Model 5682 ST 2110 to Dante Bridge

Key Features

- SMPTE ST 2110-10, ST 2110-30, and ST 2022-7 support
- Dante audio-over-Ethernet technology with AES67 and DDM support
- Two versions available: one with up to 32 channels and one with up to 64 channels in each direction
- Integrated Sample-Rate-Conversion (SRC) capability
- Multiple Gigabit Ethernet interfaces allow redundant streams and Redundant Dante operation
- AC mains and DC powering
- Multiple status LEDs and graphics display
- Lightweight enclosure, single rack-space (1U) mounting

Introduction

The Model 5682 ST 2110 to Dante Bridge provides a high-performance means of interconnecting ("bridging") SMPTE® ST 2110 audio channels with Dante® audio-over-Ethernet channels. Both the ST 2110 and the Dante interfaces are typically associated with independent local area networks (LANs). The Model 5682 supports this scenario, as well as a single network that carries both ST 2110 and Dante audio signals. The unit is compatible with the SMPTE ST 2110-30 standard for PCM audio signals and the ST 2110-10 standard for signal timing. On the Dante side, the Model 5682 is compatible with the Dante Domain Manager™ (DDM) software application and is complaint with the AES67 interoperability standard. The Model 5682 is available in two versions: the Model 5682-01 allows up to 32 audio channels to pass in each direction, while the Model 5682-02 allows up to 64 audio channels. Internal sample rate conversion (SRC) capability provides sample rate, bit-depth, and timing conversion to ensure that audio signal integrity is maintained.

The suite of ST 2110 standards is finding wide-ranging use in broadcast applications. While also handling video and control signals, the Model 5682 is focused on ST 2110-compliant audio channels and their associated timing parameters. Dante audio-over-Ethernet has found acceptance in broadcast, audio/visual, and general audio applications due to its ease of use, excellent performance, strong interoperability, and wide adoption by many equipment manufacturers. However, interconnecting or bridging ST 2110 audio channels with Dante audio channels can present a challenge. Using the Model 5682 makes this a simple task, only requiring interconnecting standard Ethernet signals and performing a moderate amount of configuration.

The Model 5682's ST 2110 and Dante interfaces each incorporate three Gigabit Ethernet (GigE) connections. Two GigE ports on each interface are designated for use by the associated ST 2110 or Dante network while the third is reserved for configuration use. The ST 2110 will support redundant streams, following the SMPTE 2022-7 standard. On the unit's Dante interface, a setting performed within the Dante Controller application selects whether the Dante interface will operate in a Switched or Redundant mode. Each Model 5682 audio channel is associated on a one-to-one basis with

Model 5682 Front View (top) and Model 5682-01 Rear View (bottom, typical for Model 5682-02)

a channel on each interface. For example, input 1 on the ST 2110 interface is associated with transmitter (output) 1 on the Dante interface. The Model 5682 does not perform any routing or crosspoint functions.

Front-panel LED indicators, an LCD display, and five push-button switches are provided to view and revise selected operating parameters. NMOS, ANEMAN, and JSON configuration support for the unit's ST 2110 interface is provided. The Dante Controller software application, available free of charge from Audinate, is used to configure the unit's Dante network and audio parameters.

The Model 5682 can be powered by 100-240 V, 50/60 Hz or a source of 12 volts DC. Both can be simultaneously connected to provide redundant power operation. The unit's lightweight enclosure mounts in one space (1U) of a standard 19-inch equipment rack. Industry-standard connectors are used for the Ethernet, AC mains, and DC power interconnections. The unit is built to professional standards and is intended for continuous, 24-hour operation.

Applications

The Model 5682's primary application is to interconnect audio channels associated with two independent networks, one that supports ST 2110 and the other Dante. The source and destination of these audio channels would typically be other equipment such as mixing consoles, broadcast or production crosspoint switchers, matrix intercom systems, or digital audio processing units. The Model 5682 can also perform effectively on the same local area network (LAN), interconnecting independent ST 2110 and Dante audio channels. Each implementation, ST 2110 or Dante, can have its own Leader Clock (sync reference), bit depth, and sample rate. Sample-rate conversion (SRC) logic within the Model 5682 ensures that the audio signals can pass between the two implementations with minimal degradation in performance. The Model 5682's ST 2110 and Dante network interfaces are electrically isolated and share no non-audio data, minimizing the risk of security issues. Only uncompressed PCM digital audio signals pass, by way of the SRC logic, between the two network interfaces.

The Model 5682 can be effective when used in both fixed and mobile applications. Ideal uses would include stadiums, live-event venues, media production studios, mobile production trucks or trailers, and education facilities. As the number of facilities that utilize both ST 2110 and Dante-compliant equipment increases so does the need to interconnect them. Maintaining isolation between these two network implementations can be important for reasons of both signal integrity and security.

ST 2110 Networking

The Model 5682's ST 2110 interface supports conformance level A and level B in single and redundant streams. The latter follows the SMPTE ST 2022-7 standard and allows connection of one or two networks as desired. The Model 5682 provides a separate Ethernet interface that serves as a control port, allowing configuration of the ST 2110 interface by way of web pages. NMOS support that follows the IS-04 and IS-05 standards is provided. The Merging Technologies ANEMAN Audio Network Manager application can also be utilized as can JSON. The ST 2110 audio sample rate is selected for 48 kHz with a bit depth of up to 24.

Dante Networking

The Model 5682's Dante interface can be configured for either Switched or Redundant network operation. In the Switched mode, only a single Gigabit Ethernet (GigE) connection is required. The unit's second Gigabit Ethernet port can function either as an active "loop-thru" resource or left unused. When the Model 5682 is placed in the Redundant mode, two Gigabit Ethernet connections are made to two independent LANs, allowing support for Redundant Dante operation. This ensures that the loss of one network resource will not result in the interruption of Dante networked audio signals. Sample rates of 44.1, 48, 88.2, and 96 kHz are supported, although selecting the latter two will reduce the number of interface channels.

Dante AES67 and Domain Manager Support

The Model 5682's Dante interface can be configured to support AES67 digital audio signals. This feature, provided by Dante, would be a subset of the full AES67 range of operations. When this AES67 support is enabled, the Dante interface's sample rate will be fixed at 48 kHz and only multicast operation will be active. The Model 5682's Dante interface is also compliant with the Dante Domain Manager (DDM) software application.

Pro Audio Quality

The Model 5682's audio circuitry was designed to meet the stringent demands of professional audio applications. To ensure that superior performance is maintained, audio data passing between the ST 2110 and Dante network interfaces always remains within the digital domain. To achieve audio data synchronization between the two network interfaces, bi-directional sample-rate-converter (SRC) logic functions are implemented in high-speed programmable (FPGA) logic. This allows compatibility between the ST 2110 and Dante audio channels, even if they have widely divergent sample rates and independent reference clock sources.

Status LEDs and LCD Display

On the Model 5682's front panel are 12 LED indicator lights, a back-lit graphics display, and five pushbutton switches. Two of the LEDs indicate the status of the AC and DC input power sources. Two sets of five LEDs each are associated with the ST 2110 and Dante network interfaces. The graphics display allows the monitoring of a number of operating conditions, including interface names, network configurations, and product firmware versions. The five pushbutton switches can be used to select which information is displayed as well as allowing key network parameters to be revised. These include the ST 2110 and Dante interface IP configuration methods, IP addresses, and subnet mask values.

LEDs on the Model 5682's back panel indicate the status of the ST 2110 network interfaces, the Dante network interfaces, the ST 2110 control interface, and the management interface. There are two LED indicators for each of the six Gigabit Ethernet connections that reflect the link and network activity status. Two additional LEDs reflect the status of the USB host interfaces which are used to update the Model 5682's firmware.

Installation and Operating Power

The Model 5682 is housed in a rugged yet lightweight aluminum enclosure that is designed for use in fixed or mobile facilities. It mounts in one space (1U) of a standard 19-inch rack enclosure. The unit allows an AC mains source of 100-240 V, 50/60 Hz to be directly connected. It can also be powered using a 10–16 volts DC source that is connected via a broadcast-standard 4-pin XLR connector. If both AC and DC power sources are connected, the Model 5682 will be powered by the AC mains supply. Should the AC mains source fail, the DC source will provide operating power with no interruption in the performance of the unit. All six of the Model 5682's Gigabit Ethernet ports support twisted-pair signals, each with Auto MDI/MDI-X capability so reversing cables are never required.

Firmware Updating

The Model 5682 was designed so that its performance and capabilities can be enhanced in the future. Two USB receptacles, accessible on the unit's back panel, allow the Main and FPGA (programmable logic) firmware (embedded software) to be easily updated using a USB flash drive. A Merging Technologies ZMAN module is used to implement the Model 5682's ST 2110 functionality. The module's firmware can be updated using a web browser connected to the Ethernet interface dedicated to ST 2110 control use. To implement its Dante interface the Model 5682 uses an Audinate Brooklyn 3 module. To help ensure that the unit's Dante capabilities remain up to date, the firmware in this module can be updated via one of the unit's Dante Ethernet connections.

Model 5682 Specifications

Applications:
Interconnects audio paths in each direction between independent ST 2110 and Dante audio-over-Ethernet networks
Integrated sample-rate-conversion (SRC) functions ensure that timing of independent networks is supported

Versions Available:
Model 5682-01: supports up to 32 channels (44.1 or 48 kHz sample rates) and 16 channels (88.2 or 96 kHz sample rates)
Model 5682-02: supports up to 64 channels (44.1 or 48 kHz sample rates) and 32 channels (88.2 or 96 kHz sample rates)

Network Audio Technology – ST 2110:
Type: SMPTE ST 2110-10:2017 and ST 2110-30:2017; supports conformance level A (48 kHz streams with 1-8 audio channels at packet times of 1 ms) and level B (48 kHz streams with 1-8 audio channels at packet times of 125 us)
AMWA NMOS Support: IS-04 Discover & Registration and IS-05 Device Connection Management
Redundant Streams: compliant with Level B, SMPTE ST 2022-7: 2013 Seamless Protection Switching (8-channel stream at 48 kHz sample rate, packet time 125 us)
Synchronization: per SMPTE ST 2110-10, Precision Time Protocol (PTP) IEEE® 1588-2008 Version 2; supported profile IEEE 1588:2008
Discovery, Control, and Connection Management: includes web user interface, JSON API, NMOS, and Merging Technologies' ANEMAN Audio Network Manager
Audio Performance and Transport: Digital
Audio Type: pulse-code modulation (PCM)
Sampling Rate: 48 kHz
Bit Depth: 24
Number of Sender (Output) Channels, Model 5682-01: 32
Number of Receiver (Input) Channels, Model 5682-01: 32
Number of Sender (Output) Channels, Model 5682-02: 64
Number of Receiver (Input) Channels, Model 5682-02: 64

Network Audio Technology – Dante:
Type: Dante audio-over-Ethernet
AES67-2018 Support: Yes
Dante Domain Manager (DDM) Support: Yes
Ethernet Interface Configuration: Switched or Redundant
Sample Rates: 44.1, 48, 88.2, or 96 kHz
Pull-Up/Down Support: Yes
Bit Depth: up to 24 bits
Number of Transmitter (Output) Channels–M5682-01: 32 (44.1 or 48 kHz sample rates) or 16 (88.2 or 96 kHz sample rates)
Number of Receiver (Input) Channels–M5682-01: 32 (44.1 or 48 kHz sample rates) or 16 (88.2 or 96 kHz sample rates)
Number of Transmitter (Output) Channels–M5682-02: 64 (44.1 or 48 kHz sample rates) or 32 (88.2 or 96 kHz sample rates)
Number of Receiver (Input) Channels–M6482-02: 64 (44.1 or 48 kHz sample rates) or 32 (88.2 or 96 kHz sample rates)
Dante Audio Flows: 32 receiver and 32 transmitter

Network Interfaces: 3, ST 2110, Dante, and System Management
Physical Ethernet Connections, ST 2110: 3; Primary, Secondary, and Control
Physical Ethernet Connections, Dante: 2; Primary and Secondary
Physical Ethernet Connection, System Management: 1
Ethernet Connection Type: 1000BASE-T Gigabit Ethernet (GigE) per IEEE 802.3ab (10 and 100 Mb/s not supported)
Ethernet Connection NIC Status LEDs: one link and one activity for each Ethernet connection

Audio Performance:
Type: fully digital paths between ST 2110 and Dante network interfaces (by way of sample-rate-converter (SRC) functions)
Dynamic Range: 147 dB at 48 kHz sample rate, 148 at 96 kHz sample rate, A-weighted
Distortion (THD+N): –140 dB at 48 kHz sample rate, –143 dB at 96 kHz sample rate, measured at –1 dBFS, 1 kHz
Internal Digital Audio Processing: 32 bits
Input-to-Output Audio Processing Latency: <500 uSec

Front-Panel LEDs: 12, dual-color
Functions: provides indication of condition of incoming AC and DC power, ST 2110 status, Dante status, and system management interface status

Back-Panel LEDs: 14
Functions: provides status indication of both firmware update functions and six Ethernet interfaces

Power Sources:
AC Mains: 100 to 240 V, 50/60 Hz, 8 W maximum
DC: 10 to 16 V, 0.6 A max

Connectors:
Ethernet: 6, RJ45 jacks
USB: 2, Type A receptacles (used only for firmware updating)
DC Input: 4-pin male XLR (pin 1 negative, pin 4 positive)
AC Mains Input: 3-blade, IEC 320 C14-compatible (mates with IEC 320 C13)

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: 5 to 95%, non-condensing
Altitude: not characterized

Dimensions:
19.0 inches wide (48.3 cm)
1.72 inches high (4.4 cm)
8.0 inches deep (20.3 cm)

Mounting: one space (1U) in a standard 19-inch rack

Weight: 3.3 pounds (1.5 kg)

Specifications and information contained in this Data Sheet subject to change without notice.

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