



Model 45DR

INTERCOM INTERFACE



Key Features:

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

Overview

The Model 45DR Dante® to 2-Channel Party-Line Intercom Interface is designed for applications that utilize 2-channel analog party-line (PL) intercom technology. This type of intercom is commonly used in broadcast, corporate, and commercial applications where a simple, reliable, easy to use solution is desired. The RTS® TW-series of 2-channel intercom equipment is directly compatible with the Model 45DR. The Dante audio-over-Ethernet media networking technology is used to transport the two send and two receive audio channels associated with the party-line circuit. 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 45DR is compatible with the latest broadcast and audio equipment that uses Dante technology. An Ethernet connection is all that's required to make the Model 45DR part of a sophisticated, networked audio system.

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

the Model 45DR, allowing connection of user belt-packs such as the popular RTS BP-325. A Model 45DR can also connect with an existing powered and terminated intercom circuit. Audio level meters provide confirmation of system performance during setup and operation. Support for transporting call light signals between Model 45DR units is also provided.

Standard connectors are used for party-line intercom, Ethernet, and DC power interconnections. The Model 45DR'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 45DR 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 45DR can be used in applications: adding party-line intercom 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 45DR's Dante input (receiver) and output (transmitter) channels. The Model 45DR's circuitry will then convert these signals into a 2-channel party-line intercom circuit. In this way adding party-line support to RTS + OMNEO is a simple task. The Model 45DR 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 45DR's audio input and output channels.

Two separate party-line intercom circuits can easily be interconnected using two Model 45DR Interfaces. A Model 45DR is connected to each party-line circuit as well as the Dante network. The Dante Controller software 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 45DR can also be used to "bridge" a 2-channel party-line intercom circuit with one or two single-channel party-line intercom circuits. This involves using a Model 45DR with the 2-channel circuit and one or two of the Studio Technologies Model 45DC Intercom Interface units with the single-channel circuits. The Model 45DC is the "cousin" of the Model 45DR and supports two single-channel party-line intercom circuits rather

than one 2-channel circuit. These single-channel circuits, typically supported by equipment from Clear-Com®, are commonly used in theatrical and entertainment applications.



Party-Line Interface

The Model 45DR's party-line intercom interface is optimized for connection with 2-channel party-line intercom circuits and user devices such as the TW-series from RTS. In addition, other industry-standard single- and 2-channel party-line intercom circuits and user devices, including those from Clear-Com, are compatible. (While the Model 45DR will function in a limited manner with single-channel Clear-Com circuits, the Model 45DC Intercom Interface is the much-preferred choice for that.) A party-line active detection function ensures that should a user belt-pack or active party-line circuit not be connected the Model 45DR'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-enabled devices.

A significant capability of the Model 45DR's party-line interface is its ability to supply DC power and 200 ohm AC terminations to "create" an intercom circuit. The 29 V output can power a moderate number of devices such as belt-packs. With up to 240 milliamperes (mA) of current available, a typical broadcast application which uses two or three BP-325 belt-packs can be supported. In many applications this can eliminate the need for an external intercom power supply, reducing total system cost, weight, and required mounting space. The power supply output is monitored for over-current and short-circuit conditions. Under firmware (embedded software) control the output will automatically cycle off and on to help prevent damage to the circuitry and connected equipment.

Dante Audio-over-Ethernet

Audio data is sent to and from the Model 45DR using the Dante audio-over-Ethernet media networking technology. Audio signals with a sample rate of 48 kHz and a bit depth of up to 24 are supported. Audio input (receiver) and output (transmitter) channels on associated Dante-enabled devices can be assigned to the Model 45DR using the Dante Controller application. This makes it simple to select the way in which a Model 45DR fits into a specific application.

Analog Hybrids with Auto Nulling

Circuits referred to as "hybrids" interface the Dante input and output channels with the two party-line 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 45DR's analog

circuitry maintains extended frequency response. With a pass-band 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 45DR'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 firmware-directed adjustments to account for the resistive, inductive, and capacitive conditions that are present on the connected party-line cabling and user devices. Whenever the Model 45DR's auto null button is pressed, digital circuitry adjusts the hybrids to achieve their 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 45DR'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 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." Moreover, the Model 45DR's party-line intercom power source offers a unique level of performance; its ability to deliver power while maintaining audio quality is simply unmatched.

Audio Meters

The Model 45DR contains two sets of 5-segment LED level meters. Each set of two meters displays the level of the signals being sent to and received from 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 signals 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 source, party-line activity status, and the auto null functions. Two other LEDs offer a direct indication of what source is powering the Model 45DR.

Call Light Support

RTS TW-compatible party-line intercom user devices, such as the BP-325, provide a call light function using a 20 kHz square-wave signal that is added to the designated audio path. To achieve

optimal audio performance this signal, along with essentially all content above 10 kHz, is normally removed from the audio signal that is sent out the Model 45DR's Dante transmit audio path. It's also removed from the audio signal that arrives by way of the Model 45DR's Dante receive audio path. While the result is excellent party-line talk audio, 20 kHz call light signals are prevented from being directly sent to and received from multiple Model 45DR units. A Model 45DR feature overcomes this limitation, detecting the call light activity and re-generating it (again as a 20 kHz tone) in the applicable audio path. This allows reliable "end-to-end" call light support between two Model 45DR units. It also allows a Model 45DR to send and receive call light status with an interconnected Model 45DC Dante to Dual Party-Line Interface. The Model 45DC is typically used with Clear-Com party-line user beltpacks including the popular RS-501 and RS-701.

Ethernet Data, PoE, and DC Power Source

The Model 45DR 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 45DR'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 45DR'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 45DR 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, Dante interface, and PoE power source.

Simple Installation

The Model 45DR 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 3-pin male and female XLR connectors. The Model 45DR 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 45DR was designed so that its capabilities can be enhanced in the future. A USB connector, located on the Model 45DR's back panel, allows the application firmware (embedded software) to be updated using a USB flash drive. To implement the Dante interface the Model 45DR 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, 1.0 A max @ 12 volts DC (power supply not included)

Network Audio Technology:

Type: Dante audio-over-Ethernet

Bit Depth: up to 24

Sample Rate: 48 kHz

Number of Transmitter (Output) Channels: 2

Number of Receiver (Input) Channels: 2

Dante Audio Flows: 4; 2 transmitter, 2 receiver

Analog to Digital Equivalence: a +4 dBu input with 0 dB gain selected results in a Dante digital output level of -20 dBFS

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 (PL to Dante): -0.3 dB @ 100 Hz (-4.8 dB @ 20 Hz), -2 dB @ 8 kHz (-2.6 dB @ 10 kHz)

Frequency Response (Dante to PL): -3.3 dB @ 100 Hz (-19 dB @ 20 Hz), -3.9 dB @ 8 kHz (-5.8 dB @ 10 kHz)

Distortion (THD+N): <0.15%, measured at 1 kHz, Dante input to PL interface pin 2 (0.01% pin 3)

Signal-to-Noise Ratio: >65 dB, A-weighted, measured at 1 kHz, Dante input to PL interface pin 2 (73 dB, PL interface pin 3)

Party-Line (PL) Intercom Interface:

Type: 2-channel analog PL, unbalanced (pin 1 common; pin 2 DC with channel 1 audio; pin 3 channel 2 audio)

Compatibility: 2-channel PL intercom systems such as those offered by RTS®

Power Source: 29 volts DC, 240 mA maximum

Impedance – Local PL Power Not Enabled: >10 k ohms

Impedance – Local PL Power Enabled: 200 ohms

Analog Audio Level: -10 dBu, nominal, +3 dBu maximum, PL interface pin 2 (+7 dBu, PL interface pin 3)

Call Light Signal Support: 20 kHz, ±800 Hz

Mic Kill Signal Support: 24 kHz, ±1%

Party-Line (PL) 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: >50 dB, typical at 800 Hz, PL interface pin 2 (>55 dB, PL interface pin 3)

Meters: 4

Function: displays level of audio input and output channels

Type: 5-segment LED, modified VU ballistics

Connectors:

Party-Line (PL) Intercom: 3-pin male and female XLR

Ethernet: Neutrik etherCON RJ45

External DC: 4-pin male XLR

USB: type A receptacle

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- or dual-unit rack-mount front panels; uses one space (1U) in a standard 19-inch rack

DC Power Supply Option: Studio Technologies' PS-DC-02 (100-240 V, 50/60 Hz; 12 volts DC, 1.5 A), purchased separately

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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