1.3 of the application firmware (**m380.bin**) is contained within this zip file.

Once the USB flash drive is inserted into the USB interface, located on the main circuit board under the cover, the unit must be powered off and again powered on. At this point the file will automatically load. The precise steps required will be

highlighted in the next paragraphs of this guide. After the firmware has been updated the LED associated with the talkback button should be used to confirm that the desired application firmware version has been successfully installed.

To install the application firmware file follow these steps:

1. Disconnect power from the Model 380. This will entail removing the Ethernet connection that is providing PoE power.

2. Remove the cover from the Model 380. Begin by removing the four Phillips head screws (#1 screw driver tip), two per side. Be certain to save the screws so that re-assembly will be fast and painless. Then carefully slide the cover forward to separate it from the level controls and buttons and then lift it off.

3. Locate the USB connector on the main circuit board. It's near the front of the unit, directly between the channel 1 and channel 2 rotary level controls. Insert the prepared USB flash drive into it.

4. Apply power to the Model 380 by connecting to a Power-over-Ethernet (PoE) Ethernet source.

5. After a few seconds the Model 380 will run a "boot loader" program that will automatically load the new application firmware file (**m380.bin**). This loading process will take only a few seconds. During this time period the talkback button LED will flash slowly in alternate colors. Once the entire loading process is over, taking approximately 10 seconds, the Model 380 will restart using the newly-loaded application firmware.

6. At this time the Model 380 is functioning with the newly-loaded application firmware and the USB flash drive can be removed. But to be conservative, remove PoE power first and then remove the USB flash drive.

7. To confirm that the desired firmware version has been correctly loaded, press and hold the talkback button, apply power to the Model 380, and "read" the application firmware version number by observing the button's LED colors. Ensure that this is the desired version.

Note that upon power being applied to the Model 380 if a connected USB flash drive doesn't have the correct file (**m380.bin**) in the root folder no harm will occur. Upon power up the talkback button's LED will flash on and off rapidly for a few seconds to indicate this condition and then normal operation using the unit's existing application firmware will begin.

Ultimo Firmware Update

As previously discussed in this guide, the Model 380 implements Dante connectivity using the 2-input/2-output Ultimo integrated circuit from Audinate. The Dante Controller software application can be used to determine the version of the firmware (embedded software) residing in the Ultimo "chip." This firmware can be updated by way of the Model 380's Ethernet connection. The latest Dante firmware file is available on the Studio Technologies website. The Dante Firmware Update Manager (FUM) application is used to install the firmware. This program is also available for download on the Studio Technologies website.

Specifications

Power Source:

Power-over-Ethernet (PoE): class 1 (very low power, ≤3.84 watts)

Network Audio Technology:

Type: Dante audio-over-Ethernet

Bit Depth: up to 24

Sample Rate: 44.1 and 48 kHz

Number of Transmitter (Output) Channels: 2

Number of Receiver (Input) Channels: 2

Dante Audio Flows: 4; 2 transmitter, 2 receiver

Network Interface:

Type: twisted-pair Ethernet, Power-over-Ethernet (PoE) supported

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

Microphone Input:

Compatibility: dynamic microphones; P12 or P48 phantom powered mics are compatible when powered by an external source

Type: balanced, capacitive coupled (protected from presence of P12 or P48)

Impedance: 2 k ohms, nominal

Gain: 35, 43, 52, 59 dB, selectable

Frequency Response: 30 Hz to 20 kHz, −3 dB

Distortion (THD+N): <0.02%

Dynamic Range: 93 dB, A-weighted

Compressor:

Application: applies to Dante main and talkback output channels

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

Slope: 2:1

Status LED: compressor active

Microphone Output:

Type: passive, via 200 ohm resistors from microphone input, will pass phantom power to microphone input

Muting: solid-state relay contacts, 60 dB attenuation @ 1 kHz

Headphone Output:

Type: dual-channel

Compatibility: intended for connection to mono or stereo headsets or earpieces with nominal impedance of 50 ohms or greater

Maximum Output Voltage: 3.8 Vrms, 1 kHz, 150 ohm load

Frequency Response: 20 Hz to 20 kHz, −2 dB

Distortion (THD+N): <0.002%

Dynamic Range: >100 dB

Connectors:

Microphone Input: 3-pin female XLR

Microphone Output: 3-pin male XLR

Headphone Output: ¼-inch 3-conductor jack

Ethernet: Neutrik etherCON RJ45

USB: type A receptacle (located inside Model 380's enclosure and used only for firmware updates)

Dimensions (Overall):

3.8 inches wide (9.6 cm)
1.6 inches high (4.0 cm)
4.8 inches deep (12.6 cm)

Mounting: intended for portable applications; contains integral belt clip

Weight: 0.7 pounds (0.3 kg)

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

Appendix A: Model 380 Block Diagram

The following block diagram shows a simplified version of the Model 380's microphone input and microphone output circuitry.

MICROPHONE
PREAMPLIFIER
35, 43, 52, OR 59 dB

ACTIVE

ISOLATION
AND
PROTECTION

COMPRESSOR

TO
ANALOG-TO-DIGITAL
CONVERTER

DIGITAL CONTROL

PASSIVE
MUTING
NETWORK*
(400 OHM
INSERTION
IMPEDANCE)

MICROPHONE
INPUT
(XLR-3F)

2
3
1

MICROPHONE
OUTPUT
(XLR-3M)

2
3
1

DIGITAL CONTROL

* ALLOWS P12 AND P48 PHANTOM POWER TO PASS
  FROM MICROPHONE OUTPUT TO MICROPHONE INPUT

MODEL 380 ON-AIR BELTPACK
MICROPHONE INPUT AND OUTPUT
SIMPLIFIED BLOCK DIAGRAM