



Model 45DC

INTERCOM INTERFACE



Key Features:

- Dante™ Audio-over-Ethernet technology
- Integrated party-line intercom power sources
- Analog hybrids with auto null capability
- Input and output level metering
- Excellent audio quality
- PoE and 12 volt DC powering
- Standard connectors
- Table-top, portable, or optional rack-mount use

Overview

The Model 45DC Dante™ to Dual Party-Line Intercom Interface is designed for applications that utilize single-channel analog party-line (PL) intercom technology. This type of intercom is commonly used in theater, entertainment, and education applications where a simple, reliable, low-cost, and easy to use solution is desired. Analog party-line products from Clear-Com® are compatible with the Model 45DC. The Dante Audio-over-Ethernet media networking technology is used to transport the send and receive audio channels associated with each of the two party-line circuits. Two hybrid circuits with automatic nulling provide excellent audio quality and high return-loss. (These hybrid circuits are sometimes referred to as 2-wire to 4-wire converters.) The Model 45DC is directly compatible with the latest broadcast and audio equipment that uses Dante technology. An Ethernet connection is all that's required to make the Model 45DC part of a sophisticated, networked audio system.

A Model 45DC can interconnect with devices such as matrix intercom systems, DSP processors, and audio consoles. The Model 45DC is directly compatible with the RTS ADAM® OMNEO® matrix intercom network. Alternately, two Model 45DC units can interconnect by way of the associated Ethernet network. The Model 45DC can be powered by Power-over-Ethernet (PoE) or an external source of 12 volts DC. A party-line power source and impedance termination network can be supplied by the Model

45DC, allowing connection of user beltpacks such as the Clear-Com RS-501 and RS-701. A Model 45DC can also connect with an existing powered and terminated intercom circuit. Audio level meters provide confirmation of system performance during setup and operation. Standard connectors are used for party-line intercom, Ethernet, and DC power interconnections. The Model 45DC'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 45DC units can be mounted in a single space (1U) of a standard 19-inch rack enclosure.

Applications

There are two main ways that the Model 45DC can be used in applications: adding party-line support for matrix intercom systems and linking two stand-alone party-line intercom circuits. Ports on matrix intercom systems that support Dante, such as the RTS ADAM with OMNEO, can be routed to the Model 45DC's Dante input and output channels. The Model 45DC's circuitry will then convert these signals into two single-channel party-line circuits. In this way adding party-line support to RTS + OMNEO is a simple task. The Model 45DC can also be used with matrix intercom systems that don't support Dante. An external analog-to-Dante interface can be used to convert analog intercom ports to Dante channels. Once in the digital domain, these Dante channels can be interconnected with the Model 45DC's audio input and output channels.

Two separate sets of party-line circuits can easily be interconnected using two Model 45DC Interfaces. At each end a Model 45DC is connected to both party-line intercom circuits as well as the Dante network. The Dante Controller application will then be used to route the audio channels between the two units. That's it — nothing else is required to achieve excellent performance. The Model 45DC can also be used to "bridge" two single-channel party-line intercom circuits with one 2-channel party-line intercom circuit. This involves using a Model 45DC for the two single-channel circuits and one of the Studio Technologies' Model 45DR Interface units for the 2-channel-channel circuit. The Model 45DR is the "cousin" of the Model 45DC and supports one 2-channel party-line intercom circuit rather than two single-channel circuits. These 2-channel circuits, typically supported by equipment from RTS®, are commonly used in broadcast applications.

Party-Line Interfaces

The Model 45DC's two party-line interfaces are optimized for connection with two single-channel party-line intercom circuits such as those associated with equipment from Clear-Com and other compatible manufacturers. (While the Model 45DC will function in a limited manner with a 2-channel RTS TW circuit, the Model 45DR Interface is the much-preferred choice.) The Model 45DC's party-line interfaces can correctly function with powered ("wet") or unpowered ("dry") party-line intercom circuits. Each interface has a party-line active detection function to ensure that should a belt-pack or active party-line circuit not be connected the Model 45DC's interface circuitry will remain stable. This unique feature makes certain that objectionable audio signals, including oscillations and "squeals," won't be sent to other Dante-connected devices.

A significant capability of the Model 45DC's two party-line interfaces is their ability to supply DC power and 200 ohm AC terminations to "create" an intercom circuit. The 20 volt DC output can power user devices such as belt-packs. With up to 200 milliamperes of current available, a typical theater application could connect up to four RS-501 or six RS-701 belt-packs for each of the Model 45DC's two interfaces. In many applications this can eliminate the need for an external intercom power supply, thereby reducing total system cost, weight, and required mounting space. The power supply outputs are monitored for over-current and short-circuit conditions. Under software control the outputs will automatically cycle off and on to help prevent damage to the circuitry and connected equipment.

Note that a typical stand-alone party-line intercom power supply will provide approximately 30 volts DC. And user belt-packs from Clear-Com are specified to function correctly with as little as 12 volts DC. This 18 volt difference allows support for long cable runs and their associated DC voltage drop. But the Model 45DC's two party-line intercom power supply circuits are limited to what they can provide due to the energy available from the connected PoE power source. In an effort to most efficiently support connected user devices the DC voltage supplied by the Model 45DC's party-line intercom power supply circuitry was selected to be 20 volts DC. This lower voltage then allowed the very-reasonable 200 milliamperes of current to be supplied, enough for supporting multiple user belt-packs. In conclusion, while providing 20 volts DC for the two party-line intercom circuits is somewhat non-standard, it should prove to be a reasonable compromise. For the intended Model 45DC applications, limiting the maximum length of the user-device interconnecting cabling shouldn't be an issue — the length limit should still be in the hundreds of feet. And an external party-line intercom power supply can always be used if the provided source is not sufficient for a specific application.



Dante Audio-over-Ethernet

Audio data is sent to and from the Model 45DC using the Dante Audio-over-Ethernet media networking technology. For flexibility in meeting application requirements bit depths of up to 24 and sample rates of 44.1 and 48 kHz are supported. Audio input and output channels on associated Dante-connected devices can be assigned to the Model 45DC using the Dante Controller software application. This makes selecting the way in which a Model 45DC fits into a specific application a simple matter.

Analog Hybrids with Auto Nulling

Two circuits referred to as "hybrids" interface the Dante input and output channels with the two party-line interface channels. The hybrids provide low noise and distortion, good frequency response, and high return-loss ("nulling"), even when presented with a wide range of party-line conditions. Unlike telephone-line ("POTS") oriented DSP-based hybrid circuits, the Model 45DC's analog circuitry maintains extended frequency response. With a passband of 100 Hz on the low end and 8 kHz on the high end, natural-sounding voice signals can be sent to and received from a party-line circuit.

The Model 45DC's sophisticated hybrid auto nulling function uses a combination of digital and analog circuitry under microprocessor control to achieve significant trans-hybrid loss. This return-loss "null" is achieved by making a series of software-directed adjustments to account for the resistive, inductive, and capacitive conditions that are present on the connected party-line cabling and user devices. Whenever one of the Model 45DC's auto null buttons is pressed digital circuitry adjusts the associated hybrid to achieve its maximum return-loss in less than 15 seconds. While the nulling process is automatic, it only takes place upon user request. The resulting null parameters are stored in non-volatile memory.

Pro Audio Quality

The Model 45DC's audio circuitry was designed in the spirit of professional audio equipment rather than that found in typical party-line intercom gear. High-performance components are used throughout, providing low-distortion, low-noise, and high headroom. Using passive and active filters the frequency response of the audio channels is limited to nominally 100 Hz to 8 kHz. This range was selected to provide excellent performance for human speech while maximizing the ability of the hybrid circuits to create substantial "nulls."

Metering

The Model 45DC contains two sets of 5-segment LED level meters. Each set of two meters displays the level of the signals being received from and sent to the Dante channel associated with a party-line interface channel. At the time of installation and setup the meters are invaluable in helping to confirm correct operation. During normal operation the meters offer rapid confirmation of audio signal flowing in to and out of the unit. Additional LED indicators are also provided on the front panel, offering a status indication of the party-line DC power sources, party-line activity status, and the auto null functions. Two other LEDs offer a direct indication of which source is powering the Model 45DC.

Ethernet Data, PoE, and DC Power Source

The Model 45DC 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, locking interconnection for harsh or high-reliability environments. The Model 45DC'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 45DC's PoE interface reports to the power sourcing equipment (PSE) that it is a class 3 (medium power) device. The unit can also be powered using an external source of 12 volts DC.

For redundancy, both power sources can be connected simultaneously. An internal switch-mode power supply ensures that all Model 45DC features, including party-line intercom circuit power, are available when the unit is powered by either source. Four LEDs on the back panel display the status of the network connection, PoE power source, and Dante interface.

Simple Installation

The Model 45DC 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. Party-line intercom connections are made using two 3-pin male XLR connectors. The Model 45DC 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 45DC was designed so that its capabilities can be enhanced in the future. The primary additions will be in the area of Dante remote control transport functionality. Should an industry-standard be established it's expected that remote control and status transport of the auto null, call light, and microphone mute functions will be available. (The Model 45DC's circuitry includes provisions for detecting and generating DC "call light" and "mic kill" signals.) A USB connector, located on the Model 45DC's back panel, allows the operating firmware (embedded software) to be updated using a USB flash drive. To implement the Dante interface the Model 45DC uses Audinate's Ultimo™ integrated circuit. The firmware in this integrated circuit can be updated via the Ethernet connection, helping to ensure that its capabilities remain up to date.

Specifications

Power Sources:

Power-over-Ethernet (PoE): class 3 (medium power) per IEEE 802.3af

External: 10 to 18 volts DC, 1 amp max @ 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 Output Channels: 2

Number of Input Channels: 2

Network Interface:

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

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

General Audio:

Frequency Response: +0/-3 dB, 100 Hz to 8 kHz

Distortion (THD+N): <TBD%, measured at 1 kHz,

Dante input to party-line interface pin 3

Signal-to-Noise Ratio: >TBD dB, measured at 1 kHz,

Dante input to party-line interface pin 3

Party-Line (PL) Intercom Interface: 2

Type: single-channel party-line (pin 1 common; pin 2 DC; pin 3 unbalanced analog audio)

Compatibility: single-channel intercom systems such as those offered by Clear-Com®

Impedance, pin 3 – Local Power Not Enabled: >10 k ohms

Impedance, pin 3 – Local Power Enabled: 200 ohms

Analog Audio Level: -10 dBu, nominal, +TBD dBu maximum

“Call Light” Signal: DC voltage on pin 3

“Mic Kill” Signal: momentary break in DC voltage on pin 2

Power Source, Pin 2: 20 volts DC, 200 milliamperes maximum

Party-Line Hybrids: 2

Topology: 3-section analog circuitry compensates for resistive, inductive, and capacitive loads

Nulling Method: automatic upon user initiation, processor implements digital control of analog circuitry; settings stored in non-volatile memory

Nulling Line Impedance Range: 120 to 350 ohms

Nulling Cable Length Range: 0 to 3500 feet

Trans-Hybrid Loss: >40 dB, typical at 800 Hz

Meters: 4

Function: displays level of Dante input and output channels

Type: 5-segment LED, modified VU ballistics

Connectors:

Party-Line Intercom: two 3-pin male XLR

Ethernet: Neutrik etherCON RJ45

USB: type A receptacle

External DC: 4-pin male XLR

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: 1U rack-mount front panels for one or two units

Weight: 1.7 pounds (0.77 kg); rack-mount front panels add 0.2 pounds (0.09 kg)

Specifications subject to change without notice.

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