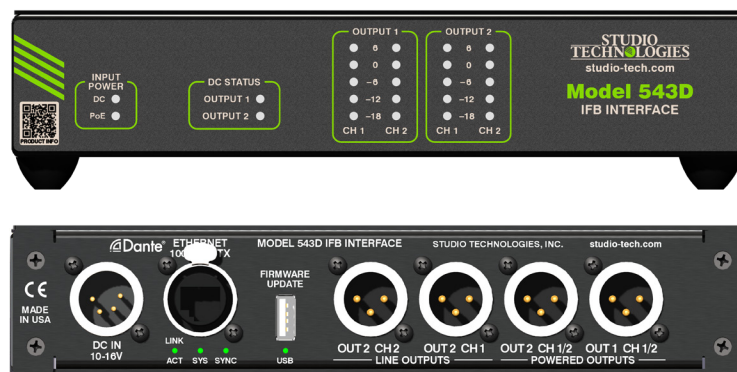# Model 543D IFB Interface

Key Features

- Dante audio-over-Ethernet technology

- Two powered 2-channel IFB outputs

- Two line-level IFB outputs

- Excellent audio quality

- Level metering and status LEDs

- Uses STcontroller for configuration

- PoE and 12 volts DC powering

- Table-top, portable, or optional rack-mount use

Overview

The Model 543D IFB Interface provides broadcast-standard powered and line-level (non-powered) analog IFB outputs from audio signals that are supplied by way of Dante® audio-over-Ethernet media networking technology. IFB, also known as "interruptible foldback" or talent cueing, is a method commonly used by broadcast on-air talent and related personnel to receive one-way (listen-only) audio signals associated with live-event broadcasts. Especially important in sports and entertainment events, IFB plays a crucial role in virtually all broadcast applications that require people to stay "in the know." Dante 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 543D is a unique product that helps to extend Dante's capabilities into the important but specialized world of broadcast and production IFB.

Dante audio-over-Ethernet technology is used to transport four audio channels from their source to the Model 543D and then on to the two, 2-channel IFB outputs. Each of the Model 543D's powered IFB outputs supplies DC voltage and two audio channels to groups of listen-only user devices. Two analog line-level IFB outputs are also provided for general-purpose use. The Model 543D 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 543D part of a sophisticated, networked audio system.

A Model 543D can utilize up to four digital audio input channels provided by Dante-enabled devices such as matrix intercom systems, DSP processors, broadcast routers, and audio consoles. The unit's powered IFB outputs allow direct connection with listen-only user beltpacks such as the Studio Technologies' Model 32A, Model

Model 543D IFB Interface front and back views

33A, or Model 34. The powered IFB outputs also support connection of listen-only devices from manufacturers such as RTS® and Clear-Com®. Two LED indicators serve as status displays for the 28 volts DC that is provided as part of each powered IFB output. The two line-level IFB outputs are provided for connection with a variety of devices that have balanced or unbalanced analog inputs.

Four audio level meters provide confirmation of system performance during setup and operation. Careful attention to circuit design and component selection ensures that excellent audio quality is maintained. The Model 543D's operating power can be provided either by a power-over-Ethernet (PoE) connection or an external source of 12 volts DC. Two LEDs display the status of the PoE and/or DC sources. Standard connectors are used for the powered and line-level IFB outputs, Ethernet, and DC power interconnections. The Model 543D'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 543D units can be mounted in a single space (1U) of a standard 19-inch rack enclosure.

The STcontroller software application is used to configure the nominal level of the Model 543D's line-level IFB outputs. Versions of STcontroller are available that are compatible with the Windows® and macOS® operating systems. They are available, free of charge, from the Studio Technologies' website.

Dante Audio-over-Ethernet

Digital audio data is sent to the Model 543D using the Dante audio-over-Ethernet media networking technology. Audio signals with a sample rate of 48 kHz and a bit depth of 16, 24, or 32 are supported. Using the Dante Controller application, up to four Dante transmitter (output) channels on associated equipment can be assigned to the unit's Dante receiver (input) channels. This makes it simple to select the way in which a Model 543D fits into a specific application.

Applications

The Model 543D was designed to add broadcast-standard 2-channel IFB functionality to Dante-enabled broadcast and related applications. Combining the networked audio capability of Dante with traditional analog powered ("wet") and non-powered ("dry" or line-level) IFB outputs allows traditional, proven cueing methods to be maintained.

The Model 543D can be used in applications where IFB (talent cueing) channels are created in matrix intercom systems and become part of a Dante audio-over-Ethernet network deployment. Output ports on matrix intercom systems that directly support Dante, such as the RTS ODIN® or ADAM® with OMNEO™, can be routed to the Model 543D's Dante receiver (input) channels. The Model 543D's circuitry will then convert these signals into analog powered and line-level (non-powered) IFB audio outputs. In this way, adding IFB support for RTS + OMNEO infrastructures is a simple task. Other matrix intercom and broadcast router systems also directly support Dante.

The Model 543D can also be used with matrix intercom systems that don't directly support Dante. An external analog-to-Dante interface can be used to convert analog intercom output ports to Dante channels. For example, the Studio Technologies' Model 544D or Model 5412 audio interface do an excellent job of converting line-level analog signals to Dante digital audio channels. Once in the Dante digital domain, these audio channels can be transported over standard Ethernet networks and then interconnected with the Model 543D's audio input channels.

In applications where on-air talent uses headsets with two earphones (stereo or "dual muff"), two unique audio channels are typically part of the provided IFB signal source. Generally, one channel is configured in a matrix intercom system as "interrupt" while the other channel is configured as "program" or "program only." (In U.S. applications the former signal is typically assigned to the left ear and the latter signal to the right ear.) An alternate term often used for the "interrupt" channel is "program-with-interrupt." This is probably a more descriptive as the function is actually a program source that gets interrupted with talk audio. The source of interrupt audio is typically a producer or director who provides real-time information to the on-air talent. The "program" channel is typically a continuous source of program audio.

In other applications, talent will use a single-ear headset, earbud, or in-ear monitor, keeping the other ear accessible to ambient audio. This is frequently done in electronic news gathering (ENG) or sports-broadcast applications where live interviews take place. A program-with-interrupt audio is normally provided; no program-only audio source is utilized.

Powered IFB Outputs

The Model 543D provides two, 2-channel powered IFB outputs that are designed to directly support connection of listen-only user devices. Each powered IFB output provides both DC voltage and two channels of unbalanced analog audio. Two, 3-pin male XLR connectors, located on the Model 543D's back panel, are used to interface the powered IFB outputs with the listen-only user devices. Following broadcast-industry conventions, pin 1 is the common connection, pin 2 has DC power with channel 1 audio superimposed on it, and pin 3 has channel 2 audio. The nominal audio levels are –10 dBu. Each power source supplies 28 volts DC with a maximum current of 120 milliamperes. The DC power sources are monitored for over-current and short-circuit conditions. Under firmware (embedded software) control the DC power sources will automatically cycle off and on to help prevent damage to the circuitry and connected equipment.

Line-Level IFB Outputs

The Model 543D provides two analog line-level IFB output channels. The audio sources for these two outputs are the same as used for channels 1 and 2 of powered IFB output 2. The line-level IFB outputs are intended to allow interconnection with externally powered listen-only user devices, inputs on wireless IFB systems, or analog inputs on consoles or related audio devices. The line-level IFB outputs are electronically balanced, capacitor-coupled and ESD (static) protected. These are compatible with virtually all balanced and unbalanced line-level analog inputs that have an impedance of 2 k ohms or greater. For application flexibility, the STcontroller application allows the nominal output level to be configured for either –10 dBu or +4 dBu.

Reliability and Pro Audio Quality

The Model 543D is a fully professional product that offers the audio quality, features, and reliability required by 24-hour, on-air, and commercial applications. The unit's audio circuitry was designed in the spirit of professional audio equipment rather than that found in typical IFB or talent cueing gear. High performance components are used throughout, providing low-distortion, low-noise, and high headroom. The powered IFB outputs offer a unique level of performance, able to deliver reliable power and excellent audio quality in a variety of challenging applications.

Audio Meters and Status LEDs

The Model 543D provides four 5-segment LED meters. The meters, located on the unit's front panel, display the level of the audio signals associated with the two, 2-channel IFB outputs. At the time of installation and setup the meters can be invaluable in helping to confirm correct operation. During normal operation the meters offer a real-time confirmation of the unit's incoming audio signal levels, helping to ensure that optimal audio quality is maintained. Additional LED indicators are provided on the front panel, providing real-time status indications of the powered IFB outputs and incoming PoE and/or DC power.

Ethernet Data, PoE, and DC Power Source

The Model 543D connects to a local area data network (LAN) using a standard 100 Mb/s twisted-pair Ethernet interface. The physical interconnection is made by way of a Neutrik etherCON RJ45 jack. While compatible with standard RJ45 plugs, an etherCON CAT5-compatible plug allows a ruggedized and locking interconnection method for harsh or high-reliability environments. Three LEDs on the unit's back panel display the status of the network connection and Dante interface.

The Model 543D'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 543D's PoE interface reports to the power sourcing equipment (PSE) that it is a class 3

(mid power) device. Alternately, the unit can be powered using an external source of 12 volts DC. For redundancy, both power sources can be connected simultaneously. Two LEDs on the unit's front panel provide a real-time indication of the connected power sources.

Simple Installation

The Model 543D uses standard connectors to allow fast and convenient interconnections. A twisted-pair Ethernet signal is connected using a Neutrik etherCON RJ45 jack. If Power-over-Ethernet (PoE) is available operation will commence immediately. An external source of 12 volts DC can also be connected by way of a 4-pin female XLR connector. Powered IFB and line-level IFB output connections are made using 3-pin male XLR connectors. The Model 543D 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-mounting kits are available, as an option, allowing one or two Model 543D units to be mounted in one space (1U) of a standard 19-inch rack enclosure.

Future Capabilities and Firmware Updating

The Model 543D was designed so that its capabilities and performance can easily be enhanced in the future. A USB receptacle, located on the unit's back panel, allows the application firmware (embedded software) to be updated using a USB flash drive. The Model 543D's Dante interface uses the UltimoX4™ integrated circuit from Audinate. The firmware in this integrated circuit can be updated via the Ethernet connection helping to ensure that its capabilities remain up to date.

Model 543D Specifications

Power Sources:

Power-over-Ethernet (PoE): class 3 (mid power, ≤12.95 watts) per IEEE® 802.3af

DC In: 10 to 16 volts DC, 1.0 A max at 12 volts DC

Network Interface:

Type: 100BASE-TX, Fast Ethernet per IEEE 802.3u (10BASE-T and 1000BASE-T (GigE) not supported)

Power-over-Ethernet (PoE): Per IEEE 802.3af

Data Rate: 100 Mb/s (10 Mb/s and 1000 Mb/s not supported)

General Network Audio:

Type: Dante audio-over-Ethernet

AES67-2018 Support: yes, selectable on/off

Dante Domain Manager (DDM) Support: yes

Bit Depth: up to 24

Sample Rate: 48 kHz

Dante Receiver (Input) Channels: 4

Nominal Level: −20 dBFS

Dante Receiver Audio Flows: 2

Powered IFB Outputs: 2

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

Compatibility: 2-channel listen-only powered IFB user devices such as those offered by Studio Technologies

Power Source: 28 volts DC, 120 mA maximum, nominal

Nominal Audio Level: −10 dBu, +4 dBu maximum, pins 2 and 3

Frequency Response: ±1 dB, 20 Hz to 20 kHz

Distortion (THD+N): <0.02%, measured at 1 kHz, pins 2 and 3

Signal-to-Noise Ration: >85 dB, A-weighted, measured at 1 kHz, pins 2 and 3

Line-Level IFB 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: −10 dBu or +4 dBu, configurable

Maximum Level: +24 dBu, when nominal level configured for +4 dBu

Frequency Response: ±0.1 dB, 20 Hz to 20 kHz

Distortion (THDS+N): 0.003% (-90 dB), measured at −1 dBFS input, 22 kHz bandwidth

Signal-to-Noise Ratio: >87 dB, A-weighted, measured at 1 kHz

Meters: 4

Function: displays level of IFB output audio

Type: 5-segment LED, modified VU ballistics

Status LEDs: 2

Connectors:

Powered and Line-Level IFB Outputs: 3-pin male XLR

Ethernet: Neutrik etherCON RJ45 jack (Compatible with standard RJ45 plug or etherCON CAT5-compatible plug)

External DC: 4-pin male XLR

USB: type A receptacle (used only for updating application firmware)

Configuration: requires Studio Technologies' STcontroller software application

Software Updating: USB flash drive used for updating application firmware; Dante Updater application used for updating Dante interface firmware

Environmental:

Operating Temperature: 0 to 50 degrees C (32 to 122 degrees F)

Storage Temperature: −40 to 70 degrees C (−40 to 158 degrees F)

Humidity: 0 to 95%, non-condensing

Altitude: not characterized

Dimensions – Overall:

8.70 inches wide (22.1 cm)

1.72 inches high (4.4 cm)

8.30 inches deep (21.1 cm)

Weight: 1.7 pounds (0.77 kg); rack-mounting installation kits add approximately 0.2 pounds (0.09 kg)

Deployment: intended for tabletop applications. Four optional mounting kits are also available:

RMBK-10 allows one unit to be mounted in a panel cutout or on a flat surface

RMBK-11 allows one unit to be mounted in the left- or right-side of one space (1U) of a standard 19-inch rack

RMBK-12 allows two units to be mounted in one space (1U) of a standard 19-inch rack

RMBK-13 allows one unit to be mounted in the center of one space (1U) of a standard 19-inch rack

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

Specifications and information subject to change without notice.