



# Model 5512 Audio Interface Featuring ST 2110 Technology

## Key Features

- Supports SMPTE ST 2110, AMWA NMOS IS-04 and IS-05
- Analog line-level inputs to ST 2110-30 outputs
- ST 2110-30 inputs to analog line-level outputs
- Two versions available: 8 or 16 input and output channels
- Connection management using ANEMAN™
- Three Gigabit Ethernet interfaces
- Standard connectors
- Excellent audio quality
- AC mains and 12 volt DC powering
- Lightweight enclosure, single rack-space (1U) mounting

## Introduction

The Model 5512 Audio Interface provides a simple yet high-performance means of interfacing analog signals with applications that utilize the SMPTE® ST 2110 suite of standards to implement audio-over-Ethernet networking connectivity. Redundant stream performance is supported following the ST 2022-7 standard. Line-level analog sources can be connected to the unit and then output in the digital domain by way of the Ethernet interfaces. Digital audio signals, which also arrive by way of the Ethernet connections, are converted to analog and then output as balanced line-level signals. For application troubleshooting a configuration choice allows a sine wave tone or the analog inputs to be selected as the source for the analog output channels. The Model 5512 is available in two versions – one with 8 input and 8 output channels and the other with 16 input and 16 output channels.

The Model 5512 is a fully professional product that offers the audio quality, features, and reliability required by 24-hour on-air and commercial applications. The analog inputs and analog outputs use two or four 25-pin female D-subminiature connectors for easy interfacing with balanced and unbalanced sources and destinations.

The line-level analog audio input signals are converted to 24-bit PCM digital and then transported via the Ethernet network interfaces. Digital audio sources associated with ST 2110-compliant devices can be routed to the Model 5512, converted to analog, and provided to users as balanced line-level outputs. The routing of the audio signals can be performed using commands from the Model 5512's JSON API. The ANEMAN network management software application can also be utilized.

The Model 5512 provides three Gigabit Ethernet (GigE) network interfaces, two to support redundant operation following the ST 2022-7 standard and the third for accessing the management menu system. An internal web server allows fast and flexible monitoring and configuration of the unit's networking and audio performance. Front-panel indicators, a backlit LCD display, and pushbutton switches provide users with direct access to key operating parameters.

The Model 5512 can be powered by 100-240 V, 50/60 Hz mains or a source of 12 volts DC. Both can be simultaneously connected to provide redundant operation. The unit's lightweight enclosure mounts in one space (1U) of a standard 19-inch rack. Industry-standard connectors are used for the audio input, audio output, Ethernet, AC mains, and DC power interconnections.



Model 5512 Front View (top) and Model 5512-01 Rear View (bottom)

ST 2110 is an emerging technology that is finding wide acceptance as an audio, video, and ancillary data transport “backbone” due to its interoperability, flexibility, and support by a large number of equipment manufacturers. The Model 5512 can serve as an “edge” device for ST 2110-compliant implementations, providing high-performance line-level analog input and analog output resources in a compact, cost-effective package. The unit can also serve as a general-purpose audio “tool” to help extend ST 2110 capabilities to facilities and applications that were initially implemented to support signals in the analog domain.

## Audio over Managed IP Networks

Digital audio data associated with the Model 5512 is interfaced with local area network (LAN) connections following SMPTE ST 2110 standards. A highlight of ST 2110 is the ability to utilize any standard Ethernet network implementation, including switches, to directly transport professional audio signals. For signal integrity the Model 5512 supports redundant audio data streams per the ST 2022-7 standard. The unit is compatible with digital audio signals with a sampling rate of 48 kHz and a bit depth of 24. This ensures compatibility with virtually all broadcast, production, industrial, and commercial applications.

## Network Ports

The Model 5512’s primary and secondary Ethernet ports can be selected to operate in either a switched or a redundant mode. In the switched mode the primary Ethernet port will be used for interconnection with other ST 2110-compliant devices. The secondary Ethernet port can be used to interface with another piece of network equipment. In the redundant mode independent Ethernet connections will be made to the primary and secondary Ethernet ports to implement redundant network capability per SMPTE ST 2022-7.

The Model 5512’s management Ethernet port will always be used to access the management webpages. This port can be connected to an independent network that some facilities implement for equipment monitoring and maintenance purposes. The unit’s

management web server can also be connected to the network that is being used for ST 2110 operation. This would function correctly since the management web server will always have a unique IP address that will not interact with audio and related data. Status LEDs, located on the unit’s back panel, provide a real-time indication of LAN performance.

## Applications

Two versions of the Model 5512 Audio Interface are available. The Model 5512-01 provides 8 line-level analog inputs and 8 line-level analog outputs. The Model 5512-02 provides 16 line-level analog inputs and 16 line-level analog outputs. Both units are general-purpose interface devices intended for a variety of audio and audio-for-picture applications that utilize the ST 2110 suite of standards. Each is suitable for use in demanding on-air broadcast and live-event applications that require both solid audio performance and reliable operation. Model 5512 units feature an optimized set of controls and indicators that make them simple and intuitive to use. Rack-mounted in 1U, the unit is appropriate for installation in fixed locations, serving the needs of systems associated with post-production, content distribution, education, commercial, and government facilities. The lightweight enclosure also makes it suitable for mobile and field uses.

## Analog Inputs

Depending on the version selected, the Model 5512 provides either 8 or 16 analog inputs that are compatible with balanced or unbalanced line-level sources. The input signals are converted to digital and then output via an Ethernet network as part of an ST 2110-30 IP stream. Compatible signal sources include audio consoles, wireless microphone receivers, broadcast playback equipment, and output ports on matrix intercom systems.

The analog inputs are electronically balanced (differential), capacitor-coupled, and ESD (static) protected for reliable operation in demanding applications. Extensive filtering minimizes the chance that radio frequency (RF) energy will cause interference.



Model 5512-02 Rear View

The analog inputs are protected from damage should a moderate DC voltage be accidentally connected. These characteristics make the analog inputs suitable for use in studio and mobile facilities as well as field-deployed environments.

The audio performance of the Model 5512's analog inputs is very good. Low-noise, wide dynamic-range circuitry ensures that audio quality is preserved. The audio signals are routed to high-performance analog-to-digital conversion (ADC) sections that support a 48 kHz sampling rate and a bit depth of 24. A precision voltage-reference circuit helps the ADC circuitry perform highly accurate signal conversion. The audio signals, now in the digital domain, are packetized and prepared for transport over Ethernet networking.

## **Analog Outputs**

The selected Model 5512 version will provide either 8 or 16 line-level analog output channels. Each channel can be individually configured to use as its input source a ST 2110-30 receiver (input) channel, one of the analog input channels, or a 1 kHz sine wave tone. In most applications, a digital receiver (input) channel associated with the unit's Ethernet interfaces will serve as the audio source. The JSON API or the ANEMAN software application would be used to select the sources which originate from sender (output) channels on designated ST 2110-compliant equipment.

Another configuration choice allows a signal associated with an analog input to serve as the source for an analog output channel. Useful for troubleshooting purposes, the selected signal would provide an active "loop through" version of its associated analog input signal. Also, for troubleshooting purposes a 1 kHz sine wave tone can be assigned to be the source for any analog output channel. The resulting output would be a steady tone with a nominal level of +4 dBu.

The Model 5512's analog outputs have a maximum level of +24 dBu. This allows both compatibility and sufficient headroom for use in applications where digital audio signals with a nominal level of -20 dBFS need to translate into analog signals that have a nominal level of +4 dBu. For flexibility, a configuration menu choice allows the level of each analog output channel to be individually adjusted ("trimmed") over a range of  $\pm 20$  dB in 1-dB steps. This ensures that the Model 5512 will also be compatible in environments that utilize 0, +4, +6, or even +8 dBu nominal output levels.

The analog outputs are electronically balanced, capacitor-coupled, and ESD (static) protected. High-quality components, including the important digital-to-analog (DAC) converters, are used to provide low-distortion, low-noise, and sonically excellent performance. Robust circuitry provides protection from damage should a moderate DC voltage be accidentally connected, something especially useful in broadcast applications. The analog outputs are compatible with virtually all balanced and unbalanced loads with an impedance of 2 k ohms or greater.

## **Simple Installation**

The Model 5512 uses standard connectors to allow fast and convenient interconnections. Multiple 25-pin female D-subminiature connectors are used to interface with the analog input and analog output signals. The unit connects to local area networks (LANs) using three RJ45 connectors. Multiple LEDs on the unit's back panel display the status of the network connections. A detachable power cord can be used to connect a source of AC mains power. A DC power source would connect using a 4-pin XLR connector. The lightweight aluminum enclosure mounts in one space (1U) of a standard 19-inch rack enclosure.

## **Operating Power**

The Model 5512 allows an AC mains source of 100-240 V, 50/60 Hz to be connected by way of a standard detachable mains power cord. It can also be DC powered using a 10-18-volt source that is connected via a broadcast-standard 4-pin XLR connector. If both AC and DC power sources are connected the unit will be powered by the AC mains supply. Only if the AC mains source fails will a load be placed on the DC source. This allows a source of DC, such as a battery pack, to serve in a backup capacity. With this arrangement, normal operation can continue even if AC mains power is lost.

## **Future Capabilities and Firmware Updating**

The Model 5512 was designed so that its capabilities can be easily updated and enhanced in the future. A USB host connector, located on the unit's back panel, allows the application and FPGA (programmable-logic) firmware (embedded software) to be updated using a USB flash drive. All software files and configuration parameters are stored in non-volatile memory.

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## Model 5512 Specifications

### Versions Available:

Model 5512-01: 8 line-level analog inputs and 8 line-level analog outputs

Model 5512-02: 16 line-level analog inputs and 16 line-level analog outputs

**Network Audio Technology:** SMPTE ST 2110-10:2017, 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, 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 profiles include SMPTE ST 2059-2, AES67, and IEEE 1588 Default

**Connection Management:** JSON API and Merging Technologies' ANEMAN Audio Network Manager

**Remote Control of Input and Output Parameters:** webpages provided by internal web server

### Audio Performance and Transport:

Digital Audio Type: pulse-code modulation (PCM)

Sampling Rate: 48 kHz

Bit Depth: 24

Number of Sender (Output) Channels: 8 (Model 5512-01) or 16 (Model 5512-02)

Number of Receiver (Input) Channels: 8 (Model 5512-01) or 16 (Model 5512-02)

### Network Interfaces:

Qty: 3; primary, secondary, and management

Type: 1000BASE-T (Gigabit Ethernet (GigE)) per IEEE 802.3ab

NIC Status LEDs: one link and one activity for each Ethernet interface

### Analog Inputs:

Type: electronically balanced, capacitor coupled, intended for connection to balanced (differential) or unbalanced signal sources  
Impedance: 20 k ohms

Nominal Level: +4 dBu, reference -20 dBFS, adjustable  $\pm 20$  dB in 1-dB steps

Maximum Level: +24 dBu, results in digital output level of 0 dBFS

Dynamic Range: 120 dB, A-weighted

Distortion (THD+N): <0.0004% (-108 dB), ref 1 kHz, +23 dBu input/-1 dBFS output

Frequency Response:  $\pm 0.2$  dB, 14 Hz to 20 kHz

### Analog Outputs:

Type: 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, adjustable  $\pm 20$  dB in 1-dB steps

Maximum Level: +24 dBu

Dynamic Range: >119 dB, A-weighted

Distortion (THD+N): <0.001% (-101 dB), reference 1 kHz, -1 dBFS input/+23 dBu output

Frequency Response:  $\pm 0.1$  dB, 6 Hz to 20 kHz

**Remote Configuration Capability:** analog input and analog output nominal level adjustable  $\pm 20$  dB (uses webpages accessible by way of management port)

**Front-Panel Display:** backlit LCD

**Software Updating:** USB flash drive supports updating of application and FPGA firmware (embedded software)

### Power Sources:

AC Mains: 100 to 240 V, 50/60 Hz, 20 W maximum

DC: 10 to 18 V, 1.5 A maximum

### Connectors:

Analog Inputs and Analog Outputs: 25-pin female D-subminiature (DB-25F), AES59-2012-compliant

Ethernet: RJ45

USB: type A receptacle (used only for firmware updates)

AC Mains Input: 3-blade, IEC 320 C14-compatible (mates with IEC 320 C13)

DC Input: 4-pin male XLR (pin 1 negative, pin 4 positive)

### 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 – Overall:

19.0 inches wide (48.3 cm)

1.72 inches high (4.4 cm)

7.8 inches deep (19.8 cm); 8.3 inches (21.1 cm) overall

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

**Weight:** 3.2 pounds (1.5 kg)

Specifications and information subject to change without notice.

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