



## **Model 5536 Announcer's Console Featuring ST 2110 Technology**

### **Key Features**

- Compact unit supports one on-air location
- Microphone preamplifier with selectable gain and P48 power
- One main and six talkback output channels
- User-controlled headphone mixing
- Superior audio quality and extensive feature configuration
- SMPTE ST 2110 audio-over-Ethernet technology support
- SMPTE ST 2022-7 Redundant Stream capability
- Independent management Ethernet interface
- Dual PoE and 12 Vdc powering
- Supports REMI/At-Home applications



Model 5536 Announcer's Console Top View

### **Introduction**

The Model 5536 Announcer's Console provides a combination of high-performance analog and digital audio capability with an extensive set of user features and configurable resources. The unit supports the SMPTE® ST 2110 suite of standards to implement audio-over-Ethernet networking connectivity. For enhanced network reliability, redundant stream performance, following the ST 2022-7 standard, is also supported. The Model 5536 is intended for use in demanding broadcast sports, eSports, live event, entertainment, and streaming broadcast applications. Requiring only minimal connections for deployment, the Model 5536 can provide one on-air talent with all the resources they need to support a wide range of applications. The compact, rugged enclosure is intended for tabletop use, small enough for use "court-side" or in a crowded booth, yet flexible enough for numerous remote production scenarios.

The Model 5536 integrates directly into ST 2110 environments. With just a PoE Ethernet (Power-over-Ethernet) Gigabit network connection, a microphone, and a pair of headphones, a complete broadcast on-air position can be created. With the addition of a second Ethernet connection, enhanced ST 2110 performance can be achieved using the ST 2022-7 Redundant Streams standard. An independent Gigabit network interface provides access to the Model 5536's management webpages. This allows full separation of audio transport and management functions.

Ten ST 2110 receiver (input) channels and an integrated sidetone function allow users to easily create their desired headphone audio mix. They'll enjoy clear and "click-free" monaural or stereo audio that should help their on-air performance. An eleventh ST 2110 receiver (input) channel allows an alternate microphone audio source to be supported.

The Model 5536 provides ten ST 2110 sender (output) audio channels. One channel is used for the main output, one serves as a configurable auxiliary output channel, and two provide a digital audio version of the headphone output. The remaining six sender (output) channels allow users to communicate ("talk-back") with a variety of support personnel. The range of Model 5536 operating capabilities includes the ability to create talent cue (IFB) channels. This resource was specifically included for REMI/At-Home applications.

The Model 5536 was designed to meet three main goals: support ST 2110 standards, provide great audio quality, and offer simple use and an extensive set of configurable features. The Model 5536 uses the ZMAN module from Merging Technologies to provide its ST 2110 capabilities. By partnering with Merging Technologies, Studio Technologies is able to offer solid ST 2110 performance that's been field-proven over many years. On-going development efforts have led to a continuous stream of ST 2110 improvements.

Using the latest in audio integrated circuits and advanced 32-bit audio processing, the unit's audio performance should meet or exceed that of any audio console, standalone microphone preamplifier, remote I/O interface, or outboard A/D or D/A converter. With over 40 years of professional audio experience, Studio Technologies takes audio performance seriously! And while providing excellent technical specifications is a "must," a device also has to "sound" good before we feel its design is complete.

The amount of flexibility provided in the Model 5536 allows it to meet the needs of virtually all on-air announcer applications. Using a standard web browser makes "customizing" the operation of a Model 5536 fast and simple. The unit's ability to handle both day-to-day and specialized situations makes it a unique product in the market. For example, the pushbutton switches and rotary encoders can be independently configured with multiple choices that range from simple to quite advanced. If a Model 5536 can't seem to be configured to meet an application's goals, feel free to contact Studio Technologies' technical support for an application review. In most cases, the unit will be able to perform as needed. Once configured, users will find operation simple with little "guesswork" involved.

The Model 5536 is part of a three-product family that differ only in the number of talkback sender (output) channels. The Model 5536 provides six talkback channels, while the Model 5532 provides two and the Model 5534 provides four. The Model 5536, as with the other two models, has a compact enclosure with overall dimensions of 6.7 inches wide (17.0 cm), 3.2 inches high (8.1 cm), and 6.1 inches deep (15.5 cm) with a weight of 2.4 pounds (1.1 kg). The Model 5536's main MCU, secondary MCU, and FPGA (programmable logic) firmware can be updated using the USB port on the back of the unit; the ST 2110 firmware can be updated via one of the Ethernet connections.

## Setup, Configuration, and Operation

Set up, configuration, and operation of the Model 5536 is simple. The unit includes three Neutrik etherCON RJ45 connectors which allow interfacing with single or redundant ST 2110 Ethernet networks along with a separate management network. Both the primary and secondary ST 2110 network connections can provide power to the unit using the PoE (Power-over-Ethernet) standard. A separate Ethernet interface allows an independent management network to be connected. All Ethernet interfaces support GigE for fast data transport and excellent network



Model 5536 Announcer's Console Back View

compatibility. Power for the Model 5536 can also be supplied from a 12 volts DC source that is connected using a 4-pin XLR connector.

A broadcast headset or handheld ("stick") microphone can be directly connected to the unit's 3-pin female XLR microphone input connector. The input is compatible with dynamic or condenser microphones. A P48 power source allows support for a wide range of "phantom-powered" microphones. A pair of stereo headphones, the headphone connection from a stereo or monaural headset, or even earbuds can be connected to the Model 5536's 1/4-inch (6.35 mm) 2-channel (stereo) headphone output jack.

Audio signals can be routed to and from the Model 5536's ST 2110 interface using a variety of software applications. The unit supports NMOS, ANEMAN, and JSON protocols. An extensive set of parameters, accessible using webpages, allow the unit's functions to be tailored to meet the needs of many applications.

The Model 5536's front panel includes eight rotary controls (encoders) which are used to adjust the level of the ST 2110 receiver (input) channels as they are used to create an audio mix that is fed to the analog headphone output channels. For performance confirmation an integrated sidetone function allows audio coming from the headset's microphone to be returned to the headset output. In addition to the 2-channel (stereo) analog headphone output, two ST 2110 sender (output) channels provide a digital version of the headphone output function for specialized applications.

Using RGB (red-green-blue) LEDs, each rotary encoder is illuminated and can display whether or not signal is present on their associated ST 2110 receiver (input) channels. Additional functions allow adjustment of the sidetone level and the overall level of the analog headphone output.

Seven pushbutton switches allow the user to control the state of the ST 2110 main sender (output) channel as well as the six ST 2110 sender (output) talkback channels. Another configuration choice allows the auxiliary sender (output) channel to be optimized from among four choices. Other configuration choices allow the operation of the pushbutton switches and functions associated with the main and talkback sender (output) channels to be optimized to meet the needs of specific applications. For example, the talkback functions can be independently configured for talkback, talent cueing (IFB), call signal (20 kHz tone), and other related actions. For user confirmation, the unit's main and talkback pushbutton switches are illuminated so as to display their current operating state.

## **Audio Quality**

The Model 5536's audio performance is completely "pro." A low-noise, wide dynamic-range microphone preamplifier ensures that microphone audio quality is preserved while minimizing the chance of signal overload. The gain of the microphone preamplifier can be adjusted over a range of 20 to 65 dB in 1-dB steps. A digitally controlled analog limiter function allows the microphone signal level to be automatically adjusted to reduce the chance of overload. A configuration setting allows the limiter function to be enabled or disabled as desired. The limiter function applies only to signals that are connected to the analog microphone input.

The output of the microphone preamplifier is routed to analog-to-digital conversion (ADC) circuitry that supports sampling rates of 48 and 96 kHz. The audio signal, now in the digital domain, routes through a 32-bit microprocessor and associated programmable logic and then on to the ST 2110 interface section where it is packetized and prepared for transport over Ethernet. Ten ST 2110 sender (output) channels are provided: one main, one aux, two digital headphone monitor, and six talkback.

Audio input signals arrive in the Model 5536 by way of eleven ST 2110 receiver (input) channels and pass into the Model 5536's 32-bit logic circuitry. Four channels are associated with the headphone's main section, six are associated with the headphone output's talkback section, and one can serve as an alternate microphone audio source. In addition to being used for typical headphone monitoring, the ST 2110 receiver (input) channels associated with the six talkback channels can be used as part of a talent cue (IFB) function.

All channel routing, headphone level control, signal detection, and sidetone functions are performed within the digital

domain. This preserves audio quality, enhances performance, and provides flexibility, allowing precise level control and mixing as well as eliminating the need for analog audio signals to pass through passive level controls (potentiometers). The audio signals destined for the analog headphone output are sent to a high-performance 2-channel digital-to-analog converter and then on to robust driver circuitry.

## **ST 2110 Audio-over-Ethernet**

Audio data is sent to and received from the Model 5536 using ST 2110 audio-over-Ethernet networking technology. The Model 5536's ten sender (output) channels and eleven receiver (input) channels can be routed using applications that support NMOS, ANEMAN, and a JSON API. The unit's sender and receiver channels support 128 streams, 64 in each direction. The digital audio's bit depth is 24 with a sample rate of 48 or 96 kHz. Bi-color LEDs, located on the unit's back panel, provide status indications related to Ethernet network performance. In addition to directly supporting ST 2110 applications, the Model 5536 can be used in settings where AES67 is being utilized.

## **Ethernet Data, PoE, and DC Powering**

The Model 5536's ST 2110 interface connects to one or two local area networks (LANs) by way of Gigabit (GigE) twisted-pair Ethernet interfaces. A third Ethernet interface is used for accessing the Model 5536's management webpages. These 1000BASE-T interconnections are made by way of Neutrik® etherCON RJ45 connectors. While compatible with standard RJ45 plugs, etherCON allows a ruggedized and locking interconnection for harsh or high-reliability environments. The Model 5536's operating power can be provided by way of either its primary or secondary ST 2110 Ethernet interface following the 802.3at Power-over-Ethernet (PoE) standard. This allows both redundant data and redundant power to be easily provided. Alternately, an external source of nominal 12 volts DC can be connected to power the unit.

## **Option Capability**

Provision has been made such that a technician can "customize" the Model 5536's hardware. Option kits, purchased separately, can be added to support functions such as direct microphone output, multi-pin headset connectors, remote control inputs, and a low-voltage, low-current DC tally output. Two available connector locations are provided on the Model 5536's back panel. These allow the installer-selected options to be added as needed to support unique applications.

## Future Capabilities and Firmware Updating

The Model 5536 was designed such that its capabilities and performance can be easily updated. A USB type A connector, located on the unit's back panel, allows the main MCU, secondary MCU, and FPGA firmware files to be loaded using a USB flash drive. The Model 5536's ZMAN module, used to implement the ST 2110 interface, can be updated via an Ethernet connection, helping to ensure that its capabilities remain up to date.

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## Model 5536 Specifications

### Network Audio Technology – ST 2110:

Type: SMPTE ST 2110-10:2017 and ST 2110-30:2017

Supports Conformance Levels:

A: 48 kHz streams with 1-8 audio channels at packet times of 1 ms

B: 48 kHz streams with 1-8 audio channels at packet times of 125 us

C: 48 kHz streams with 1-64 audio channels at packet times of 1 ms

AX: 96 kHz streams with 1-4 audio channels at packet times of 1 ms

BX: 96 kHz streams with 1-8 audio channels at packet times of 125 us

CX: 96 kHz streams with 1-32 audio channels at packet times of 125 us

AMWA NMOS Support: IS-04 Discover & Registration ("Discovery") and IS-05 Device Connection Management ("Routing")

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

Compatibility: JT-NM TR-1001 (System Environment and Device Behavior)

Discovery, Control, and Connection Management: includes web user interface, NMOS, Merging Technologies' ANEMAN Audio Network Manager, and JSON API

Sampling Rate: 48 kHz, 96 kHz

Bit Depth: 24

Number of Sender (Output) Channels: 10

Number of Receiver (Input) Channels: 11

**Network Interfaces:** 3, Primary (PRI-PoE), Secondary (SEC-PoE), Management (MGMT)

Type: 1000BASE-T Gigabit Ethernet (GigE) per IEEE® 802.3ab (10 and 100 Mb/s not supported)

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

### Analog Microphone Input:

Compatibility: dynamic or phantom-powered microphones

Type: balanced, capacitive coupled

Impedance: 3.6 k ohms, nominal

Gain: 20 to 65 dB in 1-dB steps

Frequency Response: 20 Hz to 22 kHz, +0/-1 dB

Distortion (THD+N): <0.0004%, 1 kHz, -4 dBFS output, 20 dB gain, 22 kHz BW

Dynamic Range: 120 dB, ref 0 dBFS output, 20 dB gain, A-weighted

Phantom Power: P48 per IEC 61938 standard, on/off selectable with status LED

### Limiter Function:

Type: digitally controlled analog

Application: applies only to analog microphone input, selectable on/off

Threshold: 12 dB above nominal level (-8 dBFS)

Minimum On Time: 30 milliseconds

Maximum Attenuation: 16 dB at 36 dB or greater microphone preamplifier gain

### Headphone Output:

Type: analog 2-channel (stereo)

Compatibility: stereo (dual-channel) or monaural (single-channel) headphones, headsets, or earpieces with nominal impedance of 50 ohms or greater

Maximum Output Voltage: 3.0 Vrms, 1 kHz, 150 ohm load

Frequency Response: 20 Hz to 20 kHz, +0/-1 dB

Dynamic Range: > 110 dB, A-weighted

Distortion (THD+N): <0.002%, measured at 1 kHz, 0 dBu output

### Talkback Input Low-Pass Filter (LPF):

Function: active only when specific talkback channel has tone detect function enabled

Type: digital, 8-pole Butterworth (48 dB/octave)

Cutoff: -3 dB at 12 kHz

### 18 kHz and 20 kHz Tone Outputs:

Type: sine wave

Level: -20 dBFS

Distortion: <0.0001%

### Tone Detect Function:

Receive Frequency: ≥ 15 kHz nominal to upper end of frequency response, within audio channel

Receive Level: -27 dBFS minimum

Send Frequency: 20 kHz

Send Level: -20 dBFS

### Call Light Function:

Activation: in-band tone detection per Tone Detect function

### Remote Control Inputs: 2

Function: configurable, can mimic the action of the main and talkback 1/2 button functions

Type: active low, 1 mA maximum, input pulled up to 3.3 volts DC via 3.4 k ohm resistors

### Tally Outputs: 2

Functions: follows the status of the main output or talkback 1/2 buttons

Type: configurable active high or low, 3.3 volts DC in series with 130 ohm resistor (25 mA maximum)

**Connectors:**

Analog Microphone Input: 3-pin female XLR  
Headphone Output: 3-conductor ¼-inch (6.35 mm) jack  
Ethernet: 3, Neutrik NE8FBH etherCON RJ45 receptacles  
DC Input: 4-pin male XLR (pin 1 negative, pin 4 positive)  
USB: type A receptacle (used only for updating main MCU, secondary MCU, and FPGA firmware)  
Remote Control Inputs / Tally Output: 2, 3-pin headers located on the main circuit board  
Headphone Output: 3-pin header located on the analog circuit board  
Analog Microphone Input: 3-pin header located on the analog circuit board

**Spare Connector Locations: 2**

Allows a Studio Technologies' cable assembly or option module to be installed. Also compatible with Neutrik NC\*D-L-1 connectors (\*=3F, 3M, 5M, 6F, 6FS, etc.).

**Configuration:** standard web browser

**Power Sources:**

Power-over-Ethernet (PoE): class 3 (mid power, ≤12.95 watts) per IEEE® 802.3af  
DC Input: 10 to 16 volts DC, 0.7 A maximum at 12 volts DC (can be powered by optional PS-DC-02, not included)

**Environmental:**

Operating Temperature: 0 to 50 degrees C (32 to 122 degrees F)  
Storage Temperature: -30 to 70 degrees C (-22 to 158 degrees F)  
Humidity: 25 to 85%, non-condensing  
Altitude: not characterized

**Dimensions (Overall):**

6.7 inches wide (17.0 cm)  
3.2 inches high (8.1 cm)  
6.1 inches deep (15.5 cm)

**Deployment:** intended for tabletop applications

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

**Weight:** 2.4 pounds (1.1 kg)

Specifications and information subject to change without notice.

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