

# **Model 5202**

## **Dante™ to Phones and Line Output Interface**

### **User Guide**

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**This User Guide is applicable for serial numbers  
M5202-00151 and later**

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# Introduction

The Model 5202 Interface is a general-purpose audio device that supports applications utilizing the Dante™ Audio-over-Ethernet media networking technology. Two Dante-associated audio channels can be assigned to the Model 5202 which provides headphone and balanced line-level outputs. The audio quality is such that virtually any audio application can be supported, from simple headphone or loud-speaker monitoring to interfacing with high-performance on-air broadcast, stadium AV, or corporate audio systems. Multi-step LED meters provide confirmation of the level of the two input audio channels. The compact, lightweight design allows the Model 5202 to be used in portable or desktop situations or deployed as a permanent solution in fixed applications. Standard connectors ensure fast, reliable deployment. The unit requires only an Ethernet connection to supply both the data interface as well as Power-over-Ethernet (PoE) power.

## Applications

The Model 5202 is perfect for use in conjunction with the Dante Controller software application. Driving a pair of headphones or set of amplified speakers, audio flows and associated channels can be quickly

confirmed for content as well as signal level. For field applications the unit can serve as both a test tool and a general-purpose source of analog audio outputs. With level controls associated with both the headphone and line outputs interfacing with virtually any analog audio input is a simple matter. For permanent applications there's no reason why a Model 5202 can't reside within an equipment rack or be mounted, using optional brackets, underneath a table or on-air studio set. The low-power circuitry is intended for continuous operation.

## Headphone Output

A sonically-excellent 2-channel (stereo) headphone output is provided. It is capable of driving contemporary headphones, headsets, and earbuds to substantial levels at very low distortion. A rotary control is used to adjust the headphone output level. The level knob is a push-in/push-out type which helps prevent inadvertent adjustment. For flexibility the headphone output is provided on two separate 3-conductor jacks: a 3.5 mm on the front panel and a ¼-inch on the back. The audio quality of the headphone output is such that it can also be used as a 2-channel unbalanced line output. The output level control will make it a simple task to optimally interface the headphone output with inputs on personal computers, portable audio devices, and “semi-pro” equipment.



Figure 1. Model 5202 Dante to Phones and Line Output Interface front and rear views

## Line Outputs

The Model 5202 provides a 2-channel line-level, electronically-balanced analog audio output by way of standard 3-pin male XLR connectors located on the back panel. A rotary level control allows the nominal (average) level of the line outputs to be adjusted. Using the push-in/push-out knob it's a simple matter to achieve the desired nominal output levels which include  $-10$ ,  $0$ , or  $+4$  dBu. And with a maximum output level of  $+24$  dBu there will always be sufficient headroom for "pro" audio performance. Protection components in the output circuitry help ensure reliability in field applications.

The line outputs can serve a number of monitoring and interfacing uses. Audio amplifiers or amplified speakers can be directly connected. The level control can be used to adjust the speaker volume or used as a level trim function to match the speaker's input sensitivity. The line outputs can also serve as a source for interfacing with analog inputs on audio consoles, wireless in-ear or IFB monitor systems, as well as audio recording devices. The level control will help to ensure that the nominal level of the line outputs will match the requirements of the connected equipment.

## Metering

Two 7-step LED meters provide a real-time level indication of the two Dante-supplied audio channels. Scaled in dBFS (decibels referenced to full scale digital) the meters offer a direct view of the signal levels as they arrive in the digital domain. Optimal audio performance requires transporting signals at their proper levels — without an accurate indication this can be difficult to achieve.

## Ethernet Data and PoE

The Model 5202 connects to a 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 5202's operating power is provided by way of the Ethernet interface using the Power-over-Ethernet (PoE) standard. This allows fast and efficient interconnection with the associated data network. To support PoE power management the Model 5202's PoE interface reports to the power sourcing equipment (PSE) that it's a class 1 (very low power) device. An LED is provided to indicate when power is being supplied to the Model 5202. Note that no provision has been made to allow an external power source to be connected. However, if the associated Ethernet switch does not provide PoE capability a commonly-available mid-span PoE power injector can be utilized.

## Dante Audio-over-Ethernet

Audio data is sent to the Model 5202 using the Dante Audio-over-Ethernet media networking technology. As a Dante-compliant device, two audio channels can be assigned to the unit using the Dante Controller software application. A single mouse-click is all that's required to route an audio signal to the Model 5202. Bit depths of up to 24 and sample rates of 44.1, 48, 88.2, and 96 kHz are supported. Two bi-color LEDs provide an indication of the Dante connection status. The Model 5202 uses Audinate's Ultimo™ integrated

circuit for implementing Dante. The integrated circuit's firmware can be updated via the Ethernet connection, helping to ensure that its capabilities remain up to date.

## Connections

In this section signal interconnections will be made using the connectors located on the front and back panel of the Model 5202. 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. Headphones can be connected using either the 3.5 mm or ¼-inch 3-conductor phone jack. Line output connections are made using two 3-pin male XLR connectors.

### System Components

Included in the shipping carton are a Model 5202 Interface and printed copy of the user guide.

### Ethernet Connection

A 100BASE-TX Ethernet connection that supports Power-over-Ethernet (PoE) is required for Model 5202 operation. This one connection will provide both the Ethernet data interface and power for the Model 5202'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. For PoE switch (PSE) power management the Model 5202 will enumerate 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 back panel of the Model 5202. This allows connection by way of a cable-mounted etherCON plug or

a standard RJ45 plug. The Model 5202's Ethernet interface supports auto MDI/MDI-X so that most cabling implementations will be correctly supported.

### Headphone Output

The Model 5202's headphone output is compatible with standard stereo headphones, headsets, or earbuds. Connecting devices with a nominal impedance of 100 ohms or greater is recommended. But this shouldn't be an issue since essentially all of the contemporary devices meet this recommendation.

Devices are connected to the headphone output by way of either a 3.5 mm 3-conductor jack located on the Model 5202's front panel or a ¼-inch 3-conductor phone jack located on the Model 5202's back panel. As is standard for stereo headphones, the left channel is connected to the jacks' tip lead, the right channel to the jacks' ring lead, and the common connection to the jacks' sleeve. Inside the Model 5202 the connections on the two jacks are wired in parallel ("malted"); the same output circuitry drives both connectors. While it's expected that typically only one pair of headphones or earbuds will be connected at a time, there is no reason why two pairs can't be connected at the same time.

### Line Outputs

The line outputs are designed for general-purpose use which could include connecting to inputs on audio consoles, amplified speakers, audio storage devices or systems, or transmitters associated with wireless in-ear monitors. The audio quality is such that using the line outputs for on-air broadcast or streaming applications would be appropriate. The line outputs are analog,

electronically balanced, capacitor coupled, and will perform optimally when driving loads of 2 k (2000) ohms or greater. The nominal output level depends on the setting of the rotary level control. When the control is set to its fully clockwise position the nominal level is +4 dBu. This means that if there is a Dante transmitter (output) channel that has a nominal level of -20 dBFS, when it's routed to a Model 5202 the associated line output will have a nominal level of +4 dBu.

The Model 5202 provides two 3-pin male XLR connectors for interfacing with associated equipment. Pin 2 should be connected as signal + (high), pin 3 as signal - (low), and pin 1 as common/shield. To connect to an unbalanced load use pin 2 as signal + (high) and pin 1 as low/shield. Pin 3 should be left unconnected. To clarify, for correct unbalanced operation it is important not to connect pin 3 to anything; do not connect pins 1 and 3 together.

## Dante Configuration

Several Model 5202's Dante-related parameters can be configured. These configuration settings will be stored in non-volatile memory within the Model 5202'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](http://www.audinate.com). Versions of Dante Controller are available to support Windows® and OS X® operating systems. The Model 5202 uses the Ultimo 2-input/2-output integrated circuit to implement the Dante architecture. However only the two receiver (input) channels are utilized. This dictates

which parameters can be configured and what choices are available.

The two audio input channels associated with the Model 5202's Dante interface must be assigned to the desired output sources. Within Dante Controller a "subscription" is the term used for routing a transmit flow (a group of output channels) to a receive flow (a group of input channels). The Model 5202 will support audio sample rates of 44.1, 48, 88.2, and 96 kHz with a limited selection of pull-up/pull-down values. The Model 5202 can serve as the clock master for a Dante network but in most cases it will "sync" to another device.

The Model 5202 has a default Dante device name of **ST-M5202** and a unique suffix. The suffix identifies the specific Model 5202 that is being configured (it relates to the MAC address of the Ultimo integrated circuit). The two Dante receiver channels have default names of **Ch1** and **Ch2**. Using Dante Controller the default device and channel names can be revised as appropriate for the specific application.

## Operation

At this point an Ethernet connection with Power-over-Ethernet (PoE) capability should have been made. The unit's Dante configuration settings should have been made using Dante Controller software application. At a minimum a transmitter source should have been routed to the Model 5202's two Dante receiver channels. Headphone and line output connections should have been made as desired. Normal operation of the Model 5202 can now begin.

## Initial Operation

The Model 5202 will immediately begin to function after a Power-over-Ethernet (PoE) power source is connected. However, full operation may take up to 20 seconds to begin. Upon initial power up the four status LEDs located on the back panel will begin to light. The meter LEDs on the front panel will light in a test sequence. After the meter LEDs complete their test sequence one meter LED associated with channel 1 and one meter LED associated with channel 2 will briefly light to indicate the version number of the unit's firmware (embedded software). Once that sequence has completed and the Dante connection has been established audio signals can be available.

## Ethernet, PoE, and Dante Status LEDs

Four status LEDs are located below the Ethernet connector on the Model 5202's back panel. The PoE LED will light green to indicate that Power-over-Ethernet (PoE) associated with the connected Ethernet signal is providing operating power for the Model 5202. 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 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 5202 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 5202 is not synchronized with a Dante network. It will light solid green when the Model 5202

is synchronized with a Dante network and an external clock source (timing reference) is being received. It will slowly flash green when the Model 5202 is part of a Dante network and is serving as a clock master.

## How to Identify a Specific Model 5202

The Dante Controller software application offers an identify command that can be used to help locate a specific Model 5202. When identify is selected for a specific unit the SYS and SYNC LEDs on that unit will slowly flash green.

## Level Meters

Two 7-step LED meters will display the level of the two Dante audio receiver (input) channels. The meter steps are calibrated in dBFS which indicates the number of dB below the maximum possible digital signal level. The maximum level is 0 dBFS which occurs when the digital audio data is all "1"s. In typical applications a signal level of -20 dBFS would be the nominal (normal average) value. The five meter steps that have a threshold of -20 dBFS and less light with the color green. The step that lights at -15 dBFS and greater is yellow in color and indicates a "hot" or above average signal level. The top step lights red in color when a signal level is -5 dBFS or greater, indicating that a potentially "clipped" (distorted due to excessive level) signal is present.

## Headphone Output

Dante input channel 1 is routed to the left headphone output channel. This signal is connected to the tip connection on both the 3.5 mm and 1/4-inch headphone output

jacks. Dante input channel 2 is routed to the right headphone output channel which is associated with the ring connection on the output jacks. The push-in/push-out headphone level control adjusts the level of both the left and right channels of the headphone outputs. In the fully counterclockwise position the output level is essentially off.

Care must be taken when adjusting the headphone output level control. The output circuitry is capable of driving headphones, headsets, or earbuds to damaging levels. Hearing damage is a real possibility and caution must be exercised.

## Line Outputs

Dante input channel 1 is routed to line output channel 1. Dante input channel 2 is routed to line output channel 2. The associated push-in/push-out rotary control adjusts the level of both line output channels. In its fully counterclockwise position the output level of the two channels are essentially off. In its fully clockwise position the output levels will be approximately +4 dBu with a Dante input signal that has a level of -20 dBFS.

# Technical Notes

## Ultimo Firmware Update

The Model 5202 implements Dante connectivity using the Ultimo integrated circuit from Audinate. This 2-input/2-output device can be updated by way of the Model 5202's Ethernet connection. As of the date of writing this guide it's not evident as to whether or not newer firmware will ever need to be loaded.

## Identifying the Firmware Version Number

As previously discussed in this guide, upon power up the meter LEDs are used to briefly display the version number of the Model 5202's firmware (embedded software). This information is typically only necessary when working with the factory on support issues. The meter LEDs will first go through a display sequence followed by an approximately 1-second period where the version number will be indicated. The top row of seven LEDs will display the major version number with a range of 1 to 7. The bottom row of seven LEDs will display the minor version number with a range of 1 to 7. Refer to Figure 2 for details.



Figure 2. Detail of front panel showing the LEDs that display the firmware version. In this example, the version shown is 1.1.

# Specifications

## **Network Audio Technology:**

**Type:** Dante Audio-over-Ethernet

**Bit Depth:** up to 24

**Sample Rates:** 44.1, 48, 88.2, and 96 kHz

## **Network Interface:**

**Type:** twisted-pair Ethernet with Power-over-Ethernet (PoE)

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

**Power:** Power-over-Ethernet (PoE) per IEEE 802.3af class 1 (very low power,  $\leq 3.84$  watts)

## **General Audio Parameters:**

**Frequency Response:** 20 Hz to 20 kHz,  $\pm 0.5$  dB, Dante to line output

**Distortion (THD+N):** 0.01%, measured at 1 kHz, +4 dBu, Dante to line output

**Dynamic Range:** >100 dB, A-weighted, Dante to line output

## **Headphone Output:**

**Type:** stereo, configured to drive headphones through 100 ohm series resistors

**Compatibility:** intended for connection to headphones with impedance of 100 ohms or greater

**Level:** adjustable using rotary level control

**Maximum Voltage:** 8 Vpp, 100 ohm load

## **Line Outputs:** 2

**Type:** electronically balanced, capacitor-coupled, intended to drive balanced or unbalanced loads of 2 k ohms or greater

**Source Impedance:** 200 ohms

**Nominal Level:** adjustable using rotary level control, +4 dBu @ 100% rotation

**Maximum Level:** +24 dBu into 2 k ohms

## **Meters:** 2

**Function:** displays level of Dante input signals

**Type:** 7-segment LED, modified VU ballistics

## **Connectors:**

**Ethernet:** Neutrik etherCON RJ45

**Headphone Output:** 3.5 mm and 1/4-inch 3-conductor jacks

**Line Outputs:** 3-pin male XLR

## **Dimensions (Overall):**

4.2 inches wide (10.7 cm)

1.7 inches high (4.3 cm)

5.1 inches deep (13.0 cm)

**Mounting Option:** bracket kit

**Weight:** 0.8 pounds (0.35 kg)

Specifications subject to change without notice.