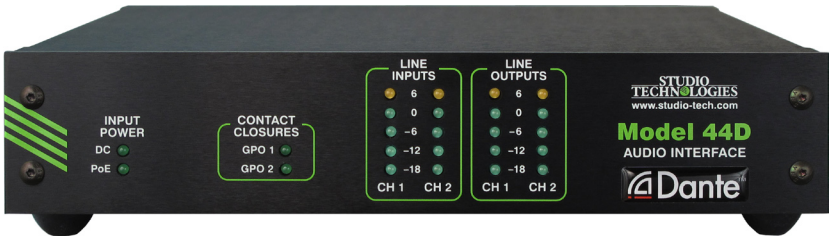
Model 44D
AUDIO INTERFACE

STUDIO TECHNOLOGIES INC.



Key Features:

- Dante® audio-over-Ethernet technology
- Input and output level metering
- Selectable input and output nominal levels
- Excellent audio quality
- GPI/GPO support
- Tone generator mode for REMI and call light applications
- PoE and 12 Vdc powering
- Standard connectors
- Table-top, portable, or optional rack-mount use

Overview

The Model 44D Audio Interface provides a simple yet high-performance means of interfacing two channels of analog line-level audio to and from applications that utilize Dante® audio-over-Ethernet media networking technology. Two Model 44D units can also provide one-to-one signal paths, two in each direction, over a standard local area network (LAN). In addition, the unit supports transport of status signals or contact closures between Model 44D units and other compatible products. There are two general-purpose inputs (GPI) and two general-purpose output (GPO) on each Model 44D.

A special operating mode allows the Model 44D to serve as a tone generator rather than an audio interface. When configured for the tone generator mode 18 kHz and 20 kHz sine-wave audio signals are available in both the analog and digital domains.

The Model 44D is a fully professional product that offers the audio quality, features, and reliability required by 24-hour, on-air, and commercial applications. The two line-level audio inputs use standard 3-pin female XLR connectors for easy interfacing with balanced and unbalanced sources. The input audio signals are converted to 24-bit digital and then transported via the Dante interface. Two digital audio signals arrive into the Model 44D via the Dante interface and are then converted to analog. Two 3-pin male XLR connectors on the Model 44D's back panel provide balanced line-level outputs.

The Model 44D is designed as a bridge, using Dante to link analog or other Dante interfaces found on devices such as matrix intercom systems, broadcast routers, and audio consoles. An Ethernet connection is all that's required to make the Model 44D part of a sophisticated, networked audio system. Dante audio-over-Ethernet has found wide acceptance as an audio "backbone" due to its ease of use, high performance, strong interoperability, and wide adoption by a large number of equipment manufacturers. The Model 44D is a general-purpose "tool" that helps to expand Dante's capabilities to facilities and equipment that primarily supports signals in the analog domain.

Careful attention to circuit design and component selection ensures that excellent audio quality is maintained. Extensive filtering helps prevent damage or less-than-optimal performance should DC voltage, ESD ("static"), or strong RF signals be present on the associated analog signals.

Configuration switches allow several Model 44D operating parameters to be selected. The nominal audio levels of the line input and line output functions can be independently selected. In this way compatibility with SMPTE® and EBU nominal signal levels is supported. Audio level meters provide confirmation of system performance during setup and operation. Two general purpose input and two general purpose output functions allow support for installer-selected applications, including party-line intercom call-light functions. Two LEDs provide a direct indication of the status of the GPO functions.

The Model 44D can be powered by Power-over-Ethernet (PoE) or an external source of 12 volts DC. Standard connectors are used for the line inputs and outputs, Ethernet, GPI/GPO, and DC power interconnections. The Model

44D's enclosure has a "1/2-rack" 1U form factor and weighs less than two pounds, making it well suited for use in portable applications. Alternately, using one of the optional rack-mount front panels, one or two Model 44D units can be mounted in a single space (1U) of a standard 19-inch rack enclosure.

Dante Audio-over-Ethernet

Audio data is sent to the Model 44D using the Dante audio-over-Ethernet media networking technology. Audio signals with a sample rate of 44.1 or 48 kHz and a bit depth of up to 24 are supported. The two line input channels are converted to digital and then routed to transmitter (output) channels on the Dante interface. Two transmitter (output) channels from an associated Dante-enabled source device can be assigned to the Model 44D's receiver (input) channels using the Dante Controller application. These are then converted into analog outputs.

Applications

The most basic application for Model 44D is for transporting analog audio signals to and from one location to another using the data transport resources of a local area network — there's really no simper means to getting high-quality audio from "point A to point B" and back. With standard connectors and PoE power, setup can be completed in just a few minutes. This makes Model 44D units effective in both fixed and portable applications.

The Model 44D can also find use when an application already supports Dante. For example, ports on a matrix intercom system that directly supports Dante, such as the RTS® ADAM® with OMNEO®, can be routed to a Model 44D's Dante output (transmitter) and input (receiver) channels. The Model 44D will then provide two analog input and two analog output interfaces for use in a variety of applications. These can include interfacing with audio inputs and outputs associated with audio consoles, providing talent cueing (IFB) feeds, and interfacing with the audio outputs of aerial camera systems.

The Model 44D's tone generator mode enables the unit to create 18 kHz and 20 kHz analog and digital sine-wave audio signals. The 18 kHz tone is provided as a resource when supporting remote-production (REMI) applications that use the Studio Technologies' Model 5422 Dante Intercom Audio Engine. The tone can be used by a matrix intercom system to facilitate creation of voice-with-tone interruptible foldback (IFB) signals. When routed to the Model 5422's interrupt inputs these specialized IFB signals will allow excellent talent cueing performance to occur.

The 20 kHz tone is provided for use in applications where generation of a party-line call signal is desired. For example, the 20 kHz tone can be connected to a matrix intercom system which would be configured such that a button press will cause 20 kHz to be sent out an intercom channel. This can serve as a "trigger" signal for visual or audible alerting devices, such as the Studio Technologies' Model 391 Dante Alerting Unit.

Line Inputs

The Model 44D provides two analog line-level input channels. A configuration choice allows the nominal level of the input signals to be +4 or 0 dBu. When configured for +4 dBu the unit will be compatible with SMPTE applications where the nominal digital signal level is –20 dBFS. In the 0 dBu configuration the line inputs are optimized for EBU applications where the nominal digital signal level is –18 dBFS.

The electronically balanced (differential) input circuits are capacitor-coupled and ESD (static) protected for reliable operation in a variety of applications. They are also protected from damage should a moderate DC voltage be accidentally connected. Sources can include analog I/O cards on matrix intercom systems, audio consoles, wireless microphone receivers, and broadcast routers.

Line Outputs

The Model 44D provides two analog line-level output channels. As with the line inputs, a configuration choice allows the nominal level of the output signals to be +4 or 0 dBu. This allows compatibility in applications where SMPTE (+4 dBu = –20 dBFS) or EBU (0 dBu = –18 dBFS) standards may apply. The outputs are electronically balanced, capacitor-coupled and ESD (static) protected. The outputs are compatible with virtually all balanced and unbalanced inputs with an impedance of 2 k ohms or greater.

General Purpose Inputs and Outputs

The Model 44D allows the sending and receiving of status signals using high-frequency audio tones that are included with within the Dante audio channels. When two Model 44D units are interconnected using an Ethernet network and Dante, two status signals will be transported in each direction. Each general purpose input (GPI) is compatible with contact closures provided by equipment such as matrix intercom systems or routers. A closure on a GPI on one Model 44D unit will result in the closing (shorting) of a solid-state relay contact on the other Model 44D. To assist in implementing specialized GPI and GPO applications a source of low-current DC power is also provided.

The GPI and GPO functions can be especially useful in party-line intercom applications where call-light signals are utilized. Contact closures on matrix intercom systems can be "repeated" by Model 44D units that are located anywhere within the associated local area network (LAN). The Model 44D is also directly compatible with the call-light signal support provided by the Studio Technologies' Model 45DC and Model 45DR Intercom Interface units. With a Model 44D appropriately interconnected with a matrix intercom system full call-light support can be provided to and from RTS and Clear-Com® party-line intercom circuits.

Pro Audio Quality

The Model 44D's audio circuitry was designed in the spirit of professional audio equipment rather than that found in typical broadcast or commercial audio gear. High-performance components are used throughout, providing low-distortion, low-noise, and high headroom. Care was taken so that signal integrity is maintained in both the analog and digital domains.

Audio Meters and Status LEDs

The Model 44D provides four 5-segment LED meters. The meters, located on the front panel, display the level of the audio signals associated with the two line inputs and two line outputs. At the time of installation and setup the meters are invaluable in helping to confirm correct operation. During normal operation the meters offer direct confirmation of the unit's audio signal levels, helping to ensure that optimal audio quality is maintained. Additional LED indicators are provided on the front panel, offering status indications of the incoming power and general purpose output (GPO) functions.

Tone Generator Mode

For special applications the Model 44D can be configured to serve as a tone generator. Instead of functioning as an audio interface device, the Model 44D will generate two sine-wave audio signals, one 18 kHz and the other 20 kHz. These signals are available both as line-level analog and Dante digital audio (transmitter) outputs. The 18 kHz tone is intended for use with matrix intercom systems that are used with the Studio Technologies' Model 5422 Dante Intercom Audio Engine. This tone will be connected to a matrix intercom system using either analog or Dante inputs. The matrix intercom system will be configured such that it will combine voice audio with the 18 kHz tone to create specialized IFB signals. These voice-with-tone signals will be routed, by way of an audio transport system, to Model 5422 interrupt inputs associated with tone operated (TOX) IFB channels. The Model 5422 will detect the 18 kHz tone and "trigger" the associated IFB function. In this way high-performance IFB functions can be implemented for REMI (remote-production) applications.

The 20 kHz tone is provided for use in applications where generation of in-band signals that are compatible with the call function on RTS TW-series party-line (PL) intercom channels is desired. One example would be for the 20 kHz tone to be connected to an analog or Dante receiver (input) channel on a matrix intercom system. The intercom system would be configured such that a button press on an intercom "key" panel would cause 20 kHz to be sent out an intercom channel. This would then serve as a call "trigger" for devices such as a Studio Technologies' Model 391 Dante Alerting Unit. Another interesting example would be for the 20 kHz tone to be used to serve as an activation signal for contact closures. Using Dante subscriptions (routes), the intercom channel from the matrix interface would be connected to additional Model 44D units. When those units receive the 20 kHz tone signal they would enable their associated GPO contact closure.

Both the 18 kHz and 20 kHz tones are precise in terms of frequency and level accuracy, as well as being very low in harmonic distortion.

Ethernet Data, PoE, and DC Power Source

The Model 44D 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. The Model 44D's operating power can be 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 44D's PoE interface reports to the power sourcing equipment (PSE) that it is a class 1 (very low power) device. The unit can also be powered using an external source of 12 volts DC. Four LEDs on the back panel display the status of the network connection, Dante interface, and PoE power source.

Simple Installation

The Model 44D uses standard connectors to allow fast and convenient interconnections. An Ethernet signal is connected using a Neutrik etherCON RJ45. If Power-over-Ethernet (PoE) is available operation will commence immediately. An external 12 volt DC power source can also be connected by way of a 4-pin XLR connector. Line input and line output connections are made using 3-pin XLR connectors. A 9-pin female D-subminiature (DE-9F) connector provides access to the two GPI, two GPO, and auxiliary DC output functions. The Model 44D is housed in a rugged yet lightweight aluminum enclosure that is designed to be "field tough." It can be used as a standalone portable unit, supporting what's known in the broadcast world as "throw-down" applications. Rack-mount options are also available allowing one or two units to be mounted in one space (1U) of a standard 19-inch rack enclosure.

Future Capabilities and Firmware Updating

The Model 44D was designed so that its capabilities 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.

To implement the Dante interface the Model 44D uses Audinate's Ultimo™ integrated circuit. The firmware in this integrated circuit can be updated via the unit's Ethernet connection, helping to ensure that its capabilities remain up to date.

Specifications

Power Sources:
Power-over-Ethernet (PoE): class 1 (very low power, ≤3.84 watts) per IEEE 802.3af
External: 10 to 18 volts DC, 0.3 amp maximum at 12 volts DC

Network Audio Technology:
Type: Dante audio-over-Ethernet
Bit Depth: up to 24
Sample Rates: 44.1 and 48 kHz
Number of Receiver (Input) Channels: 2
Number of Transmitter (Output) Channels: 2
Dante Audio Flows: 4; 2 receiver, 2 transmitter

Network Interface:
Type: twisted-pair Ethernet, Power-over-Ethernet (PoE) supported
Data Rate: 100 Mb/s (10 Mb/s not supported; 1000 Mb/s "GigE" Ethernet not supported unless falls back to 100 Mb/s)

Line Inputs: 2
Type: analog, electronically balanced, capacitor coupled
Impedance: 20 k ohms, nominal
Nominal Level: +4 dBu, reference –20 dBFS or 0 dBu, reference –18 dBFS, configurable
Maximum Level: +24 dBu when configured for +4 dBu nominal, +18 dBu when configured for 0 dBu nominal
Dynamic Range: >114 dB, A-weighted
Distortion (THDS+N): <0.002% (–95 dB), measured at –1 dBFS, 22 kHz bandwidth
Frequency Response: +0.0 dB/–0.5 dB, 20 Hz to 20 kHz; 10 kHz low-pass filters disabled
Low-Pass Filters: –3 dB @ 10 kHz, –55 dB @ 20 kHz, configurable on or off in tandem with line output filters

Line Outputs: 2
Type: analog, electronically balanced, capacitor coupled, intended to drive balanced or unbalanced loads of 2 k ohms or greater.
Source Impedance: 200 ohms
Nominal Level: +4 dBu, reference –20 dBFS, or0 dBu, reference –18 dBFS, configurable
Maximum Level: +24 dBu when configured for +4 dBu nominal, +18 dBu when configured for 0 dBu nominal
Dynamic Range: >114 dB, A-weighted
Distortion (THDS+N): 0.003% (–90 dB), measured at –1 dBFS, 22 kHz bandwidth
Frequency Response: ±0.1 dB, 20 Hz to 20 kHz, 10 kHz low-pass filter disabled
Low-Pass Filters: –3 dB @ 10 kHz, –55 dB @ 20 kHz, configurable on or off in tandem with line input filters

Tone Generator:
Type: sine-wave
Frequency: 18 kHz ±350 mHz; 20 kHz ±350 mHz
Analog Output Level: +4 dBu, nominal
Analog Output Distortion (THD+N): <0.003%
Digital Output Level (Dante transmitter (Output)): –20 dBFS
Digital Output Distortion (THD+N): <0.0001%

Meters: 4
Function: displays level of line inputs and line outputs in dBFS
Type: 5-segment LED, modified VU ballistics

GPI: 2
Type: logic input, pulled to +3.3 volts DC through 3.3 k (3300 ohm) resistor, pull down to common to enable
Signaling Method: tones summed into Dante transmitter audio path, 20 kHz nominal at 48 kHz sampling rate, 18.375 kHz nominal at 44.1 kHz sampling rate

GPO: 2
Output Type: solid-state relay contact
Contact Type: form A (normally open, not shorted), isolated
Contact Rating: 400 mA, 60 volts AC/DC, maximum
Contact Resistance: 2 ohms, maximum
Detection Method: monitors Dante receiver audio path for presence of 20 kHz (±800 Hz) tone at 48 kHz sampling rate, 18.375 kHz (±800 Hz) tone at 44.1 kHz sampling rate. Tones will pass to line outputs unless low-pass filters enabled.
GPO Status LEDs: 2

Auxiliary DC Output:
Application: for use with GPO outputs
Type: 12 volts DC, nominal, 10-18 volts DC with external power connected, 25 mA maximum

Connectors:
Line Inputs: 3-pin female XLR
Line Outputs: 3-pin male XLR
Ethernet: Neutrik etherCON RJ45
External DC: 4-pin male XLR
GPI/GPO/Aux DC: 9-pin female D-subminiature (DE-9F)
USB: type A receptacle (located inside Model 44D's enclosure and used only for application firmware updates)

Dimensions – Overall:
8.7 inches wide (22.1 cm)
1.72 inches high (4.4 cm)
8.3 inches deep (21.1 cm)

Mounting Options: single-unit rack-mount front panel (M44DRM-1) and two-unit rack-mount front panel (M44DRM-2); uses one space (1U) in a standard 19-inch rack

Weight: 1.8 pounds (0.80 kg); rack-mount front panels add 0.2 pounds (0.09 kg)

Specifications subject to change without notice.

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