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# Telos Infinity®

## Break the Matrix



## From the company that invented AoIP for broadcast,

Telos Infinity IP Intercom is the next-generation communication solution that eliminates the matrix, delivering a quantum leap in scalability, ease of integration, and efficiency, while reducing total cost of ownership.

- Seamless interoperability through standards-based Livewire+™ AES67
- Infinite scalability with plug-and-play device integration
- Intuitive UI for simplified operation
- Matrix-free design
- Distributed DSP architecture
- Lower TCO than traditional intercom systems
- Optimization for broadcast communications
- Suitable for use in all Intercom-related applications

Telos Infinity IP Intercom is a complete reimagining of broadcast communications technology developed by the same Telos Alliance engineering team that invented AoIP for broadcast in 2003. More than just a talkback system, Telos Infinity IP Intercom converges voice communication and contribution audio on a single IT backbone employing the latest standards-based VoIP and AoIP transport to provide dedicated features and functionality without compromise or limitations.

## Break the Matrix

Telos Infinity IP Intercom replaces outmoded matrix technology with an advanced, distributed IP network solution that provides superior functionality in a simplified, more elegant form. Because it is matrix-free, you can add plug-and-play networked hardware and software devices to the system as part of a planned or ad-hoc change, without ever worrying that you might exceed the number of available ports on a matrix.

## As Part of an Integrated System...

Telos Infinity IP Intercom unleashes the full potential of a distributed IP audio infrastructure, allowing access to any networked audio endpoint through the intuitive Telos Infinity Dashboard application. Mix-minuses, program busses, mixer auxes, monitor feeds, remote contribution audio, and presenter mics are all available anywhere you need them—for communication or on-air use.

When combined with an Infinity system, Axia Quasar AoIP Mixing Console and Axia Pathfinder Core PRO users benefit from integrated remote control of their virtual or hardware intercom panels. Telos Infinity IP Intercom natively supports Livewire+ AES67, allowing for easy interoperability with other Telos Alliance AoIP products or those from other manufacturers that support AES67 or SMPTE ST 2110-30.

## ... Or as Part of a Legacy Installation

Harnessing the benefits of Telos Infinity IP Intercom doesn't mean you have to abandon existing audio infrastructure. Instead, Telos Infinity seamlessly integrates into analog, AES, SDI, and MADI systems using Telos Alliance xNode baseband-to-IP interfaces and other AES67 partner devices. A transition to AoIP reduces the amount of cabling and its associated costs, system design time and installation expense—all while establishing a pathway to a complete AoIP solution in the future.

## Infinite Possibilities

Telos Infinity IP Intercom marks the next generation of Audio over IP solutions destined to revolutionize broadcast communication through the creation of disruptive and innovative technologies—and it's just the start.

## Award-Winning

We're honored that Telos Infinity IP Intercom has been the recipient of several awards since its introduction, including TVB Europe Best of Show (IBC 2017), Radio World Best of Show (NAB 2018), TV Technology Best of Show (NAB 2018), and AV Technology Best of Show (InfoComm 2018).

# TELOS INFINITY IP INTERCOM PANELS



By combining familiar hardware Intercom facilities with the flexibility and workflow advantages of matrix-free IP communications, the INF-MP-16, INF-MP-16B, and INF-MPX-20 set a new benchmark in talkback technology.

The INF-MP-16 1RU Intercom Master Panel features 16 multicolor talk/listen lever display keys that can show up to four lines of text plus bitmap images and icons (future feature). Complemented by optimized voice channels and loudspeaker reproduction, the INF-MP-16 features the excellent speech intelligibility required for mission-critical broadcast operations. Each INF-MXP-20 Expansion Panel provides 20 additional display keys.

Auxiliary, rear panel stereo analog I/O including a studio-quality mic preamplifier means that the INF-MP-16 can be used as a contribution or monitoring endpoint. The addition of GPIO as standard enables remote control of signalization or complex logic interfacing across the network infrastructure. Features of the INF-MP-16 Intercom Master Panel include:

- 16 multicolor display lever keys with additional shift levels at the touch of a button
- Multichannel duplex voice and contribution audio endpoint
- 24 bit/48 kHz IP audio
- Natively Livewire+ AES67 compliant
- Optional Infinity Link VoIP codec capability
  - 'Free' Standalone 'Link Lite' Mode
- Network connection via standard Gigabit Ethernet
- PoE+ or external DC power (or both for redundancy)
- Aux rear panel I/O including studio-grade mic input for on-air contribution
- GPIO via rear panel D-Sub as standard
- Headset connector supporting industry-standard XLR-4M
- Configurable dynamics processing for improved speech intelligibility
- Full configuration via Telos Infinity Dashboard
- Device management via built-in Web UI

The INF-MP-16B 1RU Intercom Master Panel Base Version offers all of the same features as the INF-MP-16 but without the rear panel audio inputs and outputs, making it a more cost-effective option in applications where local I/O is not required.

The INF-MPX-20 1RU Expansion Panel adds 20 additional display keys when paired with the INF-MP-16 or INF-MP-16B Intercom Master Panels.

## TELOS INFINITY IP INTERCOM DESKTOP STATION



The Telos Infinity INF-DS-16 and INF-DS-16B 16 Key Intercom Master Desktop Station are ideal for locations where a rackmount panel isn't practical but where the same functionality and features from the INF-MP-16 are required in a compact and attractive format. By combining familiar hardware Intercom facilities with the flexibility and workflow advantages of matrix-free IP communications, the INF-MP-16 sets a new benchmark in broadcast talkback technology. The INF-MP-16 1RU Intercom Master Panel features 16 multicolor talk/listen lever display keys that can show up to four lines of text plus bitmap images and icons (future feature). Complemented by optimized voice channels and loudspeaker reproduction, the INF-MP-16 features the excellent speech intelligibility required for mission-critical broadcast operations.

Auxiliary, rear-panel stereo analog I/O, including a studio-quality mic pre-amplifier, means that the INF-MP-16 can be used as a contribution or monitoring endpoint. The addition of GPIO as standard enables remote control of signalization or complex logic interfacing across the network infrastructure.

- 16 multicolor display lever keys with additional shift levels at the touch of a button
- Multichannel duplex voice and contribution audio endpoint
- 24 bit/48 kHz IP audio
- Natively Livewire+ AES67 compliant
- Optional Infinity Link VoIP codec capability
- Network connection via standard Gigabit Ethernet
- PoE+ or external DC power (or both for redundancy)
- Aux rear panel I/O including studio-grade mic input for on-air contribution
- GPIO via rear panel D-Sub as standard
- Headset connector supporting industry-standard XLR-4M
- Configurable dynamics processing for improved speech intelligibility
- Full configuration via Telos Infinity Dashboard
- Device management via built-in Web UI

The Telos Infinity INF-DS-16B 16 Key Intercom Master Desktop Station Base Version offers all of the same features as the INF-DS-16 but without audio inputs and outputs, making it a more cost-effective option in applications where local I/O is not required.

## TELOS INFINITY IP INTERCOM BELTPACKS



The Telos Infinity INF-BP-2 and INF-BP-4 are next-generation wired Dual and Quad Channel Digital Beltpacks that are powered by PoE (Power over Ethernet) and natively AES67 compliant. Whether via Partyline, Group, IFB, Peer to Peer, or connection to any other IP audio networked element within the wider Telos Infinity IP Intercom, Beltpacks communicate across the network seamlessly while maintaining incredibly low latency.

The BP-2 is a Dual Channel Beltpack. The BP-4 is a Quad Channel version that can either be used in standard 4-channel mode or in 3-channel mode with a dedicated “reply to last caller” button.

Multiple BP-2 and BP-4 units can be daisy-chained together, powered from the same physical PoE port, providing a functionally superior alternative to traditional 2-wire or digital-audio-based partyline systems.

An available neoprene BP Boot provides additional protection for both models in harsh environments or where additional protection is required.

- Two- and four-channel duplex communication plus auxiliary program source
- 24 bit/48 kHz IP audio
- Natively Livewire+ AES67 compliant
- Optional Infinity Link VoIP codec capability
- Standalone ‘Link Lite’ VoIP Mode
- Rugged, lightweight design with interchangeable belt clip/mounting accessory
- Network connection via standard 100mbit Ethernet
- PoE or PoE+ with managed daisy-chain connectivity
- Headset connector supporting industry-standard XLR-4M
- Internal mic/speaker for hands-free walkie-talkie, desktop or wall-mount use
- Configurable dynamics processing for improved speech intelligibility
- Full configuration via Telos Infinity Dashboard
- Device management via built-in Web UI



# TELOS INFINITY® VIP VIRTUAL INTERCOM PLATFORM

New to the Telos Infinity family is Telos Infinity® Virtual Intercom Platform (VIP), the first fully featured Cloud-based intercom system. It delivers sophisticated comms virtually, making Cloud-based media production workflows available on any modern device, whether it be a smartphone, laptop, desktop, or tablet, through an HTML5 browser or our Android and iOS App. Users can even use third-party control devices, like Elgato's Stream Deck®, to control Telos Infinity VIP. Now you can harness Telos Infinity IP Intercom's award-winning performance, scalability, ease of integration, and operational/cost efficiencies anywhere—At Home, On-Premises, Site-to-Site or in the Cloud.



- Cost-Efficient - Less Maintenance, Infrastructure, Space Required
- Scaleable - Pay for Only What you Need
- Ease of Use – Virtual Panels on Familiar Devices (Smartphone, Computer, Tablet)
- Workflow Flexibility - At Home, On-Premises, Site-to-Site, In the Cloud
- Reliable, Proven Cloud Workflows
- Flexible Deployment Options
- Users can access virtual panels via any device (PCs, Phones, Tablets) with a compatible HTML5 browser or with our Telos Infinity® VIP on compatible Android and iOS devices.
- TelosCare™ PLUS Service Option for Premium Service & Support



## Deployment Options

Meeting users where they are on the path toward virtualization, Telos Alliance offers several deployment options for VIP, which scales to suit users' varying requirements, from a few remote smartphone VIP instances to an enterprise solution requiring hundreds of instances.

- On-Premises – Use Telos Infinity VIP hardware appliance or your own server for on-premises installations.



- Integrated – For both On-Premises or Cloud versions, Telos Infinity VIP can be integrated with Telos Infinity hardware comms, or any third-party intercom or audio subsystem using AES67 or SMPTE 2110-30 connectivity.
- Cloud Server – Software for supported Cloud platform installations. A complete communications infrastructure in the Cloud with connectivity options for integration with third-party Cloud-based and On-Premises audio subsystems.

## Software as a Service (SaaS)

Grass Valley and Telos Alliance have partnered to bring you Telos Infinity® VIP (Virtual Intercom Platform) on GV AMPP (Agile Media Processing Platform), a professional intercom solution for cloud-based media production workflows.

For more info, visit:

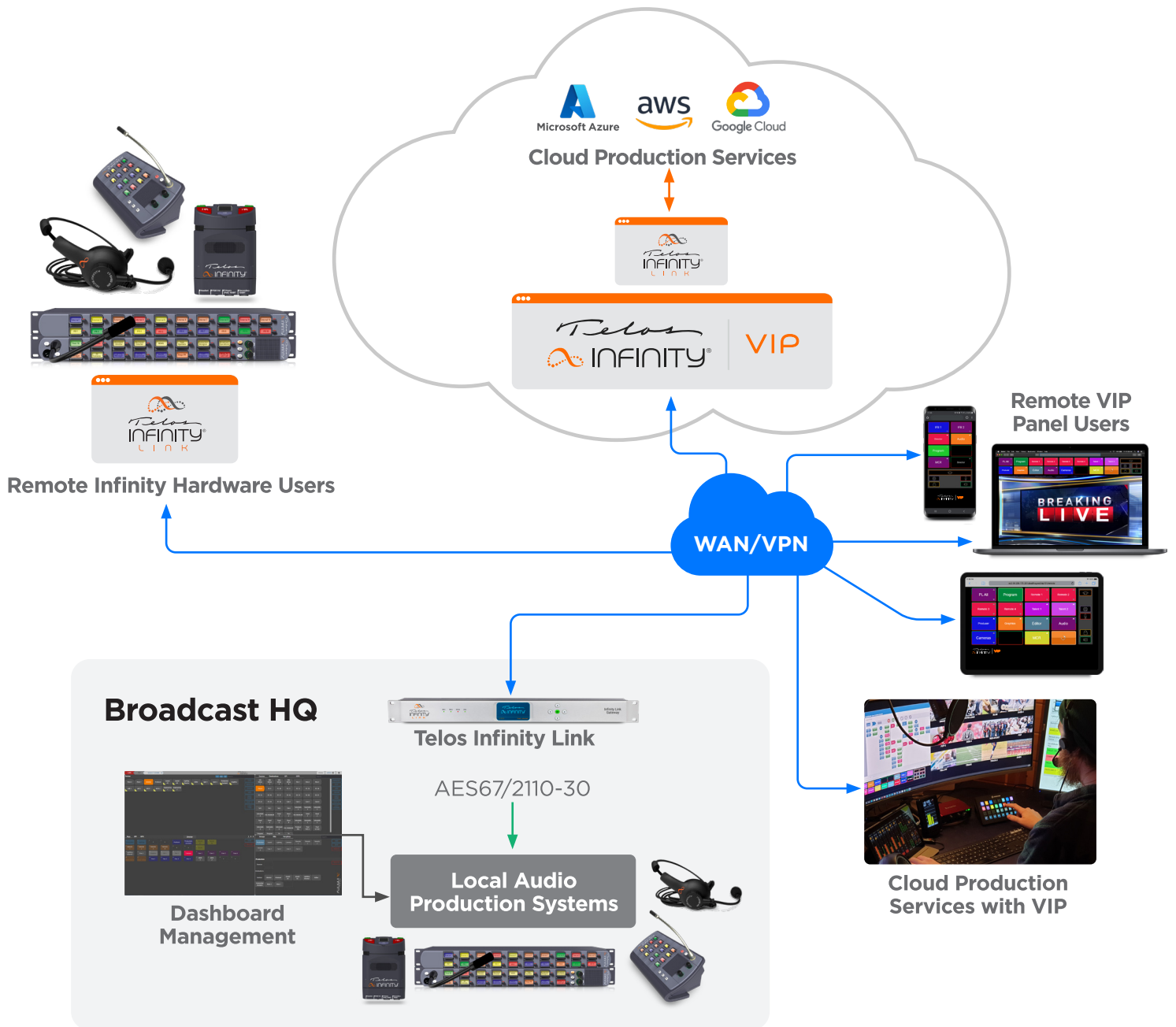
[www.grassvalley.com/products/cloud-based-workflows/telos-infinity-vip-on-ampp/](http://www.grassvalley.com/products/cloud-based-workflows/telos-infinity-vip-on-ampp/)

Telos Alliance has partnered with Vizrt to release Telos Infinity® Virtual Intercom Platform (VIP) on Viz Now, a tool for automating deployments of live productions in the cloud. Viz Now is a software-as-a-service (SaaS) portal hosted by Vizrt. It enables anyone involved in live productions – even non-technical staff – to deploy templated and pre-configured end-to-end live production capacity quickly and easily at a click through its intuitive user interface.

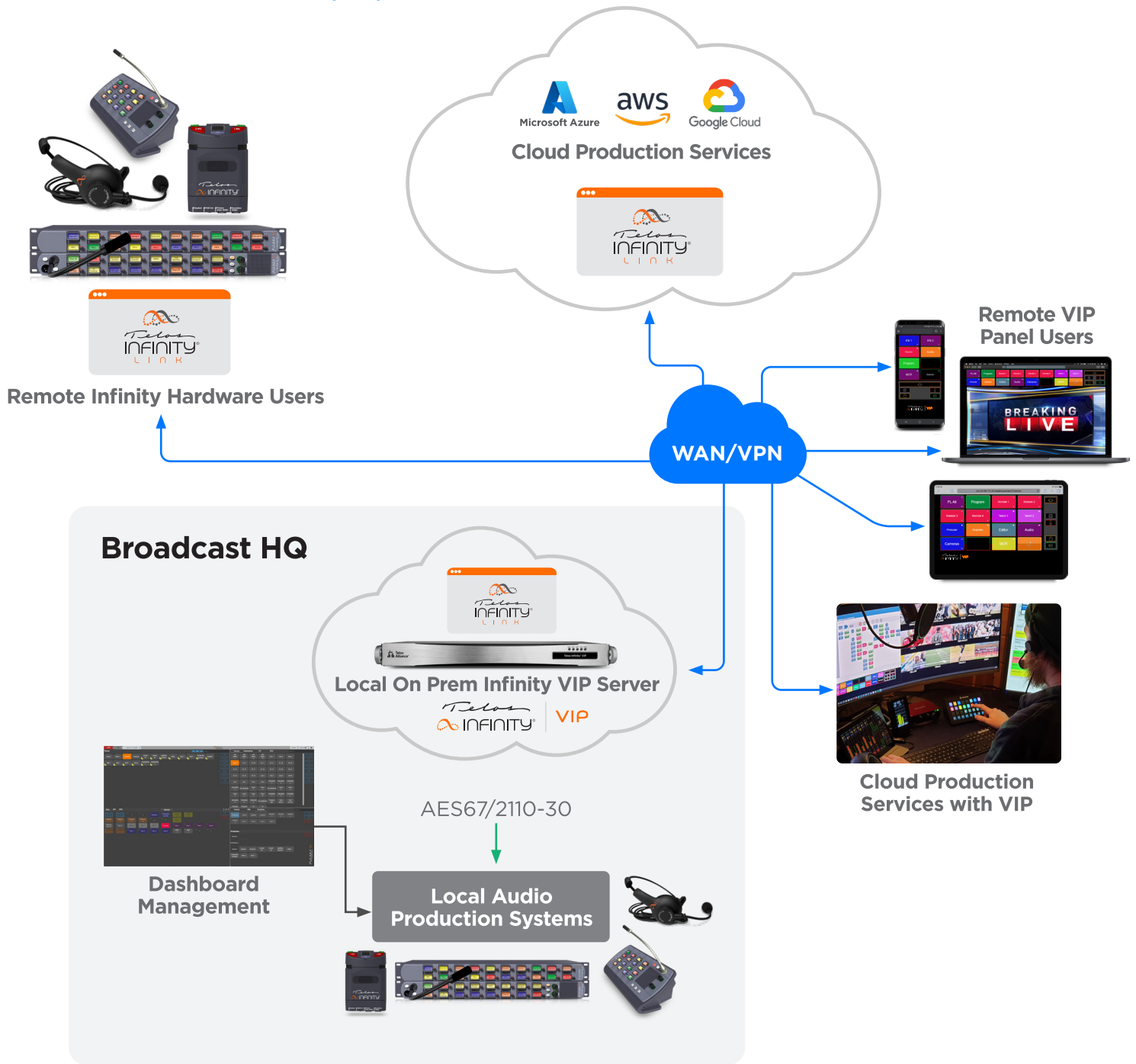
For more info, visit:

<https://www.vizrt.com/products/viz-now>

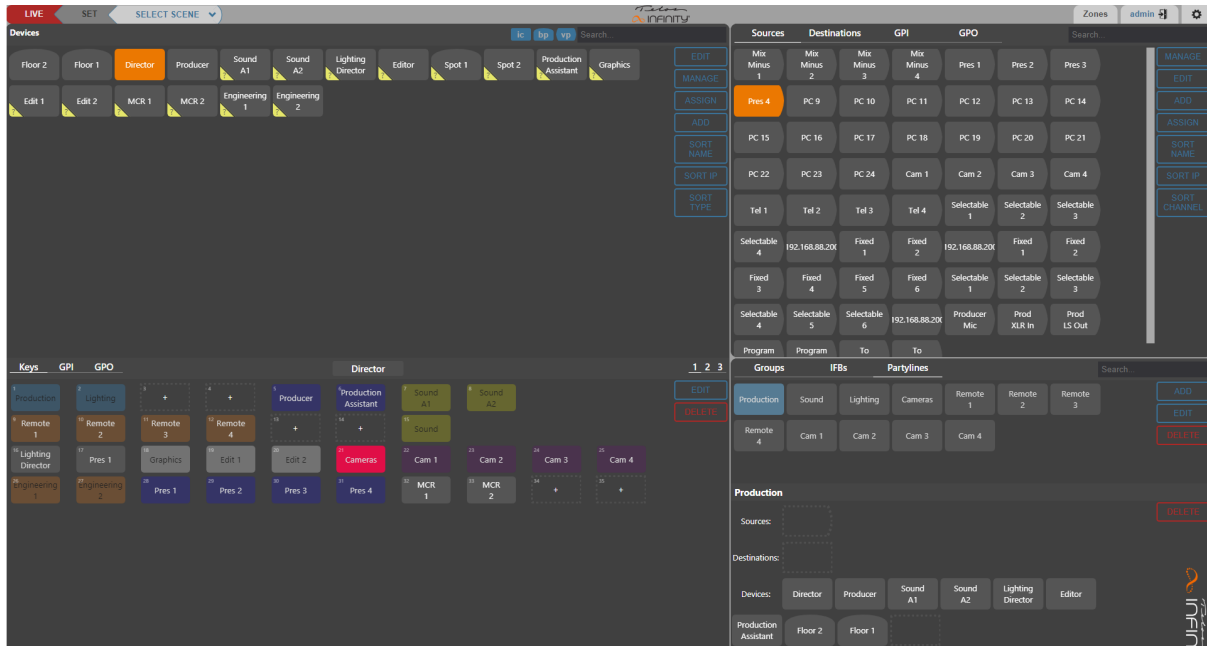
## Cloud Deployment



## On Premise Deployment



# TELOS INFINITY IP INTERCOM DASHBOARD ENTERPRISE



Telos Infinity Dashboard Enterprise represents an optimized configuration and system management tool for systems of any size that unlocks the full potential of the multi-award-winning Telos Infinity matrix-free IP Intercom System.

Dashboard Enterprise is accessible through an HTML 5 browser interface that supports single or multiple user workflows on-premises or in the cloud. By displaying the entire Intercom system as a single page view without the clutter of multiple tabs and embedded menus, the operator can navigate quickly, and within minutes take control to create or manage a working IP Intercom. Much more than a simple configuration tool, Dashboard also manages all hardware and software elements within the system, including software and firmware updates, and monitors network performance and fault logging.

Dashboard Enterprise allows users to create unlimited Groups, Partylines, and IFBs, drag-and-drop functions directly onto Panel and Beltpack keys in real-time, and manage AoIP sources and destinations as though they are physical ports on a virtualized Intercom matrix. Remote control of Panels, Desktop Stations, and Beltpacks is now possible via the web interface for all Infinity systems.

## Dashboard Enterprise Features:

- Optimized user experience
- Online and offline configuration
- Create unlimited Groups, Partylines and IFBs

- Drag-and-drop system configuration
- Remote control of Panels, Desktop Stations, and Beltpacks
- Manages all Telos Infinity and Telos Alliance AoIP devices
- Livewire+ AES67 source and destination management (virtual matrix ports)
- GPIO / Logic configuration and management
- Constantly updating system database backup
- Native AES67 input/output support for all Livewire+ and non-Livewire+ streams (including SAP discovery and advertisement)
- Drag-and-drop Intercom Device copy and cloning of Panel and Beltpack configurations
- System Zones enable user-restricted or bespoke system viewports
- System Scenes enable multiple 'snapshots' for offline creation, save and live recall of show specific configurations
- ISO Keys
- Zone by Zone System Update Tool (allows user to choose when and what hardware devices to update)

Additional features like System Zone and Scene support enable the user to define dedicated system views of specific components and quickly create snapshots (Scenes) for different productions and applications. Tailored access to specific Zones and Scenes as well as offline configuration modes are all protected by centrally managed user rights administration, ensuring that operators at all levels have restricted access to the resources that they need. Zones and Scenes can be edited, cloned and recalled both in Live and Offline modes.

Features in the latest version of Dashboard Enterprise include ISO key support, advanced VOX Detection with noise gating, redundant Ethernet support per SMPTE ST 2022-7 and Bonded Failover modes, and alerts when device firmware is out of date.

Critical for use within the wider Audio over IP ecosystem, Dashboard Enterprise supports SAP for AES67 discovery and advertisement enabling a direct connection of third-party AES67 streams including SAP for Dante and future NMOS modes.

# TELOS INFINITY LINK



**Telos Infinity Link** enables Infinity systems in remote locations to connect to one another using an embedded, versatile, speech-optimized OPUS codec, over the public internet or private infrastructure

Telos Infinity Link is available in the form of software licenses that can be added to any host Infinity Panel or Beltpack hardware, or by way of a dedicated higher-density 1RU hardware gateway.

**Infinity Link for Panels** is available for Infinity Intercom Master Panel, Infinity Expansion Panel, and Infinity Desktop Panel by way of either the Link 4 or Link 8 options, offering four or eight bi-directional codecs respectively.

**Infinity Link for Beltpack** adds two bi-directional codecs via the Link 2 option...

**Link Lite (VoIP Only) Mode** 'Link Lite' VoIP mode for Beltpacks and Panels enables instant connectivity for at-home/remote workflows with minimal config and adaptive bandwidth. This is a free feature released with all devices running V1.7 firmware and above, but with a limited feature set that is optimized for remote users running in standalone applications.

**Infinity Link Gateway** supports either eight or sixteen bi-directional codecs running on a dedicated 1RU hardware platform, making it ideal for higher-density applications. Infinity Link Gateway features dual redundant internal power supplies and dual Gigabit Ethernet ports.

Once connected, the resulting Livewire+ AES67 streams from the remote locations appear as sources and destinations within the Telos Infinity Dashboard software and behave just like local networked audio sources, providing the ultimate flexibility.

# TELOS INFINITY IP INTERCOM LITE SINGLE EAR WIRED HEADSET



Professional single-ear lightweight headset specifically designed for exceptional comfort, flexibility, and durability as needed in the most demanding environments.

## Features:

- Single-ear lightweight design with enhanced acoustic isolation
- Closed back supra-aural (on ear) design
- Flexible, ambidextrous swiveling mic boom
- Flip-up microphone mute
- Dynamic noise-cancelling cardioid microphone optimized for voice communications
- Comfort fit adjustable headband
- Replaceable ear cushion pads
- Non-reflective rubberized matte black finish

## Includes:

- Fixed 5 ft. (1.52 m) cable with 4-pin XLR Female connector termination
- Ear Sock
- Magnetic Cable Clip

# Telos® Z/IP ONE IP Codec

## The IP Codec that Drops Jaws. Not Audio.



## OVERVIEW

Z/IP ONE is a 1 RU rack-mount IP codec for remote broadcasting. It's a single-space rack unit perfect for studios, TOCs and remote kits. Z/IP ONE Includes a full range of codecs including AAC-ELD, AAC-HE, AAC-LD, MPEG 4 AAC, MPEG 2 AAC, MPEG Layer 2, G.711, G.722 codecs, plus linear audio and optional aptX® Enhanced coding. Z/IP ONE supports SIP 2.0 protocol and conforms to N/ACIP standards; it also works with VoIP devices and connects to compatible SIP PBXs. A full complement of I/O, including Livewire® AoIP, analog and AES/EBU, is standard.



## FEATURES

- Works with wired and wireless IP connections including WiFi, WLAN and UMTS/EVDO networks.
- Exclusive Agile Connection Technology (ACT) automatically senses network conditions and adapts codec performance to provide the best possible audio.
- Largest choice of high-performance codecs: AAC-ELD, AAC-HE, AAC-LD, MPEG Layer-2, MPEG-4 AAC-LC, MPEG-2 AAC-LC, G.711, G.722, and linear PCM. Enhanced aptX coding optional.
- Dual Ethernet ports for separate streaming and control, LAN for local control with Livewire audio and GPIO; separate WAN for secure connection to wide area networks.
- Livewire, analog and AES/EBU I/O standard.
- Easy browser setup via built-in Web server.
- "Push Mode" for one-way network transmission.
- "Multiple Push Mode" for audio distribution to multiple destinations.
- Distributed Z/IP Server directory service, with multiple geolocations, lets you easily connect to other Z/IP ONE devices without the need for an IP address and also provides sophisticated NAT traversal support.
- Transparent, time-aligned RS-232 channel for remote control or metadata, e.g., RDS.
- Time-aligned 8-bit parallel GPIO port for signaling and control.
- Slim 1RU form factor is perfect for studio racks, remote kits or road cases.

## IN DEPTH

### Z/IP ONE: It's The Zephyr® for IP

These days, you can get broadband Internet just about everywhere, which makes it ideal for live remotes. But public Internet can also be erratic. You could be lucky enough to get a good connection, but it might deteriorate during your broadcast. What to do? Cross your fingers and hope for the best? Or reduce your bit rate, sacrificing audio quality in hopes of making it through your show?

With Z/IP ONE (the "Z/IP" stands for "Zephyr IP"), you don't have to compromise audio quality for a solid connection. Z/IP ONE helps you get the best possible quality from public IP networks and mobile data services — even from connections behind NATs and firewalls. Telos® collaborated with Fraunhofer (the developers of MP3 and many AAC breakthroughs) to develop a unique coding control algorithm that adapts to changing Internet conditions on the fly, helping you maintain quality and stability.

We call it ACT, short for Agile Connection Technology, and only Telos has it. Using ACT to sense and adapt to the condition of your IP link, Z/IP ONE delivers superb performance on real-world networks. ACT adapts dynamically to minimize the effects of packet loss and jitter. When the bits are flowing smoothly, you'll benefit from the lowest possible delay and the highest possible fidelity. If congestion starts to occur, Z/IP ONE automatically lowers bit rate and increases buffer length to keep audio flowing at maximum quality. You'll get reliable audio even when network conditions are unpredictable — and you won't need to fiddle with settings or codecs to do it.

To make certain your remote broadcast has excellent audio quality even when IP connections are not-so-excellent, Telos engineers employed AAC-ELD (Advanced Audio Coding-Enhanced Low Delay) to produce excellent fidelity at low bitrates, with nearly inaudible loss concealment and very little delay. Standard high-performance codecs are a part of the Z/IP ONE toolkit as well, such as AAC-HE, AAC-LD, MPEG4 AAC-LC, MPEG2 AAC-LC, G.711, G.722 and even linear PCM. And if apt-X is part of your codec cache, you can add it to your Z/IP ONE as a small extra-cost option.

It's from Telos, so of course you expect that Z/IP ONE will be easy to set up and easy to use. And it is — the front panel controls are intuitive and friendly, and the built-in Web server makes short work of configuration or remote control via any PC with a Web browser. And our exclusive worldwide Z/IP Server service, free to Z/IP owners, lets you easily get around NATs and network firewalls for fast connections to your favorite locations. For even more flexibility, Z/IP ONE can connect to third-party apps such as LUCI LIVE and LUCI LIVE Lite to receive on-the-go reports from smartphones and tablets.

Around back, you'll find analog and AES3 XLR ins and outs, a Livewire LAN port for quick connection to Axia® networks, and a separate WAN port for safe connection to "the outside world."



Z/IP ONE is also wireless-capable and connects natively to IP networks via Wi-Fi. A parallel port is provided for end-to-end, time-aligned GPIO contact closures; Z/IP ONE can also transport RS-232 serial data (using an inexpensive USB-to-Serial adaptor cable), synchronized with audio delivery — useful for RDS/RBDS data, as well as other serial data, at up to 9600 bps.

## SPECIFICATIONS

### Conformance and Compatibility

- Conforms to N/ACIP (Open) Standards. Fully supports Session Initiation Protocol 2.0 (SIP). Compatible with TCP, UDP, DNS, Zephyr Xstream®, Uncompressed PCM and other Internet Protocols.

### Codecs

- SIP: G.711, G.722, MPEG Layer2, MPEG AAC, MPEG 4 AAC LC, MPEG 2 AAC LC, Linear PCM, MPEG AAC-Enhanced Low Delay (ELD), High Efficiency AAC.
- Optional: apt-X Enhanced® from CSR.

### Connections

#### Analog

- 1x Stereo input, presented on two XLR-F connections
- 1x Stereo output, presented on two XLR-M connections

#### Livewire

- 1x 100BASE-T connections, presented on RJ-45

#### AES/EBU

- 1x Stereo Input, presented on one XLR-F connection
- 1x Stereo Output, presented on one XLR-M connection

#### Network

- 2x 100BASE-T connections, presented on RJ-45 (1x LAN, 1x WAN)

**USB**

- 2x A-Type, Female

**Parallel (GPIO)**

- 1x DB25, Male

**Audio:****Analog Line Inputs:**

- Input Impedance: 6K Ohm differential
- Input Range: Selectable, Line (+4 dBu nominal), Microphone (-50dBu nominal)
- Selectable Phantom power

**Analog Line Outputs:**

- Output Impedance: 50 Ohm differential
- Output Clipping: +22dBu

**Digital Audio Inputs And Outputs**

- Reference Level: +4 dBu (-20 dB FSD)
- Impedance: 110 Ohm, balanced
- Signal Format: AES3 (AES/EBU)
- AES3 Input Compliance: 24-bit with sample rate conversion
- AES3 Output Compliance: 24-bit
- Digital Reference: Internal (network timebase) or external reference 48 kHz, +/- 2 ppm
- Internal Sampling Rate: 48 kHz
- Input Sample Rate: 32 kHz to 192 kHz
- Output Sample Rate: 48, 44.1 or 32 kHz, or "sync to input" (auto-matches rate and clock from AES/EBU input)
- A/D Conversions: 24-bit, Delta-Sigma, 256x oversampling
- D/A Conversions: 24-bit, Delta-Sigma, 256x oversampling

**Frequency Response**

- Any input to any output: +/- 1dB 25– 20 kHz

**Headroom**

- 18 dB

### Dynamic Range

- 87dB Unweighted
- 90 dB "A" Weighted

### Total Harmonic Distortion + Noise

- < 0.03% @ +12dBu, 1 kHz Sine

### Crosstalk Isolation

- > 80 dB

### Power Supply AC Input

- Auto-ranging supply, 90VAC to 240VAC, 50 Hz to 60 Hz, IEC receptacle, internal fuse
- Power consumption: 14.2 Watts

### Operating Temperatures

- 0-40 degrees C (32-104 degrees F), stirred air

## Dimensions

- 19" (48.3 cm) standard rack mounting front panel
- 1.75" (4.5 cm) height, 6.5" (16.51 cm) depth
- Shipping Weight: 8 lbs. (3.62 kg)
- Shipping Dimensions: 24" x 14" x 6" (61 cm x 35.6 cm x 15.25 cm)

# Telos® iPort High Density Multi-Codec Gateway



## THE MULTI-CODEC GATEWAY THAT GIVES YOU MORE

Telos® iPort is a Multi-Codec Gateway designed on an IP backbone that is used by broadcasters worldwide, featuring built-in resilience and reliability even with challenging connections. Worldwide networks use iPort for both Distribution and Contribution spanning multiple time zones.

Now, the iPort legacy continues with the more powerful iPort High Density, which transports multiple channels of stereo, mono, and dual-mono audio across IP networks, including private WANs, IP-radio links, and over good quality Public Internet connections—perfect for large-scale distribution of audio to single or multiple locations.

iPort High Density is the workhorse of codecs and comes with eight bi-directional stereo codecs, configurable to run in MPEG or Linear PCM mode. You can license additional codecs up to a maximum of 64, as well as add Enhanced aptX™ encoding. iPort High Density connects to your existing Livewire® Network using a single ethernet cable (CAT-6 recommended) for all I/O. It can also pair with [Telos Alliance xNodes](https://www.telosalliance.com/xNodes) via an adequately configured ethernet switch for use as a standalone multi-stream codec.

Coding algorithms include AAC, AAC-LD, HE-AAC (plus v2), MP2, MP3, linear PCM, and optional Enhanced aptX™. 24 to 320 kbps for MPEG codecs, standard fixed rates for Enhanced aptX, and 24-bit PCM at 48kHz, mono, or stereo are supported. Dual, diverse-path, end-to-end connections are available for ultra-reliability and redundancy. Built-in streaming servers use SHOUTcast/ICEcast formatting at the output.

iPort High Density offers MPEG-standard ancillary data transport, up to three transparent control and metadata channels per codec and direction, and enhanced GPIO options with up to 20 end-to-end GPIO channels per codec and direction, all bundled and synchronized with the respective audio content. An optional Content Delay feature allows independent local storage and scheduled delayed playout of any or all coded audio channels.

## FEATURES

- Transports multiple channels of stereo, mono, and dual-mono audio across IP networks
- Comes with eight bi-directional stereo codecs
- Codecs are configurable to run in multiple MPEG or linear PCM modes
- Up to four redundant IP stream destinations per encoder
- Unicast UDP and TCP, or UDP Multicast stream types, independently configurable per WAN stream
- Each codec independently configurable
- Additional codecs can be licensed up to a maximum of 64
- Enhanced aptX™ encoding optional
- Connects to existing Livewire® networks, allowing audio from remote facilities to be used as if they were local sources, with associated logic and control
- Pairs with [Telos Alliance xNodes](#) and an adequately configured ethernet switch for use as a standalone multi-stream codec
- Coding algorithms include:
  - AAC
  - AAC-LD
  - HE-AAC (plus v2)
  - MP2 (MPEG 1 layer 2)
  - MP3 (MPEG 1 layer 3)
  - Linear PCM
  - Optional Enhanced aptX™ (24 and 16 bit)
- Supported bit rates include:
  - 24 to 320 kbps for MPEG
  - Standard fixed rates for Enhanced aptX
  - 24-bit PCM at 48kHz, mono, or stereo

- Dual, diverse paths for ultra-reliability and redundancy
- SHOUTcast/Icecast formatting is offered by built-in streaming servers
- Associated data transport:
  - MPEG-standard embedded ancillary data
  - Three transparent control and metadata channels per codec and direction
  - Up to 20 end-to-end GPIO channels per codec and direction
  - All data bundled and synchronized with the respective audio content
- Sixteen five-input Virtual Mixer (VMIX) channels each allow mixing of up to five networked Livewire audio streams on a single channel
- Sixteen Virtual Mode (VMODE) channels allow audio to be split into left/right channels, summed L+R, and more, and allow conversion of stream formats between AES67 and Livewire. VMODE channels can be used independently, or they can feed encoders and process decoder outputs as well
- Optional Content Delay with SSD-based dynamic storage space allocation, configurable per codec, with synchronized delay of GPIO and user data channels
- NTP synchronization for Content Delay on absolute time
- Remote control and configuration via any computer with a standard Web browser
- Remote status signaling and control using virtual GPIO pins
- SNMP monitoring with traps and attribute read supported
- Extended remote control and monitoring support via LWRP
- Separate LAN and WAN ports help ensure network security
- 1RU form factor chassis including rack rails
- Dual-redundant, auto-switching power supplies for maximum uptime. Power supply modules are field-replaceable
- Gigabit Livewire and WAN Ethernet interfaces

## For iPort High Density + Content Delay

- Capabilities identical to iPort High Density
- Adds hardware and exclusive software to enable delayed playout of selected received audio channels
- Associated GPIO and ancillary data are likewise delayed and synchronized with audio
- Each playback delay time is independently configurable on a per-channel basis
- The total amount of hours, bitrate, and the number of streams depends on storage



## POWERFUL, ADVANCED PROGRAM DISTRIBUTION AND FACILITY CONNECTION.

If your facility is like most, rack space is a precious commodity. iPort High Density is a third-generation, sophisticated, multiple-CODEC device that saves you money and rack space by housing up to 64 broadcast-quality stereo codecs in one 1RU device.

A pair of iPort High Density connected via a QoS-controlled IP link can send and receive up to 64 channels of bi-directional stereo MPEG audio. Or, use iPorts as a one-way “push” link to encode and deliver up to 64 channels of broadcast-quality one-way audio to remote destinations. With its ability to send multiple MPEG channels over IP connections, iPort High Density is perfect for audio transmission over VPNs, satellite links, Ethernet radio systems, and Telco or ISP-provided IP services such as SD-WAN, MPLS, or more traditional (legacy) data links such as T1.

You can use iPort for studio-to-transmitter links, network distribution systems, and multi-channel links to remote studios. Install a QoS-enabled IP link between two studios with Livewire networks, put an iPort High Density at each end, and you can pass audio and GPIO between locations as if they were just next door. Paired with an appropriate streaming server, you can even use it to generate multiple channels of MP3- or AAC-coded audio for streaming, broadcasting to mobile phones, and audio distribution systems.

Finally, iPort High Density’s exclusive Content Delay option (available at extra cost) adds hardware and software that enables delayed playout of select received audio channels. Associated GPIO and ancillary data are likewise delayed and synchronized with audio. Delay any or all coded audio channels; each channel’s delay time is independently configurable. Total storage time varies by configuration.

Uncompressed 24-bit/48kHz audio is ingested from your network via Ethernet; compressed MPEG (and/or optional Enhanced aptX) streams are output on the same cable—eliminating expensive, space-consuming converters and connectors. Or, use the separate WAN connection to send your audio over an outside network.

iPort High Density’s streams sound fantastic, thanks to our long-standing relationship with Fraunhofer IIS, the inventor of MP3 and co-inventor of AAC. The encoding algorithms inside iPort are genuine FhG, not no-name knockoffs. A full range of state-of-the-art codec types and bitrates are supported; the highest quality implementations possible. Choose AAC-LD for delay-sensitive applications, AAC-HE and AAC-HEv2 for low bitrate requirements, standard MPEG AAC for best quality and resilience to packet loss at higher bit rates, MP3 and MP2 for legacy applications.

# SPECIFICATIONS

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## Audio

iPort High Density has no native audio I/O, operating on streams provided by attached Livewire+ AES67 audio devices. For full audio specifications, see the [Telos Alliance xNode](#) page.

## Network

1 LAN port, 1 WAN port; 100/1000-BaseT Ethernet interfaces

## Codecs

Standard AAC, high-efficiency AAC-HE (aacPlus), AAC-HEv2, low-delay AAC-LD, MP3, MP2. Optional: Enhanced aptX™.

## Power

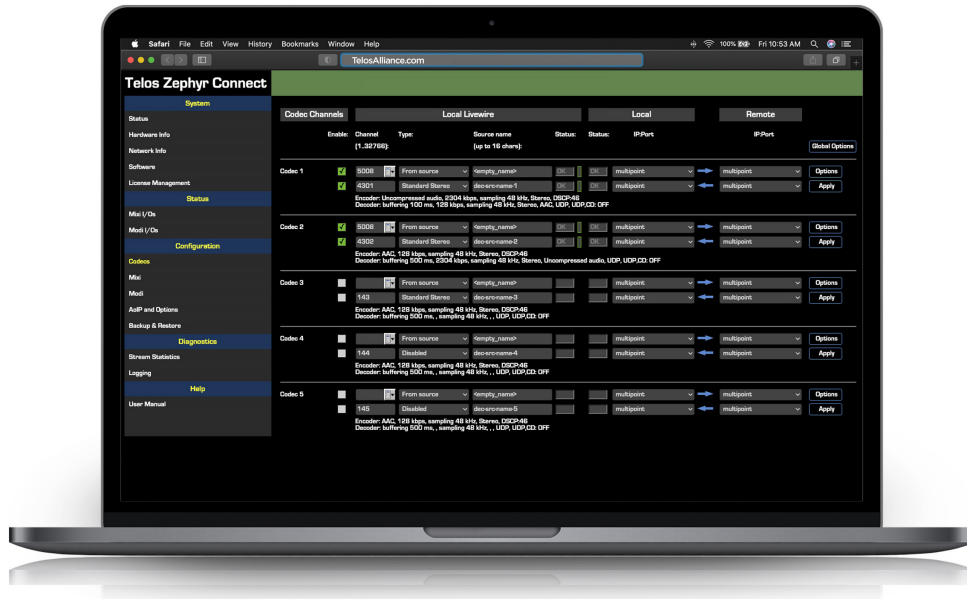
Dual-redundant internal auto-ranging power supplies, 90 – 132 / 187 – 264 VAC, 50Hz/60Hz. Power consumption: 100 Watts.

## Regulatory

[Click here](#) to view the current regulatory compliance.

# Telos® Zephyr Connect

All the power of Telos® iPort HD in a more scalable, virtual package.



## OVERVIEW

Zephyr Connect is a virtual multi-codec gateway built on the legacy of the Telos iPort series of products. It performs all the same core functions as iPort HD while allowing users to flexibly scale up and down in ways not previously possible. As a software solution, Zephyr Connect is delivered via a Docker container that can be deployed on-premises on a COTS (commercial off-the-shelf) server or cloud-hosted. Need hundreds of codec channels on one server? Zephyr Connect can handle that. Need just a handful on a fanless endpoint at a transmitter site? Zephyr Connect can handle that, too.

## FEATURES

- Transports multiple channels of stereo, mono, and dual-mono audio across IP networks
- Comes with 2 bi-directional stereo codecs, licensable up to 64 codecs per instance
- Each codec is independently configurable
- Up to four redundant IP stream destinations per encoder
- Unicast UDP and TCP, or UDP Multicast stream types, independently configurable per WAN stream
- Enhanced aptX™ encoding optional
- Pair with Telos Alliance® xNodes and an adequately configured Ethernet switch for use as a standalone multi-stream codec
- Optional Content Delay feature available

## IN-DEPTH

Zephyr Connect is a virtualized version of our Telos iPort High-Density Multi-Codec Gateway hardware product, and the two products are fully compatible and interoperable with one another. Zephyr Connect is delivered as a Docker container for on-premises hosting using a COTS server. Each Zephyr Connect instance starts with two bidirectional codec channels and is expandable via licensing up to 64 channels per instance.

A pair of Zephyr Connects operating via a QoS-controlled IP link can send and receive up to 64 channels of bi-directional stereo MPEG audio. Or, use Zephyr Connect as a one-way “push” link to encode and deliver up to 64 channels of broadcast-quality one-way audio to remote destinations. With its ability to send multiple MPEG channels over IP connections, Zephyr Connect is perfect for audio transmission over VPNs, satellite links, Ethernet radio systems, and Telco or ISP-provided IP services such as SD-WAN, MPLS, or more traditional (legacy) data links such as T1.

You can use Zephyr Connect for studio-to-transmitter links, network distribution systems, and multi-channel links to remote studios. Install a QoS-enabled IP link between two studios with Livewire® networks, put a Zephyr Connect or iPort HD at each end, and you can pass audio and GPIO between locations as if they were just next door. Paired with an appropriate streaming server, you can even use it to generate multiple channels of MP3- or AAC-coded audio for streaming, broadcasting to mobile phones, and audio distribution systems.

Finally, Zephyr Connect's exclusive optional Content Delay feature enables delayed playout of select received audio channels. Associated GPIO and ancillary data are likewise delayed and synchronized with audio. You can delay any or all coded audio channels; each channel's delay time is independently configurable. The amount of audio that can be stored varies by available storage, and high-end enterprise SSDs are recommended.

Of course, Zephyr Connect's streams sound fantastic thanks to our long-standing relationship with Fraunhofer IIS, the inventor of MP3 and co-inventor of AAC. The encoding algorithms inside are genuine FhG, not no-name knockoffs. A full range of state-of-the-art codec types and bitrates are supported in the highest-quality implementations possible. Choose AAC-LD for delay-sensitive applications, AAC-HE and AAC-HEv2 for low bitrate requirements, standard MPEG AAC for best quality and resilience to packet loss at higher bit rates, or MP3 and MP2 for legacy applications.

## REQUIREMENTS

The information below is intended to provide general operational guidance for software container deployment on a Linux server and is subject to change. For a single Zephyr Connect instance with 64 channels of bi-directional stereo coded audio, the following minimum hardware requirements must be met:

- Cores needed per instance: 4 cores (x86-64 12th generation "Alder Lake" or better, or Gen 6 Xeon server CPU)
- CPU speed requirement: 3.6 GHz
- Memory requirements: 4 GB RAM per instance
- Required Linux distribution: Ubuntu Server v20.04 or 22.04 (64-bit)

# Telos VX<sup>®</sup> Enterprise

## The Whole-Plant Broadcast Talkshow System



## OVERVIEW

Telos VX<sup>®</sup> is the world's first VoIP (Voice over IP) talkshow system — a broadcast phone system that's so powerful, it can run all the on-air phones for your entire plant. Telos VX Enterprise™, with built-in support for AES67, is the next evolution of Telos VX VoIP phone system in a powerful new 1RU hardware unit. Additionally, support for the G.722 voice codec ensures the highest quality calls from supported mobile devices. With capacity expandable to up to 120 hybrids/faders, VX Enterprise is ideal for medium to large facilities and can grow with your station over time. (For smaller facilities, check out VX Prime+ with 8-hybrid capacity.)

AES67 support brings a new level of compatibility and flexibility to VX phone systems. Support for AES67 gives broadcasters the flexibility of integrating VX Enterprise into any AES67 environment, in addition to our own Axia<sup>®</sup> Livewire<sup>®</sup> network. With plug-and-play connectivity, you can network multiple channels of audio with any manufacturer's AES67-compliant hardware. Beyond AES67, Livewire users have the added convenience and power of networking control (GPIO), advertising/discovery, and program associated data throughout the network.

Using VoIP, VX Enterprise gives you remarkable-sounding on-air phone calls with no 'gotchas'. It weds modern networking to the remarkable power of digital signal processing. VX Enterprise uses Ethernet as its connection backbone, significantly cutting the cost of phone system installation, maintenance, and cabling. It uses standard SIP protocol that works with many VoIP PBX systems and SIP Telco to take advantage of low-cost and high-reliability service offerings. VX Enterprise can also connect to traditional telco lines via Asterisk PBX systems, which can be customized for specific facility requirements.

Don't have an IP-Audio network yet? Optional Telos Alliance xNodes, like the Telos Alliance Mixed Signal Node, break out audio into analog and digital formats, along with GPIO logic commands. And with informative VSet phones, talent finds it easier than ever to take control of their callers, moving and sharing lines between studios at the touch of a button.

## FEATURES

- VX is the world's first VoIP telephone system designed and built specifically for broadcasting.
- Includes support for AES67, giving broadcasters added flexibility of integrating VX Enterprise into any AES67 network, in addition to our own Axia Livewire network.
- Works directly with SIP endpoint telco or PBX services, and in conjunction with a PBX may support POTS, T1/E1, and ISDN BRI for maximum flexibility and cost savings.\*
- Standards-based SIP/IP interface integrates with most VoIP-based PBX systems to allow transfers, line-sharing, Caller ID and common telco services for business and studio phones.
- Standard Ethernet backbone provides a common transport path for both studio audio and telecom needs, resulting in cost savings and a simplified studio infrastructure. Connection of up to 100 control devices (software or hardware) is possible.
- Modular, scalable system can be easily expanded and configured to manage a network of 60 or even more studios, each with a dedicated Program-On-Hold input—truly a “whole-plant” solution for on-air phones.
- Base system is licensed for up to 24 hybrids, may be expanded in license increments of 8 up to a total of 120 hybrids. A Telos system engineering consultation is required for any system configuration over 72 hybrids. Please contact us at [vx-presales@telosalliance.com](mailto:vx-presales@telosalliance.com) for assistance.
- Each call receives a dedicated hybrid for unmatched clarity and superior conferencing.
- Native Livewire integration: One connection integrates caller audio, program-on-hold, mix-minus, and logic directly into Axia AoIP consoles and networks.
- Connect VX Enterprise to any radio console or other broadcast equipment using available Telos Alliance AES/EBU, Mixed Signal, and GPIO xNodes. Audio interfaces feature 48 kHz sampling rate and studio-grade 24-bit A/D converters with 256x oversampling.

- Powerful dynamic line management enables instant reallocation of call-in lines to studios requiring increased capacity.
- VSet Call Controllers™ with full-color LCD displays and Telos Status Symbols™ present producers and talent with a rich graphical information display. Each VSet features its own address book and call log.
- Drop-in modules can integrate VX Enterprise phone control directly into your Axia mixing consoles.
- XScreen Lite Screening software included.
- Clear, clean caller audio from 5th-generation Telos Adaptive Hybrid technology, including Digital Dynamic EQ, AGC, adjustable caller ducking, and send- and receive-audio dynamics processing by Omnia®.
- Wideband acoustic echo cancellation from Fraunhofer completely eliminates open-speaker feedback.
- Support for G.722 codec enables high-fidelity phone calls from iPhone and Android SIP softphones using an SIP server.

\* Due to the wide variation in how traditional phone service can be delivered, and the complexities that can be involved in converting those services to SIP, we really want to talk with you about your system design before you order. Telos has VX System engineers standing by to help you draw up a configuration that will ensure your VX purchase will perform to your expectations when using traditional POTS and ISDN lines.

## IN DEPTH

### VoIP for Broadcast. From Telos, Naturally.

VX is the world's first VoIP (Voice over IP) talkshow system, and VX Enterprise is the next evolution of this legendary system, now with built-in support for AES67 in a 1RU chassis. This whole-plant broadcast phone system is incredibly powerful, very flexible, and highly scalable.

VoIP has already taken the business world by storm, increasing the flexibility of office phone systems and PBXs while simultaneously lowering maintenance and equipment costs. In fact, most Fortune 500 companies have replaced their older PBX systems with VoIP for just these reasons. There's no reason broadcasters shouldn't take advantage of this cost-saving technology as well. In addition to cost savings from digital phone service provisioning, VX Enterprise significantly eases the cost of installation, maintenance, and cabling by using standard Ethernet as its data backbone.

As a result VX Enterprise is naturally scalable, capable of serving even the largest of facilities. There are major operational benefits as well. VX Enterprise combines the flexibility and economy of modern SIP networking with powerful digital signal and audio processing—making it easier than ever for talent to take control of their phone system. You can move and share lines between studios at the touch of a button. VX Enterprise is truly the future of broadcast phones.



## Why VoIP for Broadcast?

VoIP is a natural for broadcasters. Using VoIP, you can interconnect the phone system CPU with audio interfaces, phone sets, console controllers, and PCs running screening software using efficient, low-cost Ethernet. You can finally share phone lines among multiple studios and route caller audio anywhere in your facility, easily and instantly. Got a hot talk show that suddenly needs more lines in a certain studio? Just a few keystrokes at a computer and you're ready—no delays, and no cables to pull. VX Enterprise can even connect with your business office's VoIP PBX to facilitate easy call transfers.

Of course, it's got to sound good. And it does, thanks to more than two decades of DSP hybrid technology developed by Telos. Every incoming line has its own 5th-generation digital hybrid, our most advanced ever, packed full of technology engineered to extract the cleanest, clearest caller audio from any phone line—even noisy cellular calls. Multiple lines can be conferenced with superior clarity and fidelity. Smart AGC ensures consistent caller audio levels. New Acoustic Echo Cancellation from FhG removes feedback and echo in open-speaker studio situations. And if you choose to use SIP Trunking telco services, calls from mobile handsets with SIP clients, HD capable telephone sets and PC apps will benefit from VX Enterprise's native support of the G.722 codec, instantly improving caller speech quality.

Since VX Enterprise uses Ethernet as its network backbone, it naturally plugs right into Axia IP-Audio networks, connecting multiple channels of audio and control using a single Ethernet cable. If you don't have an IP-Audio network yet, that's OK; Telos Alliance xNodes provide AES audio and GPIO connections that work with your existing studio equipment.

## VX Enterprise Components

### VX Enterprise



VX Enterprise 1RU rack-mount device is the heart of the system. It provides all the call control and audio processing needed for the system, and supports up to 120 active calls on-air simultaneously. Its two Gigabit Ethernet ports provide a cost-effective interface to both telephone lines and studio audio via proven Livewire AoIP. VX Enterprise is Web-based, so remote control and configuration are a snap — engineers can work with it from any place they can get online.

Call-processing is sophisticated and flexible. Lines may be readily shared among studios; the Web interface allows easy assignment of lines to "shows," which can then be selected by users on the studio controllers. Each studio can provide its own Program-on-Hold audio to callers.

Audio processing features also have taken a leap forward. The processing power of VX Enterprise allows multiple calls to be conferenced and aired simultaneously, with excellent quality. The hybrids are equipped with a rich processing toolbox to make caller audio sound its best, no matter what kind of line or phone the caller uses. Caller audio benefits from Smart AGC coupled with famous Telos three-band adaptive Digital Dynamic EQ and a three-band adaptive spectral processor. Send audio gets its own sweetening with an AGC/limiter and FhG's Acoustic Echo Cancellation technology that literally eliminates open-mic feedback. Call ducking and host override are part of the VX Enterprise toolkit as well, and talent can manage and customize their telephone settings and workflow using VX Enterprise Show Profiles to store and recall commonly used show configurations.

You'll notice that there are no audio I/O or phone jacks on VX Enterprise. All connections to the Engine are via the two Ethernet jacks that connect to your system's Ethernet switch to support a wide variety of peripherals: telephone lines, Livewire studio audio, VSet phones, console-integrated controllers, etc. If you have a VoIP-based PBX or SIP endpoint telco service, VX Enterprise uses standard SIP (Session Initiation Protocol).

## The Coolest Broadcast Phone Controllers Ever

With decades of experience designing broadcast phone systems, it's no wonder broadcasters agree that Telos makes the industry's most powerful, most flexible system controllers. All VSet phones can be powered by PoE from a Telos-approved switch, a PoE port on an Axia console engine, or by using a power injector.

### VSet12



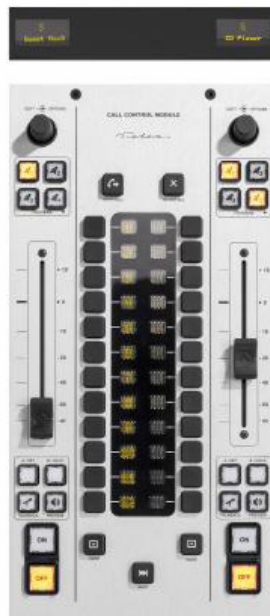
The VSet12 phone controller is an IP-based phone set with two large, high-contrast color LCD panels that provide line status and caller information. VSet phones can work like a traditional Telos controller, with calls being selected, held, and dropped in the way to which operators have grown accustomed. But because the VX Enterprise system is so powerful, much more functionality is unlocked: You can now spread multiple calls over a number of faders, using one for each call so that operators can control each line's level individually. You can hard-assign individual lines to fixed faders, such as for VIP calls.

## VSet6



VSet6 is a 6-line phone controller for VX Enterprise. Like the VSet12, it has a bright, attractive LCD color display with Status Symbols that feed talent instant information about line and caller status, and controls that enable talent to step through queued calls, busy incoming lines, lock calls on-air, start an external recording device, et cetera. Next Call functionality speeds workflow for producers, screeners, and talent. With all the control functions of the VSet12, it's great for smaller or secondary studios.

## On-Console Control



Live calls or pre-recorded, interviews or audience participation, one thing's certain: Phone segments are an integral part of today's fast-paced radio. But up to now, the phone system was separate from the on-air console; audio was shared, but little else. Wouldn't it be great if talent could take control of phones without ever having to divert their attention from the board?

They can: the Axia Console Controller provides the ideal way to integrate broadcast phones into the on-air console—the control center of every studio. VX systems connect directly to Axia consoles using Livewire+™ AES67 IP-Audio to eliminate the cost and complexity of old-style inputs, outputs, and mix-minuses. And now, VX Systems have the added flexibility of AES67 support. Multiple phone lines—each with a dedicated hybrid—can automatically map to individual console faders for complete control of caller audio. Multiple phone lines—each with a dedicated hybrid—can automatically map to individual console faders for complete control of caller audio. And users enjoy seamless console integration, with phone controls right on the board so that talent can dial, answer, screen, and drop calls without ever diverting their attention from the console. Information about line and caller status can be displayed right on the console as well.

There are plenty of other advantages to melding phones with consoles. Like ease of installation: IP-Audio consoles with built-in phone controllers don't need any additional wires or connections. Their control signaling, caller audio, and backfeeds ride on the network connection that's already there. Bringing caller audio into the IP-Audio domain makes it routable like any other audio source. With the Virtual Mixers built into Axia consoles, you could even choose to dynamically conference multiple lines and control their gain with a single fader.

## Telos Alliance xNode Audio Interfaces

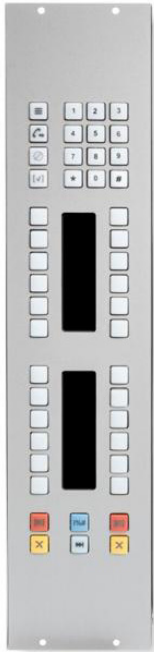


Telos Alliance xNodes let you connect VX Enterprise to any non-networked radio console or other broadcast equipment, using standard AES/EBU interfaces. A GPIO Logic xNode provides control logic where needed. To cover all your bases, the Telos Alliance Mixed Signal xNode provides one mic/line analog input (switchable); two analog line inputs (dedicated); three analog line outputs; one AES3 input, one AES3 output, and two GPIO ports, each with five opto-isolated ins and outs.

The Telos Alliance AES/EBU audio xNode 4 AES/EBU inputs and 4 AES/EBU outputs. Left and right input signals may be split and routed independently as mono signals. Stunning performance specs include 48 kHz sampling rate, 126dB of dynamic range, and <0.0003% THD.

Each Telos Alliance GPIO logic xNode interface provides six general-purpose logic ports each with five opto-isolated inputs and five outputs. A logic port can be associated with any audio input or output and routes control data transparently along with the audio.

## VSet Call Controller



Want a VX Enterprise system, but don't have an Axia mixing console? No problem—Telos provides VSet Console Controller electronics packages, which may be fitted to your console using panels supplied by your OEM console provider or preferred third-party fabricator. Like the VSet12 phoneset, the VSet Console Controller provides visual line-status indicators and fast-take keys for selection and control of up to 12 callers, along with standard controls such as Take, Drop, Hold and Busy keys, and the Telos-exclusive "Next Call" key to speed workflow for producers, screeners, and talent. There's also a built-in keypad for on-console dialing of outgoing numbers.

## VSet Desktop Controller



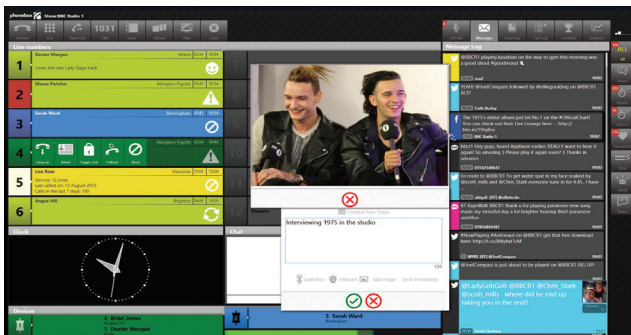
The Telos VSet Desktop Controller with visual line-status indicators provides selection and control of up to 12 callers. Includes standard controls to allow fast, error-free talent operation, including Take, Drop, Hold, and Busy keys. Telos exclusive "Next Call" key speeds workflow for producers, and talent; built-in keypad allows on-hybrid dialing of outgoing numbers. VSet Desktop Controller works in producer mode only. Make and answer calls using VSet6, VSet12, or on hybrid with VSet Desktop Controller.

## Broadcast Bionics XScreen Lite Call-Screening Software Included



XScreen Lite software comes with every VX Enterprise purchase and provides Unlimited Lite users, dial, hold, hang up, screened hold and next, conference control, dump mode, lock call, VSet control, telephone number, location, name, point & disposition, chat, clock, and call log (6 hours only) functionality. Please download your XScreen software from [www.xscreen2.com](http://www.xscreen2.com).

## Broadcast Bionics PhoneBOX VX



Broadcast Bionics offers PhoneBOX VX, a tailored-for-VX version of their original PhoneBOX software. PhoneBOX VX gives VX users an amazing amount of information and a high level of control over the VX system. There's prize management, call editing, and recording, sophisticated visual talkback, including a drag-and-drop database your show's calls, plus a rich phonebook and visual warnings, tied to Caller ID, for persistent or nuisance callers. Find out more from [www.phoneboxvx.com](http://www.phoneboxvx.com).



## NeoScreener by NeoGroupe



NeoGroupe offers NeoScreener, a call management solution that interfaces Telos NX12, NX6, IQ6, VX, HX6, 2x12 and 2101 systems, allowing for line control and database lookup using caller ID. The solution can interface to NeoWinners which is NeoGroupe's contest management software. It is designed for radio and television stations that need to manage their flow of incoming phone calls.

NeoScreener also handles external inputs, like SMS, Website, iPhone. Database driven, it enhances the phone-call workflow. With NeoScreener, call screeners can easily welcome calls and present them to the Talent on a specific display. Visit [www.neogroupe.com](http://www.neogroupe.com) to learn more.

## Arctic Palm CS Call Management

The CS Call Management package provides producers and talent with the tools to capture and control callers while staying in touch with each other in a single Caller Control window. Designed for the VX VOIP systems, both local and remote users are in constant communication.

For more information, visit [www.arcticpalm.com/CSScreener.htm](http://www.arcticpalm.com/CSScreener.htm).

# SPECIFICATIONS

## General

- Telos 5th-generation Adaptive Digital Hybrids
- Maximum number of hybrids: 120, when used with a-Law or u-Law codecs for VoIP lines. (Higher-quality codecs, such as G.722, consume more system resources and result in a decreased number of total lines available.) A Telos system engineering consultation is required for any system configuration over 72 hybrids. Please contact us at [vx-presales@telosalliance.com](mailto:vx-presales@telosalliance.com) for assistance.
- Maximum number of SIP numbers: unlimited
- Maximum active on-air calls: 120
- Maximum on-air calls on one fader: 12
- One rack unit - 1.75"H x 19"W x 15.5"D (44 x 483 x 394 mm)

## Analog Inputs (with Telos Alliance xNode)

- Input Impedance: >40 k Ohms, balanced
- Nominal Level Range: Selectable, +4 dBu or -10dBv
- Input Headroom: 20 dB above nominal input

## Analog Outputs (with Telos Alliance xNode)

- Output Source Impedance: <50 Ohms balanced
- Output Load Impedance: 600 Ohms, minimum
- Nominal Output Level: +4 dBu
- Maximum Output Level: +24 dBu

## Digital Audio Inputs and Outputs

- Reference Level: +4 dBu (-20 dB FSD)
- Impedance: 110 Ohm, balanced (XLR)
- Signal Format: AES-3 (AES/EBU)
- AES-3 Input Compliance: 24-bit with selectable sample rate conversion, 32 kHz to 96kHz input sample rate capable
- AES-3 Output Compliance: 24-bit Digital Reference: Internal (network timebase) or external reference 48 kHz, +/- 2 ppm
- Internal Sampling Rate: 48 kHz
- Output Sample Rate: 44.1 kHz or 48 kHz
- A/D Conversions: 24-bit, Delta-Sigma, 256x oversampling
- D/A Conversions: 24-bit, Delta-Sigma, 256x oversampling
- Latency <3 ms, mic in to monitor out, including network and processor loop



## Frequency Response

- Any input to any output: +0.5 / -0.5 dB, 20 Hz to 20 kHz

## Dynamic Range

- Analog Input to Analog Output: 102 dB referenced to 0 dBFS, 105 dB "A" weighted to 0 dBFS
- Analog Input to Digital Output: 105 dB referenced to 0 dBFS
- Digital Input to Analog Output: 103 dB referenced to 0 dBFS, 106 dB "A" weighted
- Digital Input to Digital Output: 138 dB

## Total Harmonic Distortion + Noise

- Analog Input to Analog Output: <0.008%, 1 kHz, +18 dBu input, +18 dBu output
- Digital Input to Digital Output: <0.0003%, 1 kHz, -20 dBFS
- Digital Input to Analog Output: <0.005%, 1 kHz, -6 dBFS input, +18 dBu output

## Crosstalk Isolation, Stereo Separation, and CMRR

- Analog Line channel to channel isolation: 90 dB isolation minimum, 20 Hz to 20 kHz
- Analog Line Stereo separation: 85 dB isolation minimum, 20 Hz to 20 kHz
- Analog Line Input CMRR: >60 dB, 20 Hz to 20 kHz

## VX Enterprise

### IP/Ethernet Connections

- One 100/1000BASE-T Ethernet via RJ-45 LAN connection
- One 100/1000BASE-T Ethernet via RJ-45 WAN connection

### Processing Functions

- All processing is performed at 32-bit floating-point resolution
- Send AGC/limiter
- Send filter
- Gated Receive AGC
- Receive filter
- Receive dynamic EQ
- Ducker
- Sample rate converter
- Line Echo Canceller (hybrid)
- Acoustic Echo Canceller

## Power Supply AC Input

- Hot-swap capable dual-redundant internal auto-ranging power supplies. 90 – 132 / 187 – 264 VAC, 50Hz/60Hz. IEC receptacle, internal fuse.
- Power consumption: 150 Watts

## Operating Temperatures

- -10 degree C to +40 degree C, <90% humidity, no condensation

## Studio Audio Connections

- Via Livewire IP/Ethernet. Each selectable group and fixed line has a send and receive input/output
- Each studio has a Program-on-Hold input
- Each Acoustic Echo Canceller has two inputs (signal and reference) and one output
- Livewire+™ AES67 equipped studios may take and supply audio directly to/from the network. Telos Alliance xNodes are available for pro analog and AES3 breakout.
- VX Enterprise supports AES67 connectivity.

## Telco Connections

- Audio: standard RTP. Codecs: g.711μ-Law and A-Law, and G.722.
- Control: standard SIP Endpoint, ISDN PRI/T-1, ISDN BRI and POTS may be supported with the appropriate interfaces using an Asterisk Open source PBX.

## Regulatory

**North America:** FCC and CE tested and compliant, redundant power supplies are UL approved.

**Europe:** Complies with the European Union Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), as amended by Commission Decisions 2005/618/EC, 2005/717/ EC, 2005/747/EC (RoHS Directive), and WEEE.

# Telos VX<sup>®</sup> Duo Broadcast Phone System

## Delivering broadcast VoIP at a breakthrough price



## OVERVIEW

### Big performance in a small, silent, affordable package

For over a decade, Telos VX broadcast phone systems have been the industry standard for bringing phone calls into any broadcast facility. VX Duo brings the same audio performance and user experience you'll find in our flagship VX Enterprise system to a compact, completely silent platform. This makes VX Duo an ideal choice for home and project studios and stations where all equipment is located inside a control room. The affordability of VX Duo puts the legendary performance of Telos VX within reach of any budget.

### Duo is an expandable two hybrid/channel VX system

VX Duo comes with two hybrids/channels which can either be used for a single studio (two separate caller faders on the board) or split between two studios, such as an AM/FM combo, or a control room and production studio.

Need more channels? No problem! VX Duo is expandable in increments of 2 channels, making a 4, 6, or 8-channel system a simple matter of adding licenses as needed.

## AES67 Support

VX Duo includes support for Livewire+ AES67, giving broadcasters the flexibility to integrate it into any Livewire or AES67 facility.

## Pathfinder control and support

Build HTML5 control panels for VX Duo using our Axia Pathfinder Core Pro Broadcast Controller.

## Pure digital call-handling throughout

Unlike some other “VoIP” systems, there are no analog stages in VX Duo, ensuring you always get the highest possible call audio quality.

## FEATURES

- Delivers the same user experience and audio performance of our flagship phone system
- Comes with 2 channels/hybrids standard
- Expandable to a total of 8 channels/hybrids via additional 2 channel expansion licenses
- Includes smart AGC and our famous three-band adaptive digital dynamic EQ, a three-band adaptive spectral processor, and noise gating
- Includes wideband acoustic echo cancellation to eliminate feedback and allow natural conversations with callers when monitoring on open speakers
- Compact, fanless, and completely silent, allowing for in-studio installation
- Up to 3 units can be positioned side by side in a single rack space
- Works with all Telos VSet call controllers and VX-compatible call screening software

## IN-DEPTH

With a capacity for up to 8 channels (hybrids/faders), Telos VX Duo is an appliance-based system that is ideal for small- to medium-sized facilities.

- Base system is licensed for 2 channels, and can be expanded up to 8 channels total by adding additional 2 channel licenses
- Supports an unlimited number of SIP extensions
- Maximum simultaneous on-air calls: 96
- Maximum on-air calls that can be conferenced on one fader: 12

## VX System Components

VX Duo is a small form factor appliance with two gigabit Ethernet ports. It is completely silent, making it ideal for deployment inside studios.

You'll notice there are no audio I/O or telco ports on VX Duo itself. That's because all I/O is interfaced via Ethernet. The AoIP network supports a wide variety of Axia audio consoles, AES67 audio devices, Telos VSet phones, console-integrated call controllers, and more. VoIP services connect through a dedicated WAN interface, which can also accept connections from VSet phones, console call controllers, and more.

## No VoIP experience? No problem!

Telos now provides easy, step-by-step configuration instructions for high-quality cloud VoIP providers. These guides can help you get up and running quickly, and are available at <https://support.telosalliance.com/article/nx0wtz8xnm-configuring-vx-for-use-with-clearly-ip-clearly-cloud>

## SPECIFICATIONS

### Analog Inputs (with Telos Alliance xNode)

- Input Impedance: >40 k Ohms, balanced
- Nominal Level Range: Selectable, +4 dBu or -10dBv
- Input Headroom: 20 dB above nominal input

### Analog Outputs (with Telos Alliance xNode)

- Output Source Impedance: <50 Ohms balanced
- Output Load Impedance: 600 Ohms, minimum
- Nominal Output Level: +4 dBu
- Maximum Output Level: +24 dBu

### Digital Audio Inputs and Outputs (with Telos Alliance xNode)

- Reference Level: +4 dBu (-20 dB FSD)
- Impedance: 110 Ohm, balanced (XLR)
- Signal Format: AES-3 (AES/EBU)
- AES-3 Input Compliance: 24-bit with selectable sample rate conversion, 32 kHz to 96kHz input sample rate capable
- AES-3 Output Compliance: 24-bit Digital Reference: Internal (network timebase) or external reference 48 kHz, +/- 2 ppm
- Internal Sampling Rate: 48 kHz

- Output Sample Rate: 44.1 kHz or 48 kHz
- A/D Conversions: 24-bit, Delta-Sigma, 256x oversampling
- D/A Conversions: 24-bit, Delta-Sigma, 256x oversampling
- Latency <3 ms, mic in to monitor out, including network and processor loop

## Frequency Response (with Telos Alliance xNode)

- Any input to any output: +0.5 / -0.5 dB, 20 Hz to 20 kHz

## Dynamic Range (with Telos Alliance xNode)

- Analog Input to Analog Output: 102 dB referenced to 0 dBFS, 105 dB "A" weighted to 0 dB
- Analog Input to Digital Output: 105 dB referenced to 0 dBFS
- Digital Input to Analog Output: 103 dB referenced to 0 dBFS, 106 dB "A" weighted
- Digital Input to Digital Output: 138 dB

## Total Harmonic Distortion + Noise (with Telos Alliance xNode)

- Analog Input to Analog Output: <0.008%, 1 kHz, +18 dBu input, +18 dBu output
- Digital Input to Digital Output: <0.0003%, 1 kHz, -20 dBFS
- Digital Input to Analog Output: <0.005%, 1 kHz, -6 dBFS input, +18 dBu output

## Crosstalk Isolation, Stereo Separation, and CMRR (with Telos Alliance xNode)

- Analog Line channel to channel isolation: 90 dB isolation minimum, 20 Hz to 20 kHz
- Analog Line Stereo separation: 85 dB isolation minimum, 20 Hz to 20 kHz
- Analog Line Input CMRR: >60 dB, 20 Hz to 20 kHz

## IP/Ethernet Connections

- (1) Gigabit Ethernet via RJ-45 LAN connection (AoIP)
- (1) Gigabit Ethernet via RJ-45 WAN connection (VoIP)

## Processing Functions

- All processing is performed at 32-bit floating-point resolution
- Send AGC/limiter
- Send filter
- Gated receive AGC
- Receive filter

- Receive dynamic EQ
- Ducker
- Sample rate converter
- Acoustic Echo Cancellor

## Power Supply

- 100-240 VAC input 50-60 Hz external power supply with 12VDC, 3.33A output

## Operating Temperatures

- -10 degree C to +40 degree C, <90% humidity, no condensation

## Studio Audio Connections

- Via Livewire IP/Ethernet. Each channel (hybrid) has one input and one output
- Each studio has a Program-on-Hold input
- Each Acoustic Echo Cancellor has two inputs (signal and reference) and one output
- Livewire+™ AES67 equipped studios may take and supply audio directly to/from the network. Telos Alliance xNodes are available for analog and AES3 breakout.
- VX Duo supports AES67 connectivity. AES67 stream parameters:
  - (2) channels per stream, 1 ms packetization rate
  - Sample rate: 48 kHz
  - Payload type: 46
  - Source port: 5001
  - Destination port: configurable
  - Time to live (TTL): configurable (1-255)
  - IEEE 802.1p priority code point (PCP): configurable (0-7)
  - IEEE 802.1Q VLAN tag: configurable (0-4094)
  - DiffServ code point (DSCP): configurable (0-63)
  - Don't Frag (DF) bit: configurable (true/false)
  - Receive buffer size: configurable (2000-20000  $\mu$ s)
- VX supports PTPv2 (IEEE 1588-2008) clocking. Domain, sync interval, announce interval, announce timeout, and many other parameters are all configurable.

## Telco Connections

- Audio: standard RTP. Codecs: g.711 $\mu$ -Law and A-Law, and G.722
- Control: standard SIP endpoint. ISDN PRI/T-1, ISDN BRI, and POTS may be supported with the appropriate interfaces using an existing PBX or an Asterisk-based PBX optionally configured by Telos Alliance.

## Dimensions

- Compact desktop hardware platform
- 1.65" H x 5" W x 5" D (42 x 127 x 127 mm)

## Regulatory

- North America: FCC and CE tested and compliant, external power supply is UL approved
- Europe: Complies with the European Union Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), as amended by Commission Decisions 2005/618/EC, 2005/717/EC, 2005/747/EC (RoHS Directive), and WEEE.



# Telos® VXs

## Virtual VoIP System - Radio Application



## Legendary Telos Audio Quality

Using VoIP, VXs combines modern networking with the power of digital signal processing developed by Telos over the past three decades. Every call gets 5th-generation audio processing packed full of technology engineered to extract the cleanest, clearest caller audio from any phone line—even noisy cellular calls.

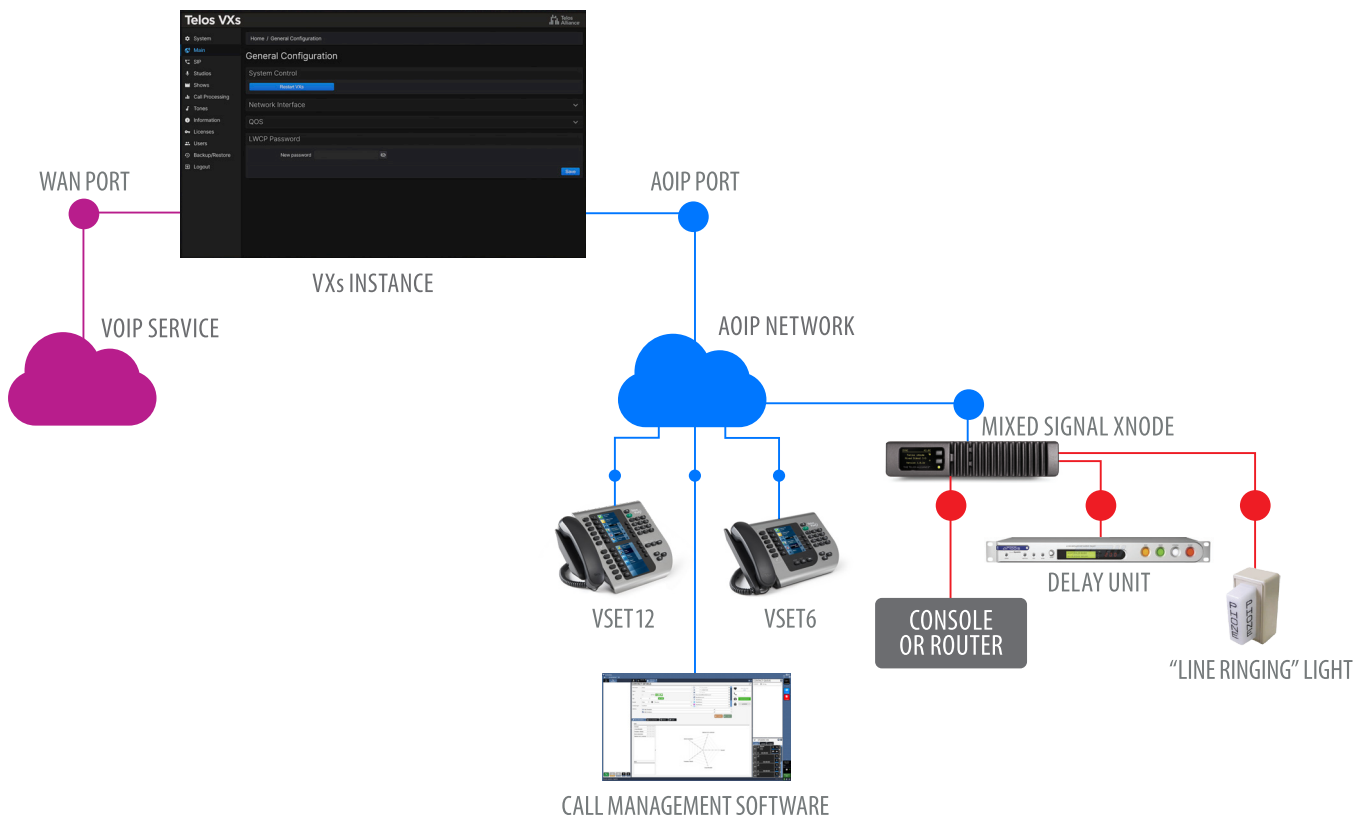
VXs includes Smart AGC coupled with our famous three-band adaptive Digital Dynamic EQ, a three-band adaptive spectral processor, and noise gating. Call-ducking and host override are part of the VXs toolkit as well. Users can conference multiple lines with superior clarity and fidelity. Send audio gets its own sweetening with an AGC, limiter, and Acoustic Echo Cancellation (AEC) technology that eliminates open-mic feedback.

And if you choose to use compatible telco services, calls from mobile handsets with SIP clients, HD capable telephone sets, and PC apps will benefit from VXs's native support of the G.722 codec, instantly improving caller speech quality.

## Standards-Based for Easy Connectivity

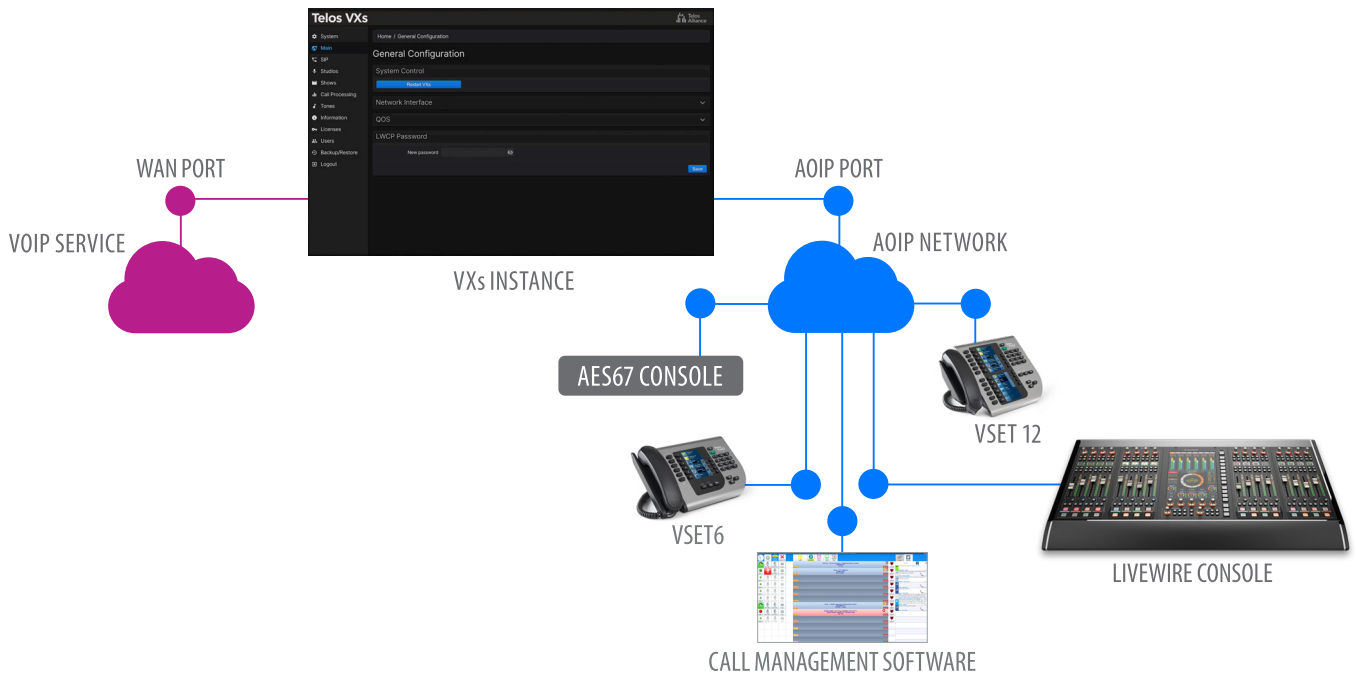
Telos VXs systems are “facility-wide” broadcast phone products. That means multiple studios, multiple stations, multiple shows—with minimal hardware requirements. Telco is delivered via IP from your SIP PBX, hosted VoIP service, or UCaaS provider. For carrier-grade reliability and redundancy, a dedicated SIP trunk circuit can be integrated via a Telos-configured Asterisk-based PBX; legacy circuits such as POTS, ISDN, or T1 can be integrated in the same way. Once connected, all telecom and audio connectivity flows via Ethernet.

## New-to-AoIP Installation



Don't have IP-Audio networking yet? VXs will work with all console brands, networked or not, using Telos Alliance xNodes and the VXs Call Controller drop-in controller for your console. xNodes, like the Telos Alliance Mixed Signal Node, break out audio into analog and digital formats, along with GPIO logic commands. The diagram above shows a typical studio with an analog mixer, using a Telos Alliance Mixed Signal xNode to connect to the console and other broadcast equipment.

## AoIP Installation



For those wanting the benefits of a virtual VoIP phone system but with the simplicity of pre-configured hardware, a single VXs system with up to four channels, four AES instances, and twelve lines can be pre-installed on the Telos Alliance AP-3000 platform.

Installing a VXs VoIP system in facilities already powered by Livewire+™ AES67 networks requires even less time and hardware. Your new VXs phone system will plug right in for seamless integration.

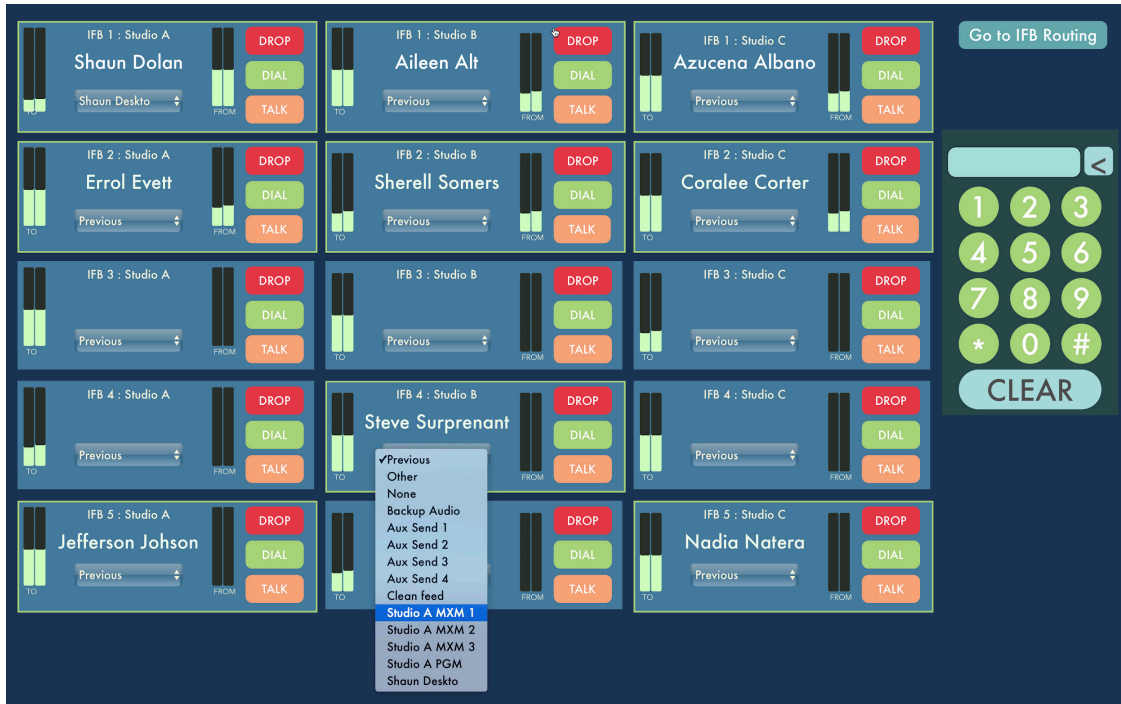
Additionally, support for AES67 gives broadcasters the capability of integrating VXs into any AES67 environment or compatible SMPTE 2110-30 environments. With plug-and-play connectivity, you can network multiple channels of audio with any manufacturer's AES67-compliant hardware. Support for SAP advertisement means VXs smoothly integrates alongside AES67-enabled Dante® devices.

## Call Management

When combined with call management software, producers and talent can screen and air calls from anywhere with a computer and a solid internet connection. Producers can identify repeat or unwanted callers and enter information about the call, such as topic and mood. This information is available to other production staff and talent in real-time. Various software options are available from Telos Alliance partners.

## Use with Axia® Pathfinder Core™ PRO

For more custom needs, Axia Pathfinder Core PRO can monitor, control, and display all aspects of your VXs system. This enables customized solutions such as drag-and-drop construction of custom control panels (pictured), timed Show changes based on studio schedules, or even API translation between third-party systems to display caller information or control lines. The possibilities are endless.



## TelosCare™ PLUS

We know that your VXs is just one piece of the telephony puzzle, which may include your VoIP provider, PBX vendor, IT team, network security team, and more. We love to leverage our combined centuries of telephony experience to serve as your trusted VoIP ninjas and help you complete and maintain your telephony puzzle for years to come. TelosCare PLUS gives you the one-stop service and support you need long after the sale, going far beyond basic support and troubleshooting with proactive, holistic service and membership perks.

## Features

- Includes support for AES67, giving broadcasters added flexibility of integrating VXs into any AES67 network and compatible SMPTE 2110-30 networks in addition to Livewire networks, plus support for SMPTE ST 2022-7.
- HTML-5 control via Pathfinder Core PRO.
- SIP call-handling throughout—no internal conversion to analog call handling like some other so-called “VoIP” systems.
- Works directly with hosted VoIP or PBX services, and in conjunction with a PBX may support POTS, T1/E1, and ISDN BRI for maximum flexibility and cost savings.\*
- Standards-based SIP interface integrates with all modern VoIP-based PBX systems to allow transfers, line-sharing, caller ID, and common telco services for business and studio phones.
- Standard Ethernet backbone provides a common transport path for both studio audio and telecom needs, resulting in cost savings and simplified studio infrastructure. Connection to hundreds of control devices (software or hardware) is possible.
- Each call receives a dedicated processing path for unmatched clarity and superior conferencing.
- Native Livewire integration: One connection integrates caller audio, program-on-hold, mix-minus, and logic directly into Axia AoIP consoles and networks.
- Connect VXs to any radio console or other broadcast equipment using available Telos Alliance AES/EBU, Mixed Signal, and GPIO xNodes. Audio interfaces feature 48 kHz sampling rate and studio-grade 24-bit A/D converters with 256x oversampling.
- Powerful dynamic line management enables instant reallocation of call-in lines to studios requiring increased capacity.
- VSet Call Controllers™ with full-color LCD displays and Telos Status Symbols™ present producers and talent with a rich graphical information display. Each VSet features its own address book and call log.
- The “Drop-in” VSet Call Controller™ modules can directly integrate VXs phone control into your mixing consoles.
- Clear, clean caller audio from 5th-generation Telos Adaptive Telephony technology, including Digital Dynamic EQ, AGC, adjustable caller ducking, and audio dynamics processing by Omnia®.
- Wideband acoustic echo cancellation eliminates open-speaker feedback.
- Support for the G.722 codec enables high-fidelity phone calls from iPhone and Android SIP softphones using a SIP server.

*\* Due to the wide variation in how traditional phone service can be delivered and the complexities involved in converting those services to SIP, we want to talk with you about your system design before you order. Telos has VXs System engineers standing by to help you draw up a configuration that will ensure your VXs purchase will perform to your expectations when using legacy telephony circuits.*

## Deployments

Broadcasters can deploy VXs on their servers in the rack room, on shared servers in the centralized data center, on the Telos Alliance AP-3000 hardware platform, or in cloud instances. These deployment options deliver the benefits of virtualization, such as easier facility-wide upgrades, cost-efficiency, and automated deployment without site visits. Broadcasters can scale VXs in size from a single studio to a facility-wide talkshow system to a multi-location system.

The system is built based on your specific needs by combining features as required: *Channels*, *Lines*, and *Acoustic Echo Cancellor* instances. These features combine into a license code, which can be active in one VXs instance at a time.

Features are tiered based on quantity to enable economic growth as overall system size increases. VXs features are available as a subscription, which includes the TelosCare PLUS while the subscription is active. VXs features are also available as a one-time buyout, with the TelosCare PLUS included for the first year and optionally renewable yearly after that. The VXs Bill of Material Generation Tool makes BOM generation easy. Please visit [TelosAlliance.com/VXs-bom](https://TelosAlliance.com/VXs-bom) to access this tool.

## Pre-Sales Configuration

Pre-sales configuration assistance with a Telos engineer is recommended before order placement. It's free and a great way to ensure the right system components are ordered, with a clear and workable system design. These calls are arranged through your Telos salesperson or dealer and can also include your IT and telecom professionals or vendors.

## VXs Specifications

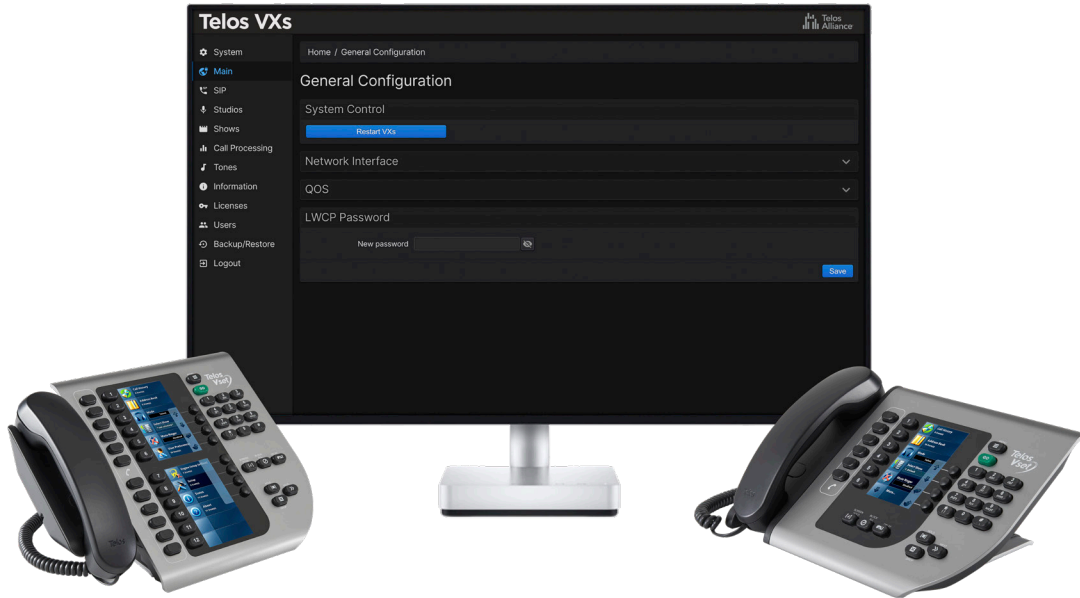
The first step to deploying VXs is ensuring you are using a compliant platform. A machine with the following specs can, at minimum, handle 64 simultaneous calls on-air, on handset, on hold, or any combination of the three:

Required	Item	Description
✓	≥ 3 GHz CPU	Four cores
✓	RAM	2 GB
✓	OCI Runtime	Container runtime, such as docker engine
✓	Internet	Used for product activation
✓	PTP4L	Additional container for time sync (or system time otherwise synced to PTP)
✓	Quay Account	Need to access VXs container

For those wanting the benefits of a virtual VoIP phone system but with the simplicity of pre-configured hardware, a single VXs system with up to four channels, four AES instances, and twelve lines can be pre-installed on the Telos Alliance AP-3000 platform. Telos Alliance is happy to consult with you on your system design to determine your specific use case's appropriate specifications.

# Telos® VXs

## Virtual VoIP System - TV Application



## Powerful, Adaptable VoIP for Live TV

Telos Alliance first introduced broadcasters to the benefits of VoIP a decade ago, with our first VoIP phone system, Telos VX®. VX replaced racks of phone couplers, contribution hybrids, and engineering coordination lines with a single hardware VoIP Engine. Now, Telos VXs is here to help broadcasters reap the benefits of true virtualization as they adapt to changing broadcast workflows, all while making it easier for remote teams to tap into production and engineering partylines.

From remote IFBs to audience call-ins, VXs can run anywhere from one or two lines in a small studio to the on-air phones for your entire plant, giving you incredible operational power, adaptable workflows, and superior audio quality.

Production facility design is evolving, moving away from dedicated hardware connected to centralized router frames to flexible SMPTE 2110 media networks with software-based workflows. VXs software can be deployed on shared servers in the centralized data center or in cloud instances. These deployment options enable the benefits of true virtualization, such as easier facility-wide upgrades, automated deployment, and more, without site visits. Broadcasters can scale VXs in size from a single contribution audio line to a facility-wide IFB system to a multi-facility system, meeting the exact needs and budget of the facility now, with the ability to upgrade at any time with no penalty.



For decades, phone-based IFB and comms have been neglected in video production facilities. Instead of treating these critical communication paths as invisible background connections, VXs allows these assets to be brought to the forefront for detailed monitoring and control via customizable Pathfinder HTML-5 user panels for applications such as OB Truck to HQ Comms.

## Standards-Based for Easy Connectivity

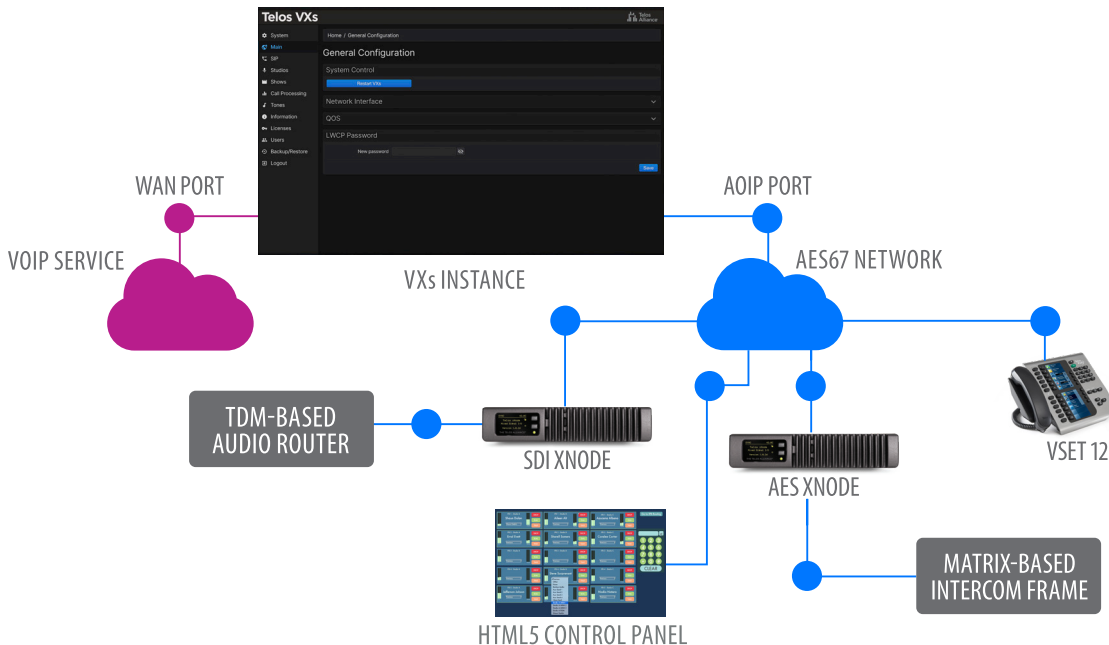
Support for SMPTE-2110 and AES67 environments brings a new level of compatibility and flexibility to VXs, allowing for direct integration with intercom systems, audio consoles, and other production systems over existing multicast media networks. Support for SAP advertisement means VXs smoothly integrates alongside AES67-enabled Dante® devices, as well.

When combined with the Telos Infinity® IP Intercom system, the drag-and-drop Infinity Dashboard interface allows remote IFBs and engineering coordination lines to be centrally configured, added to partylines and groups, and assigned to Infinity IP Intercom panels quickly.

For those without an IP media infrastructure, Telos Alliance AoIP Audio Nodes provide high-density AES3, SDI, and analog I/O to integrate with any console or intercom system now while providing an upgrade path to direct AoIP connectivity as your facility evolves in the future.

## New-to-AoIP Installation

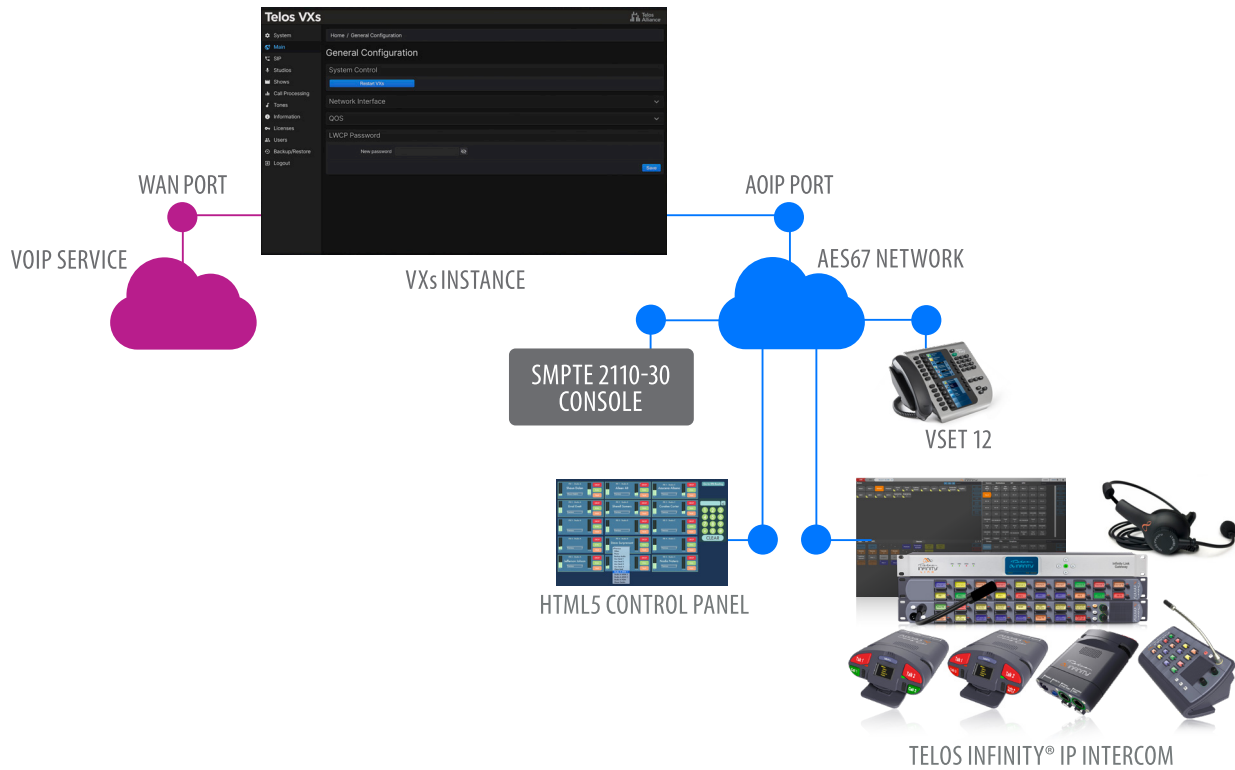
Don't have IP-Audio networking yet? VXs will work with all console and intercom brands, networked or not, using Telos Alliance Nodes with AES3, SDI, and analog I/O, as well as GPIO.



The diagram above shows an example system with a non-AoIP mixer and intercom system using a Telos Alliance AES xNode and SDI Node.

## AoIP Installation

Support for Livewire+™ AES67, AES67, and SMPTE 2110-30 environments brings a new level of compatibility and flexibility to VoIP systems. Support for AES67 gives broadcasters the capability of integrating VXs into any AES67 environment or compatible SMPTE 2110-30 environments. Support for SAP advertisement means VXs smoothly integrates alongside AES67-enabled Dante® devices.



The diagram above shows an example system consisting of a Livewire+ audio console and Telos Infinity® IP Intercom.

For those wanting the benefits of a virtual VoIP phone system but with the simplicity of pre-configured hardware, a single VXs system with up to four channels, four AES instances, and twelve lines can be pre-installed on the Telos Alliance AP-3000 platform.

## HTML-5 Control



When combined with Axia® Pathfinder™ Core PRO Broadcast Controller, you can create touchscreen-friendly custom HTML-5 panels to monitor and control every aspect of the VXs system from any web browser. Comms managers and producers can use panels to manage all the IFB, contribution, and tech coordination lines in the facility. Gone are the days of reporters calling in to the wrong IFB and missing their live shot. With an HTML-5 control panel, producers can see the status and caller ID of each IFB line and even have the ability to call the reporter directly.

## High-Performance Audio

Every call gets 5th-generation audio processing, packed full of technology engineered to extract the cleanest, clearest caller audio from any phone line—even noisy cellular calls. VXs makes TV talents' in-ear and comms feeds more intelligible as well. It includes Smart AGC coupled with Telos' three-band adaptive Digital Dynamic EQ, a three-band adaptive spectral processor, noise gating, and Acoustic Echo Cancellation.

HD voice calls will benefit from VX's native support of the G.722 codec, instantly improving speech quality.



We know that your VXs is just one piece of the telephony puzzle, which may include your VoIP provider, PBX vendor, IT team, network security team, and more. We love to leverage our combined centuries of telephony experience to serve as your trusted VoIP ninjas and help you complete and maintain your telephony puzzle for years to come. TelosCare™ PLUS gives you the one-stop service and support you need long after the sale, going far beyond basic support and troubleshooting with proactive, holistic service and membership perks.

## Deployment Options

Broadcasters can deploy VXs on their servers in the rack room, on shared servers in the centralized data center, on the Telos Alliance AP-3000 hardware platform, or in cloud instances. This enables the added benefits of true virtualization, such as easier facility-wide upgrades, automated deployment, and more, without site visits.

You can scale VXs in size from a single studio to a facility-wide IFB system to a multi-facility system. The system is built based on your specific needs by combining features as required: Channels, Lines, and Acoustic Echo Canceller instances. These features combine into a license code, which can be active in one VXs instance at a time.

Features are tiered based on quantity to enable economic growth as overall system size increases. VXs features are available as a subscription, which includes the TelosCare PLUS Customer Care while the subscription is active. VXs features are also available as a one-time buyout, with the TelosCare PLUS included for the first year and optionally renewable yearly after that. The VXs Bill of Material Generation Tool makes BOM generation easy. Please visit [TelosAlliance.com/vxs-bom](https://TelosAlliance.com/vxs-bom) to access this tool.

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# Telos VXs VoIP System for Television Features

- Provides unmatched call-handling capabilities for IFB, engineering coordination, and contribution audio.
- Scalable to serve a single control room, and entire production facility, or even multiple facilities simultaneously.
- Includes support for AES67, giving broadcasters added flexibility of integrating VXs into any AES67 network and compatible SMPTE 2110-30 networks in addition to Livewire networks, plus support for SMPTE ST 2022-7.
- HTML-5 control via Pathfinder Core PRO.
- SIP call-handling throughout—no internal conversion to analog call handling like some other so-called “VoIP” systems.
- Works directly with hosted VoIP or PBX services, and in conjunction with a PBX may support POTS, T1/E1, and ISDN BRI for maximum flexibility and cost savings.\*
- Standards-based SIP interface integrates with all modern VoIP-based PBX systems to allow transfers, line-sharing, caller ID, and common telco services for business and studio phones.
- Standard Ethernet backbone provides a common transport path for both studio audio and telecom needs, resulting in cost savings and simplified studio infrastructure. Connection to hundreds of control devices (software or hardware) is possible.
- Each call receives a dedicated processing path for unmatched clarity and superior conferencing.
- Native Livewire® integration: One connection integrates caller audio, program-on-hold, mix-minus, and logic directly into Axia® AoIP consoles and networks.
- Connect VXs to any console, intercom, or other broadcast equipment using available Telos Alliance AES/EBU, SDI, Mixed Signal, and GPIO nodes. Audio interfaces feature 48 kHz sampling rate and studio-grade 24-bit A/D converters with 256x oversampling.
- Powerful dynamic line management enables instant reallocation of call-in lines to studios requiring increased capacity.
- VSet Call Controllers™ with full-color LCD displays and Telos Status Symbols™ present producers and talent with a rich graphical information display. Each VSet features its own address book and call log.
- Clear, clean caller audio from 5th-generation Telos Adaptive Telephony technology, including Digital Dynamic EQ, AGC, adjustable caller ducking, and audio dynamics processing by Omnia®.
- Wideband acoustic echo cancellation eliminates open-speaker feedback.
- Support for the G.722 codec enables high-fidelity phone calls from iPhone and Android SIP softphones using a SIP server.

## Specifications

The first step to deploying VXs is ensuring you are using a compliant platform. A machine with the following specs can, at minimum, handle 64 simultaneous calls on-air, on handset, on hold, or any combination of the three:

Required	Item	Description
✓	≥ 3 GHz CPU	Four cores
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✓	PTP4L	Additional container for time sync (or system time otherwise synced to PTP)
✓	Quay Account	Need to access VXs container

For those wanting the benefits of a virtual VoIP phone system but with the simplicity of pre-configured hardware, a single VXs system with up to four channels, four AES instances, and twelve lines can be pre-installed on the Telos Alliance AP-3000 platform. Telos Alliance is happy to consult with you on your system design to determine your specific use case’s appropriate specifications.

# Telos® Hx1 & Hx2 Digital Hybrids

## POTS Phones Never Sounded So Good



## OVERVIEW

Telos® Hx1 one-line and Hx2 two-line POTS telephone hybrids are the most advanced hybrids ever developed for use with analog phone lines. Hx hybrids contain advanced 3rd-generation Telos hybrids for superior audio quality; universal POTS interface features disconnect-signal detection, which works with Telco providers worldwide. Hx hybrids include unique features to make operators' lives easier, such as Auto-Answer with selectable ring count, a switchable mic/line input, call screening and line-hold features, and front-panel send and receive audio metering. Audio sweetening tools include Telos Digital Dynamic EQ (DDEQ) and adjustable smart leveler, symmetrical wide-range AGC and noise gating by Omnia®, studio adaption and pitch shifter for use in open-speaker applications, and adjustable caller override.

## FEATURES

- Single (Hx1) or two-line (Hx2) capacity with standard analog I/O (1 each send and receive in/out for Hx1, 2 each for Hx2).
- Convenient switchable mic/line input.
- Our most advanced digital POTS hybrids ever, with DSP algorithms optimized for superior performance with today's wide variety of incoming call types.
- Front-panel send and receive audio metering.
- Telos DDEQ (Digital Dynamic EQ) and adjustable smart-level AGC ensure spectrally consistent audio from call to call — even on notoriously tough cellular callers.
- Excellent trans-hybrid loss of >55dB.
- Smooth, proven, symmetrical wide-range AGC by the audio processing experts at Omnia Audio.
- Studio adaptation and a subtle, inaudible pitch shifter to prevent feedback in open-speaker studio environments.
- Precision adjustable caller override.
- Analog I/O 24-bit A/D/A sample rate conversion, 20 dB headroom from +4 dBu nominal levels.
- Incredible dynamic range of > 92 db (analog in to analog out, studio loop mode, 10 hz – 20 khz A-weighted)
- Auto-Answer with selectable ring count and disconnect-signal detection.
- Call screening and line-hold features.



## IN DEPTH

### Take total control of your talk shows and call-in segments.

In the mid-1980s, Telos pioneered the very first digital adaptive telephone hybrid. Since then, our POTS phone hybrids have earned a worldwide reputation for extracting clean, clear caller audio from even the most difficult calls.

We've contributed plenty of improvements to POTS hybrid technology in the past 20 years, and the Telos Hx1 and Hx2 represent the highest state-of-the-art in hybrid performance. Advances in DSP have been pretty great as well. We've used every bit of knowledge gained to make Hx1 and Hx2 the best, most advanced POTS hybrids we've ever made, without much doubt.

Inside the single-hybrid Hx1 and dual-hybrid Hx2, you'll find Telos processing technologies that take the POTS hybrid to a new level of consistently superior performance, regardless of telephone line characteristics. This advanced hybrid technology brings new standard features that sweeten and control caller audio better than ever before; features you won't find in other POTS hybrids.

On the front panel, you'll find EQ Meters for each hybrid, to tell you exactly how much DDEQ is being applied. Next to those, separate Send and Receive level meters monitor each hybrid. There's also an animated line status display that visually indicates when a line is ringing in, on air, on hold or available. A complement of Take, Hold and Drop buttons complete the front-panel control set.



Around back (Hx2 rear panel shown above), you'll find a switchable mic/line input, balanced analog receive-out output, RJ ports for telco input and phoneset, input level adjustment, and a DB9 remote control connector with GPIO closures for hybrid control and status indicator lamps. Need digital I/O? No problem — Hx comes in an AES/EBU version with built-in sample-rate converter.

Hx1 and Hx2 are probably the most fully-featured POTS hybrids ever created, with Auto-Answer, caller disconnect detection, audio-leveling and anti-feedback routines for open-speaker applications, call screening and line-hold features, and much, much more. Audio processing tools include a new symmetrical wide-range AGC and noise gate by Omnia, with adjustable gain settings to help keep caller audio smooth and consistent from call to call. Adjustable caller override improves performance even further, and allows you to individualize the degree to which the announcer ducks the caller audio. Finally, our famous Digital Dynamic EQ, coupled with an adjustable smart leveler, keeps audio spectrally consistent from call to call.

# SPECIFICATIONS

## General

- Telos 3rd-generation Adaptive Digital Hybrid.
- Telos Exclusive Feedback Reduction Functions.
- Send-to-Caller Processing: High-pass Filter, Frequency Shifter, AGC/Limiter, Sample Rate Conversion (with AES option).
- Receive-From-Caller Processing: High-pass "Hum" Filter, Smart AGC / Platform Leveler, Noise Gate, Telos DDEQ (Digital Dynamic Equalization) 3-band Adaptive Spectral Processor, Sample Rate Conversion (with AES option)

## Analog Inputs:

- Send Analog Inputs: 1 for Hx1, 2 for Hx2 (one per hybrid)
- Connector : XLR Female, Pin 2 High (Active Balanced with RF Protection)
- Input Range: Selectable between MIC and LINE levels
- Line Input Level: Adjustable from -10dBV to +8 dBu (nominal)
- Analog Clip Point : +21 dBu
- Impedance: Bridging, > 50 Ohms
- Analog-to-Digital Converter Resolution: 24 bits

## Analog Outputs:

- Receive Analog Outputs: 1 for Hx1, 2 for Hx2 (one per hybrid)
- Connector: XLR Male, Pin 3 High (Active Balanced, RF suppressed)
- Output Level: Nominal +4 dBu, fixed
- Impedance: < 50 Ohms
- Digital-to-Analog Converter Resolution: 24 bits
- Headroom Before Clipping: 20 dB headroom above 4 dBu nominal levels

## Audio Performance

- Frequency Response: 200 to 3400 Hz, +/- 1 dB
- THD+N: < 0.5% THD+N using 1 KHz sine wave
- Dynamic Range: Analog in to Analog out, studio loop mode, 10Hz-20Khz. A-weighted: > 92 dB
- SNR: Analog output, referred to -12dBm phone line signal (+4dBu studio out), 10Hz-20Khz a-weighted: > 72 dB
- Trans-Hybrid Loss: Analog phone line with ducking, gate, AGC, EQ
- all OFF relative to +4dBu input level: >55 dB

## Analog Telephone Line Connectivity

- Universal interface for worldwide application. Programmable loop current, ring signaling, and flash time. Includes caller ID decoding using Bellcore 212 modem standard.

## Power Supply

- Type: Internal auto-ranging, 90–265 VAC auto-switching, 50–60 Hz.
- Power consumption: 100 Watts.

## Regulatory

**North America:** FCC and CE tested and compliant, power supply is UL approved.

**Europe:** Complies with the European Union Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), as amended by Commission Decisions 2005/618/EC, 2005/717/EC, 2005/747/EC (RoHS Directive), and WEEE.

# Omnia.11 FM and FM/HD

## Flagship Class FM Processing for the Most Competitive Broadcasters on the Planet



## OVERVIEW

Omnia.11 is available in FM+HD with separate processing paths for FM and HD/DRM or FM without HD/DRM. The FM-only model is upgradeable to FM/HD at a later date. Switchable Single Sideband Suppressed Carrier (SSBSC) technology for potential reduction of multipath is a standard feature. A front panel touch screen GUI, on a 10.5" diagonal screen, provides ease of use and enhanced metering and diagnostics. Remote access is available via any web browser. Livewire, AES/EBU digital and analog I/O are standard. Fanless cooling. Rugged 4 RU chassis.

Omnia.11s now ship with the G-Force™ Dynamics Engine standard. G-Force is also available as an optional Plug-In for Omnia.11 units already in the field. Designed by Frank Foti and Cornelius Gould, Omnia.11 with G-Force represents a significant update to Omnia.11's dynamics—so significant, in fact, that Omnia has updated the GUI to a vivid cobalt blue. It sounds even better than it looks thanks to a dynamics processing framework that enables the Omnia.11 to set the overall EQ for signature consistency, making it sound cleaner, clearer, louder, more consistent, more open, and more pleasing. You hear the music. You hear the voice. You don't hear the processor. Both FM+HD and FM-only models can be upgraded with the optional Perfect Declipper Plug-In, a revolutionary new algorithm that restores clipped areas in audio recordings. This algorithm not only restores dynamics, but removes distortion.

## FEATURES

### G-Force™ Dynamics Engine

The G-Force Plug-In (which ships standard on all new Omnia.11 units and can be added as an optional upgrade for existing units in the field) lets Omnia.11 handle rapidly changing, hyper-compressed source material better than ever with new, sophisticated improvements. The G-Force dynamics processing framework enables the Omnia.11 set the overall EQ for signature consistency, making it sound cleaner, clearer, louder, more consistent, more open, and more pleasing. You hear the music. You hear the voice. You don't hear the processor.

### "Pepino" Clipper

The latest FM final clipper from Frank Foti, custom-engineered to take G-Force Dynamics to the next level. Includes "Pepino Clipper Mode 2," which preserves brightness at aggressive clipping levels.

### Presets

Always updating, always evolving, Omnia engineers are constantly striving to provide new and powerful presets. From the best ears in the industry, find your custom sound easier than ever.

### Transient Detail Enhancer

In the dynamics section - smarter more powerful RMS control in the AGCs, producing stable solid increase in loudness to match the performance of Pepino.

### Solar Plexus

For deep, tight bass that you can feel!

### Unified FM/HD Bass Clipper

Improves audio consistency between the FM and HD channels and overall bass quality.

### 1 Louder

To gain that extra db of loudness.

## Intelligent Ultra-Multiband Limiter System

Self-adjusting attack/release functions guarantee crystal clear music and voice. The limiters are self-adapting and can tune themselves to the activity of the AGC section on the fly, providing more powerful and transparent limiter action than possible before. Makes adjustment of limiters a breeze!

## Bass Management

Manages harmonics for a natural and undistorted bottom end.

## Ultra LoIMD Distortion Controlled Clipper System

Dramatically reduces intermodulation distortion (IMD) for more loudness headroom.

## MPX Composite Baseband Over AES (Omnia Direct)

Output of the Omnia.11's stereo generator can be coupled directly to the modulator of the transmitter's exciter. This enables the exciter to modulate with more precision and clarity.

## Perfect Declipper Plug-In (Optional)

A revolutionary new algorithm to restore clipped segments and remove distortion in aggressively mastered audio recordings results in a clearer, more open texture that also gives more flexibility with processing choices. (Must be running v3.0 and G-Force.)

## SSBSC Technology

Omnia.11 Single Sideband Suppressed Carrier (SSBSC) technology may reduce multipath distortion.

## Extra Wide Touchscreen

10.5" diagonal screen clearly shows all controls.

## Looks Cool and Stays Cool

Military-grade, fanless industrial design stays cool with heatsinks in rugged chassis.

# IN DEPTH

## New G-Force™ Dynamics Engine

G-Force (which ships standard on new units and is available as an optional Plug-In to upgrade existing field units) has a highly refined density detection scheme, which means rock-solid performance across a wide range of recordings. Program adaptive attack, release, and ratio values let you set the characteristic elements of your signature sound and make audio acceleration and deceleration smoother than ever. A Makeup Threshold allows for gain management and control without sudden, audible swings. Additionally, AGC sections synchronize with program material. Multiband Limiters now self-adapt to the Multiband AGC activity and also feature program-controlled attack and release, actively reducing limiter-induced inter-mod distortion. Limiters are more responsive and active, yet remarkably transparent, even under extreme activity. G-Force requires v3.0, outlined below.

## Software Updates

The G-Force plug-in runs on Omnia.11 v3.0 or later. Included in this general system release are many improvements, including: Static RDS; the flexibility of analog, AES/EBU or Livewire patch points; patch point location for PPM® chains so you can integrate your Voltair/Encoder combo into your audio processing chain; patch point input and output meters for easy level references; upper subharmonic control of Solar Plexus over tonal balance; and compatibility with third party FM-HD time alignment systems.

Version 3.6 is also now available, which features many improvements over v3.0, including the New "Pepino" clipper now with two modes. G-Force processing improvements to take advantage of newly designed clipper. Improved high-frequency handling and more consistent bass response. "Transient Detail Enhancer" in the dynamics section with smarter more powerful RMS control in the AGCs, producing stable solid increase in loudness to match the performance of Pepino. Smoother switching between presets. Unified FM/HD Bass Clipper improves audio consistency between the FM & HD channels and overall bass quality. New Phat Bass update for richer stronger bass presence. Improved sound in the low-delay DJ section. Greatly improved HD look-ahead limiter in HD-enabled units. Warmer and cleaner live DJ voice.

The latest Omnia.11 software is available as a complimentary, downloadable field update at [TelosAlliance.com/omnia/omnia11](https://TelosAlliance.com/omnia/omnia11).

## The Perfect Declipper Plug-In Option

Just when you thought nothing could sound any better, G-Force-enabled Omnia.11s can be upgraded with the Perfect Declipper Plug-In. Engineered by audio-processing legend Hans van Zutphen, the Perfect Declipper uses a revolutionary new algorithm to replace clipped areas in audio recordings, restoring dynamics and removing distortion. You must be running v3.0 or later and G-Force to install the Perfect Declipper Plug-In.

## Intelligent Ultra-Multiband Limiter System

Traditional limiting technology has often resulted in various forms of audio corruption. Omnia.11's new LoIMD technology coupled with smart gain reduction algorithms now have limiters that sound amazingly transparent. All AGC and limiting algorithms employ an auto acceleration / deceleration mechanism, which tunes out perceptible intermodulation distortion. The attack/release functions adjust themselves based upon content density. This breakthrough method literally analyzes the audio content in both the amplitude and frequency domain, then adapts the timing networks—on the fly—to transparently control the signal, without the control being heard. The result is revealed in added detail, clarity, and quality, yet maintaining the desired competitive loudness level. Special attention was paid to the behavior of live voice quality. The improved performance of the AGC and limiter functions generate live voice clarity and impact far beyond that which was previously possible.

## Bass Management

The bass enhancement algorithm is a key feature of the Omnia.11. Low end is now broadcast with recording studio-like punch and impact, with no traditional side-effects whatsoever.

Omnia.11's exclusive bass-management method is a mixture of innovation, as well as a rearrangement of the system topology. Achieving great-sounding bass requires the most effort, partly due to the fact that the bass spectrum has the most number of harmonics, and all of these must be kept properly accounted for in the time domain. Also, any additional spectra created (enhancement) must have its harmonic content managed, or the bass region begins to sound distorted and unnatural. This process requires much more than just traditional EQ, bass clipping/filtering, or any ordinary attempt at bass enhancement. Even the location where the function is inserted matters, as well as how it maintains its frequency range along with the rest of the system. An entire dissertation could be done on the bass enhancement/management system alone. The classic Omnia dynamically flat & time aligned crossover system has been further refined to produce smooth, rich, and full tonality. The AGC and limiter sections cannot be fooled into false gain control due to spectral density (or lack thereof) from the crossover network.

G-Force takes this all to another level of greatness that allows broadcasters to adjust the Omnia.11's bass via a single knob. Advanced adjustment mode allows more precise bass sculpting, including Omnia's Solar Plexus bass enhancement feature. An intelligent active bass clipper system allows the full power of the new bass enhancement scheme to come through on the dial.



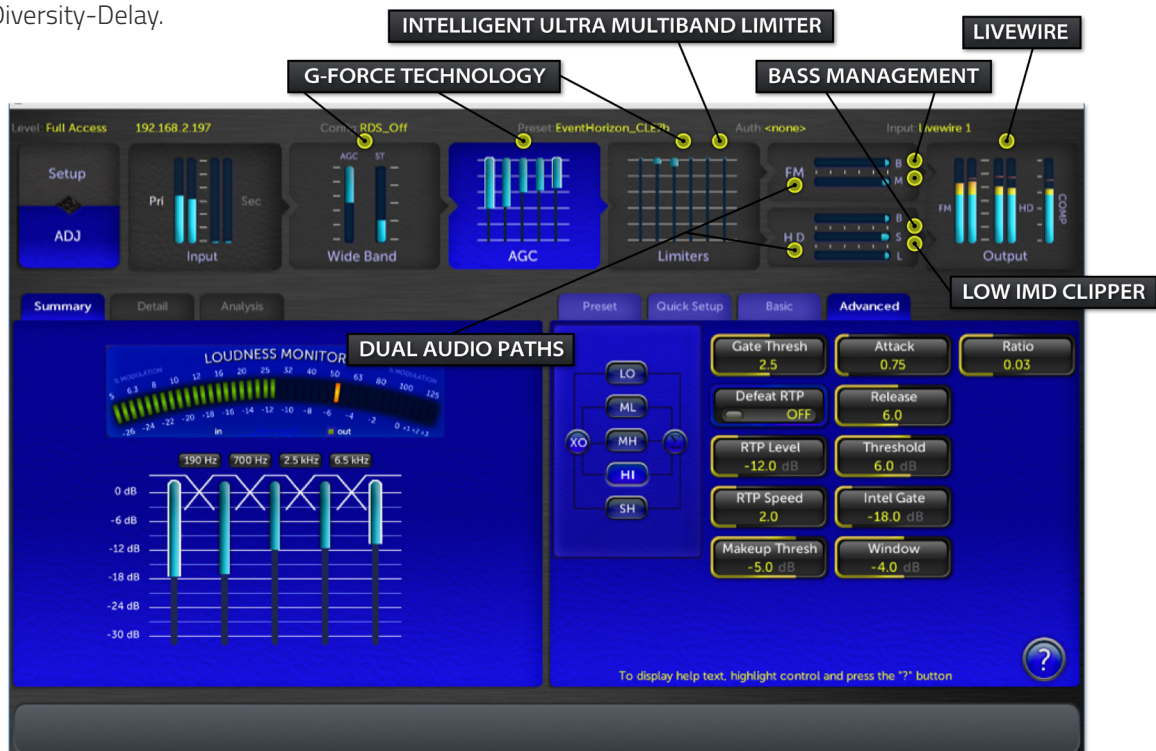
## Ultra LoIMD Distortion Controlled Clipper System

Audio processing for conventional broadcast (FM and AM) has, in some applications, reached extreme levels. Various methods are available today capable of creating LOUD competitive signals, but at the expense of perceptible quality. Through critical listening, extensive research, and evaluation of processing methods, it has been determined the single most annoying quotient is due to intermodulation distortion (IMD) induced by aggressive functions within the processing system. The algorithms are pushed to the limits, and beyond. One of the most crucial, aggressively used algorithms in the FM processor is the pre-emphasized final limiter/clipper. Omnia Engineering has developed the new Ultra LoIMD Distortion controlled clipper system specifically to reduce IMD in this critical stage of the processing.

For those who feel the need to use it, there's also a composite clipper embedded in the stereo generator. However, to date, all of our testing has been done without any composite clipping. Pilot protection is on the order of magnitude close to 90 dB, which is considerably more protection than necessary for even the best FM receiver. Integrated laboratory-grade stereo generator with dual MPX outputs, 19 kHz reference output for external RDS/RBDS systems and pilot protection that provides >80dB pilot protection—with or without composite clipping. MPX spectral low-pass filter protects RDS/RBDS and SCA signals if composite clipping is employed. There are multiple ways to adjust the system to achieve the exact sound you're looking for.

## Unprecedented Access

- A front panel touch screen GUI, on a 10.5" diagonal screen, provides ease of use and enhanced metering and diagnostics. Remote access is via any web browser.
- Livewire, AES/EBU digital and analog I/O is standard. Headphone soft "patch points" are available for listening through the processing chain.
- Diversity-Delay.



# SPECIFICATIONS

## General

- Non-linear Crosstalk: > -80 dB, main to sub or sub to main channel (referenced to 100% modulation).
- 38 kHz Suppression: > 70 dB (referenced to 100% modulation).
- 76 kHz Suppression: > 80 dB (referenced to 100% modulation).
- Pilot Protection: > -65 dB relative to 9% pilot injection,  $\pm 1$  kHz.
- 57 kHz (RDS/RBDS) Protection: better than -50 dB.
- Connectors: Two EMI suppressed female BNC, floating over chassis ground
- Maximum Load Capacitance: 5nF (at 10 ohms source impedance).
- Maximum cable length: 100 feet/30 meters RG-58A/U.

## Analog Audio Input

- Left/Right Stereo. Electronically balanced.
- Input impedance 10k ohms resistive.
- Maximum Input Level: +22 dBu.
- Nominal Input Level: +4dBu, which nets a -18dBFS input meterreading on a steady-state signal when the Input Gain controls are set to 0.0dB. Program material with a nominal average level (VU reading) of +4dBu will typically produce peak readings on the input meter in the range of -12 dBFS to -6dBFS. This is the correct operating level.

## A/D Conversion

- Crystal Semiconductor CS5361, 24 bit 128x over-sampled delta-sigma converter with linear-phase anti-aliasing filter. Pre-ADC anti-alias filter, with high-pass filter at <10 Hz.
- Connectors: Two, EMI-suppressed XLR-female. Pin 1 chassis ground, Pin 2 "Hot."

## Analog Audio Output

- Left/Right Stereo. Electronically balanced.
- Output Impedance 20 ohms.
- Minimum load Impedance: 600 ohms.
- Output Level adjustable from -2 dBu to +22dBu peak in 0.1dB steps.

## D/A Conversion

- Crystal Semiconductor CS4391, 24 bit, 128x oversampled.
- Connectors: Two, EMI-suppressed XLR-male. Pin 1 chassis ground, Pin 2 "Hot."

## Frequency Response

- Complies with the standard 50 or 75 microsecond pre-emphasis curve within  $\pm 0.5$  dB, 30 Hz to 15 kHz. The analog left/right output and AES/EBU Digital outputs can be configured for flat or pre-emphasized output.

## System Distortion

- Less than 0.01% THD, 20 Hz – 7.5 kHz. Second harmonic distortion above 7.5 kHz is not audible in the FM system.
- Signal-Noise Ratio: > -80 dB de-emphasized, 20 Hz – 15 kHz bandwidth, referenced to 100% modulation.
- The measured noise floor will depend upon the settings of the Input and Output Gain controls and is primarily governed by dynamic range of the Crystal Semiconductor CS5361 A/D Converter which is specified as >110 dB. The dynamic range of the internal digital signal processing chain is >144 dB.

## Stereo Separation

- Greater than 65 dB, 20 Hz – 15 kHz; 70 dB typical.

## Crosstalk

- > -70 dB, 20 Hz -- 15 kHz.

## System Latency

- 36-50ms dependant on processing and clipper selection through "FM" channel, as measured from the analog inputs through the composite MPX output.

## Composite Outputs

- Source Impedance: 5 ohms or 75 ohms, jumper-selectable. Single ended and floating over chassis ground. Output Level: 0V to 10V in 0.05V steps, software adjustable.

## D/A Conversion

- Texas Instruments/Burr Brown PCM1798, 24-bit sigma-delta converter.

## Configuration

- Two electrically independent outputs. Software based level adjustment.

## Load Impedance

- 50 ohms or greater load is suggested.

## Pilot Level

- Adjustable from 4.0% to 12.0% in 0.1% steps and OFF.

## Pilot Stability

- 19 kHz,  $\pm 0.5$  Hz.

## Signal-to-Noise Ratio

- -85 dB typical, 75  $\mu$ s de-emphasized, 15 kHz bandwidth, referenced to 100% modulation).

## Distortion

- < 0.02% THD 20 Hz – 15 kHz bandwidth, 75  $\mu$ s de-emphasized, referenced to 100% modulation.
- Stereo Separation: > 65 dB, 30 Hz – 15 kHz.
- Linear Crosstalk: > -80 dB, main to sub or sub to main channel, referenced to 100% modulation.

## Connector

- XLR-female, EMI-suppressed. Pin 1 chassis ground, Pin 2-3 transformer isolated, balanced, and floating. Standard AES3 specified balanced 110 ohm input impedance.

## External Sync Range

- Automatically accepts sample rates between 32kHz and 96kHz. Connector: XLR-female, EMI-suppressed. Pin 1 chassis ground, pins 2 and 3 transformer isolated, balanced, and floating – AES3 standard 110 ohm impedance.

## Remote Control

- Via Ethernet using built-in Java (TM) based remote control program integrated into web page interface. All software is served from the built-in web server to any standard web browser; there is nothing to install on the user's computer.

## Connectors

- Ethernet - Industry standard EMI-suppressed RJ-45 connector.

## GPI Interface

- Connector: EMI suppressed DB-15 female connector.

## Power Requirements

- Voltage: 100-250 VAC, 47-63 Hz, Typical: 65W RMS, Max: 90W RMS.

## Power Connector

- EMI suppressed IEC male. Detachable 3-wire power cords supplied for US and European use.

## Power Supply

- Internal. Overvoltage and short circuit protected.

## Digital Audio Input

- Configuration: Stereo per AES/EBU standard, CS8420 Digital Audio Transceiver with 24 bit resolution, software selection of stereo, mono from left, mono from right or mono from sum.
- Automatically accepts and locks to input sample rates between 30 and 108 kHz.
- Connector: XLR-female, EMI-suppressed. Pin 1 chassis ground, pins 2 and 3 transformer isolated, balanced, and floating – AES3 standard 110 ohm impedance.

## Digital Audio Output #1

- Stereo per AES3 standard. Output can be configured in software for flat or pre-emphasized response at 50 or 75 microseconds.
- Digital Sample Rates: Output sample rates software selectable for 48kHz, Sync to Input or Sync to External.
- Connector: XLR-male, EMI-suppressed. Pin 1 chassis ground, pins 2 and 3 transformer isolated, balanced, and floating. Standard AES3 specified 110 ohm source impedance.
- Digital Output Level: -22.0 to 0.0 dBFS software adjustable.

## Digital Audio Output #2:

- Stereo per AES3 standard. Output can be configured in software for flat pre-emphasized response at 50 or 75 microseconds.
- Digital Sample Rates: Output sample rates software selectable for 48kHz, 44.1kHz or Sync to External.
- Connector: XLR-male, EMI-suppressed. Pin 1 chassis ground, pins 2 and 3 transformer isolated, balanced, and floating. Standard AES3 specified 110 ohm source impedance.
- Digital Output Level: -22.0 to 0.0 dBFS software adjustable.

## External Sync Input:

- External Sync: Output sample rate can be synchronized to the signal present on the AES/EBU input, or to an AES3 signal applied to the Ext. Sync input connector. (Does not accept Word Clock Inputs)

## Regulatory

**North America:** FCC and CE tested and compliant, power supply is UL approved.

**Europe:** Complies with the European Union Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), as amended by Commission Decisions 2005/618/EC, 2005/717/EC, 2005/747/EC (RoHS Directive), and WEEE.

# Omnia.9

Top-of-the-Line FM or AM Processing. Optional HD-1, HD-2, HD-3 Processing and Streaming/Encoding, RDS. Also Available in Dual Path Model.



## OVERVIEW

Omnia.9 is the most powerful and flexible multi-transmission platform audio processor in the world. One Omnia.9 can be configured for FM/AM, dual FM, up to 3 DAB signals, and a separate streaming engine all in one 3RU chassis. With the clear, clean sound that the Omnia.9 is known for, this processor is the choice of stations from classical to hot CHR and everything in between. The newest MKII upgrade includes Livewire+ AES67 I/O, an even more advanced final clipper, and additional logging capabilities.

# FEATURES

## Exclusive “Undo” Technology

“Undo” is a two-step process that restores peaks and dynamic range to – and removes distortion from – source material that has been damaged by over-compression and clipping during the mastering process.

## Psychoacoustically Controlled Distortion-Masking Clipper

Omnia.9’s final FM clipper takes into account how the human ear hears and perceives distortion and uses that information to effectively mask it, leaving only clean, distortion-free audio on the air.

## Livewire + AES67

For even more flexible I/O.

## Omnia $\mu$ MPX Encoding

Omnia 9 is the the FIRST hardware processor to support this revolutionary codec. Full composite MPX over a 320kbps pipe.

## Kantar Watermarking

For our customers in France, support for Kantar watermarking.

## Omnia® Toolbox

Every Omnia.9 comes with a “toolbox” that includes loudness metering, a digital oscilloscope, an FFT spectrum analyzer, and real time analyzer (RTA) to help you adjust your processing and “see what you’re hearing”.

## Speaker Calibration

With the addition of a calibrated microphone, Omnia.9’s built-in real time analyzer (RTA), pink noise generator, and parametric equalizer can be used to calibrate any speaker system.

## Dry Voice Detector

The dry voice detector is a selectable feature that helps eliminate the audible distortion sometimes evident on bare voice (voice with no music mixed under it) when very aggressive processing settings are used.

## Remote Client

Omnia.9’s client software allows full remote control of the processor from any Windows-based PC or tablet, including touch screen devices, on the local network. The remote interface looks and functions just like the front panel screen.



## Auto Pilot

A selectable feature that automatically turns off the 19kHz stereo pilot when Omnia.9 detects that the source material is mono, and turns it back on when the input is determined to be stereo, automatically gaining a 20 dB increase in signal to noise during mono programming.

## Additional Features

- Multiband downward expansion (source noise reduction)
- 3-stage wideband AGC with adjustable sidechain equalization
- Phase Correction with Mono Bass reduces multipath distortion
- Supports Shoutcast 2 and lossless streaming. Integrated internal stream server
- Shared processing path for AM+HD units (allowing them to share a watermark encoder)
- Program-dependent multiband compression
- Multiband look-ahead limiting
- Selectable phase linear high pass filter, 15, 30 or 45 Hz
- Two-band final look-ahead limiting on digital paths
- 7 inch front panel touch screen
- Full remote control via included NFRremote software with client audio streaming for remote adjustment and monitoring. Also supports full remote control and monitoring via HTTP request
- On-screen keyboard with several layouts (QWERTY, QWERTZ, AZERTY, Dvorak and ABC sequential) for easy setup and preset name typing
- Selectable SSB (Single Sideband) stereo encoder
- HTTP push support for automation, such as RDS and streaming song titles, preset recall
- Studio Output with very low latency for talent monitoring
- Dual independent power supplies
- Composite pass-through (relay bypass) for your backup processor, with full analysis tools for external composite signals
- Internal patch point capability so you can optimize placement of your Voltair / PPM® encoder within your audio processing chain.

## IN DEPTH

### “Undo”

The first step of Undo is the de-clipper, which examines and recreates audio peaks that were clipped during mastering. The second step is a multi-band expander that creates dynamic range. Clean, well-recorded audio has always been able to withstand greater degrees of processing. This was true decades ago and it's still true (and more relevant than ever) today. An FM processor, by its very nature, compresses dynamic range and employs some form of clipping to deliver a “signature sound” and a competitively loud signal on the air. It is an unfortunate but well-accepted fact that recordings made in the past two decades have been on the decline in terms of quality, as mastering engineers seem to be waging their very own “loudness wars”. The result is source material that is hyper-compressed right out of the jewel case with only a dB or two of dynamic range at most. As if that weren't bad enough, the music is run through unsophisticated, brute-force clippers to make them louder still. The result is that the audio going INTO a processor today sounds more distorted than the audio coming OUT of an FM air chain 10 years ago! Before it even gets touched by the compressors, limiters, and clippers in the processor itself, it has been damaged. Rip a track from the modern CD of your choice and look at the waveform in your favorite editor if you need proof. Processors add more distortion still, and the resulting “music” heard on the air is nearly unlistenable. By repairing the damaged audio first, “Undo” gives Omnia.9 cleaner and more dynamic audio to work with, which can better stand up to the rigors of on-air processing. The result is a clean, dynamic, and listenable sound on the air. In fact, audio processed by Omnia.9 for FM often sounds far better than the original CD.

### Psychoacoustically Controlled Distortion-Masking Clipper

Clipping is typically the final stage of an FM processing chain. The majority of clipping is usually done in the final L/R audio, with additional, optional clipping available in the composite signal. The final clipper is also where the classic (and oft dreaded) “loud v. clean” tradeoff is made. When more clipping is used to gain loudness on the dial, clipper distortion becomes more and more pronounced. The clipped peaks fall back into the audio and manifest themselves as audible distortion.

There are ways to get around that problem, but they come at a price. You could back down on the clipper drive to clean up the sound, but then you lose loudness. Or, you could put more of the “heavy lifting” on the compressors and limiters preceding the clipper, but that results in an overly busy, dense sound that robs the music of life and causes listener fatigue. Some processors HAVE to resort to building excess density in the dynamics section because their simple or old-technology clippers simply aren't up to the job. The Omnia.9 identifies clipper distortion and uses a proprietary psychoacoustic-controlled algorithm in the composite signal to mask it, effectively eliminating it from the final audio. It is so robust that it boasts an additional 3dB of high-frequency headroom and is capable of 140% L/R modulation within 100% total modulation. That means Omnia.9 can be significantly cleaner for a given loudness level or substantially louder for a given level of quality. It comes closer to eliminating the “either/or” compromise than any other processor on the market today.

## Omnia Toolbox

When Leif Claesson was creating Omnia.9, he knew that having diagnostic and measurement tools would be necessary. The original plan was to keep them in place only for development, but he quickly realized that engineers would find great value in them as well, and decided to leave them in place. Audio processing is largely a “hearing” process, but there is much to be learned by seeing what your adjustments are doing to your sound as well. Some stations still have an oscilloscope on the test bench or a spectrum analyzer at the transmitter, but it’s not always convenient (or possible) to hook up a processor to them while it’s on the air.

Even if you did so, you’re pretty much limited to monitoring only the composite output of your own station’s processing. Omnia.9’s built-in solution means there’s no extra test equipment to buy (scopes and analyzers aren’t cheap) and no cables to hook up. It also means you can visually monitor the signal at the input, the output, and dozens of other points throughout the processing path so you can tell what’s happening to the audio every step of the way. As an added bonus, Omnia.9’s composite inputs can be fed from a calibrated tuner or frequency-agile mod monitor so that you can monitor the other signals in your market too!

In addition to these tools, Omnia.9 also includes RTA and speaker calibration tools to further assist with monitoring and fine-tuning your processing. While it is certainly good practice to listen to your station on a variety of radios and speakers as you adjust your processing, it is also good practice to have at least one set of calibrated speakers available. Otherwise, the changes you make to your processing will be influenced by listening to speakers that don’t accurately reflect the frequency response of your processing adjustments. By adding an inexpensive calibrated microphone and using the included pink noise generator and RTA, you can quickly and easily calibrate a set of speakers to use as a reference as you adjust your sound.

## Speaker Calibration

If you make decisions about your processing on uncalibrated monitors, you are making choices that are influenced by the differences in frequency response present in every speaker, not to mention the coloration imposed by the room in which you are listening. Simply put, you're dealing with subjective, not objective, information. By using the pink noise generator and RTA built into Omnia.9 and adding an inexpensive calibrated microphone, it is possible to calibrate any speaker system to deliver as flat a response as the speakers themselves will allow (small speakers still won't reproduce low frequencies as well as larger ones – the laws of physics still apply after all). With speaker and room influences removed from the equation, you are in a position to adjust your audio based only upon "the facts." When explaining this process to someone in person, this is the point in the conversation where they inevitably say, "But listeners aren't hearing my station on calibrated speakers! They're listening in their cars, at their computer, and through cheap ear buds, so I should too!" It's true – that's exactly how your listeners are hearing your station in the real world, and why it is always important to listen on a wide variety of radios in many different environments. But adjusting your processing this way is a shortcut to a lot of tail-chasing frustration and lousy audio. Let's say you listen first in an inexpensive compact car with a typical factory stereo. You notice there isn't much bass, so you adjust your processing to deliver more low end. It sounds good. Then you move into a high-end luxury car with 10 speakers and a subwoofer, and the bass is muddy, boomy, and overwhelming. Why? Because you adjusted the bass in the processor to make up for deficiencies you thought were in your processing, but in fact were in your speakers! Having at least one pair of high quality, calibrated speakers to go back to as your reference will dramatically improve your on-air sound, save you valuable time, and help preserve your sanity at the same time. (Don't worry – there are still plenty of people at your station to chip away at your mental well-being – we just don't want to be among them!).

## Dry Voice Detector

We know that the human voice can present a tough challenge to an FM processor. If it's bare voice – that is, voice alone with no music mixed underneath – any distortion created in the processing really stands out. We also know that all-out loudness comes at a price: At some point, you have to give up "clean" to get "loud." Even Omnia.9's psychoacoustically-controlled distortion-masking clipper, which really minimizes the dreaded "clean v. loud" tradeoff, can reveal some distortion on dry voice when the overall processing is set up to really push for loudness. So ensure clean voice quality in these situations, the dry voice detector first determines that the incoming audio is actually bare voice. It then automatically and inaudibly transfers more of the "heavy lifting" to the compressor and limiter sections, thereby reducing the amount of overall clipping needed to maintain the same level of loudness.

## Remote Client

Every modern processor provides some means by which to control it or adjust its settings remotely, which is handy if the processor is at a transmitter site miles (and often mountains) away from the studio. Most employ web-based interfaces, which on the surface sounds convenient because it allows you to remote in from a browser on any computer at any location, but even the best of them fall short when it comes to a great user experience. They require browser plug-ins, typically feel “laggy” when viewing meters or adjusting controls, and don’t always have the same look and feel as the front panel interface. Omnia.9’s client software delivers exactly the same experience whether you’re standing in front of the processor or controlling it from your PC or tablet. If you have Omnia.9’s on more than one station in your group (who can buy just one?) you can connect to any of them through a single connection window, and can run multiple remotes simultaneously.

Providing your connection has sufficient bandwidth, you can even stream audio from various patch points within the processing chain back to the client computer. This allows you to hear what effect your adjustments have on your audio in the environment of your choice instead of a rack room or transmitter building, locations which almost never have decent monitors but offer noise in abundance!

## Auto Pilot

The ability to transmit 2-channel source audio in FM stereo certainly has a sonic advantage, but it’s far from a “free ride”. The stereo pilot typically claims around 9% of total modulation; stereo signals are more susceptible to noise and multipath distortion than mono FM signals; and for a given RF level at the receiver, the signal-to-noise ratio of a stereo signal will be worse than that of a mono signal. Those are acceptable tradeoffs if you’re actually playing stereo music, but if your source material is mono (be it mono music or talk programming), it hardly seems fair to force those compromises upon your signal when there’s no reason to do so.

Thus, the Auto Pilot feature will automatically turn off the pilot (resulting in mono transmission) when the audio is mono, lowering the noise floor by 20dB and stopping multipath in its tracks when it is most audible.

# SPECIFICATIONS

## Frequency Response

- +/-0.5dB 20Hz to 15kHz, 17.5kHz in extended mode

## Signal to Noise Ratio

- Greater than -80dBu de-emphasized, 20Hz to 15kHz

## System Distortion

- Less than 0.01% THD below pre-emphasis, inaudible above

## Stereo Separation

- 65dB minimum, 20Hz to 15kHz, 70dB typical

## Digital Output Level

- Adjustable from -24.0dBFS to 0.0dBFS in 0.1dB increments

## Stereo Baseband Output

- Adjustable from -2dBu to +22dBu (0.1dB increments) into 600-Ohms, 20-Ohm output impedance

## A/D Conversion

- Crystal Semiconductor CS5361, 24 bit 128x over-sampled delta sigma converter with linear-phase anti-aliasing filter.
- Pre-ADC anti-alias filter, with high-pass filter at <10 Hz

## D/A Conversion

- Crystal Semiconductor CS4391, 24-bit, 128x oversampled

## External Sync Input

- Per AES11 Digital Audio Reference Signal (DARS), reference for digital output sample rate. Range is 32kHz to 96kHz.

## Analog I/O

- Two balanced, EMI filtered XLR connectors

## Stereo Generator Connections

- Four 75-Ohm BNC female, two inputs, two outputs
- (FM style only) AES/EBU In & External Sync

## Digital I/O

- AES/EBU via four XLR connectors for Main and Aux Digital programs (two stereo in, two stereo out)

## Ethernet

- Shared RJ45 supporting 100 and 1000BASE-T Ethernet connections

## Power Requirements

- 100-264 VAC, 47-63Hz autosensing, dual PSU

## Power Connector

- Dual IEC male, detachable 3-wire power cords supplied

## Power Supply

- Internal dual redundant, hot-swappable

## Dimensions and Weight:

- 3RU - 5"H x 19"W x 18"D (12.7 x 48.26 x 45.72 cm)
- Net weight: 28 lbs. (12.7006 kg)

## Environmental

- Operating: 0 to 50 degrees C
- Non-operating: -20 to 70 degrees C.

## Regulatory

**North America:** FCC and CE tested and compliant, power supply is UL approved.

**Europe:** Complies with the European Union Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), as amended by Commission Decisions 2005/618/EC, 2005/717/EC, 2005/747/EC (RoHS Directive), and WEEE.

# Omnia VOLT®

The 4-in-1 Processing Powerhouse with Audio Processing for FM, AM, SG, HD/DAB/DRM, or Studio Applications.



## OVERVIEW

Omnia VOLT offers “best in class” processing performance from the people who brought you the multiple-award-winning Omnia.11, the acclaimed Omnia.9, the power-packed Omnia 7, and the 13,000+ Omnia ONEs currently in service. With thousands of units on the air, VOLT gives you more sonic performance and processing power in one rack unit than others give you in three. Now with new Version 2.0, the best just got better!

### Here’s how:

With VOLT, we rewrote the rules for broadcast DSP, fine-tuning our algorithms and creating the world’s best-sounding, most powerful and versatile 1RU audio processor. The QuickTweak system helps users get just the sound they want quickly. You can get VOLT on the air and sounding great in minutes, select presets that we’ve designed for today’s stations and programming, and create a unique sonic personality with just a few nudges.

VOLT may be the most value-packed audio processor on the market, thanks to its DSP|Core firmware module system. This system means you can repurpose your VOLT to serve different needs by simply updating firmware. The capability to turn your FM VOLT into an AM unit or an HD/DAB or SG box comes built into every VOLT, and the fact that each DSP|Core firmware package is FREE is like getting four processors in one package. Modules include VOLT FM, VOLT AM, VOLT HD PRO, and VOLT SG. Each Core has a feature set that has been fine-tuned for its application, optimizing system DSP to the unique demands of different use cases.



**VOLT FM** - Killer Omnia FM sound featuring 6 AGC sections (5 multiband + wide-band), 5-band, time-aligned limiters, Dynamics Engine architecture, the latest low distortion clipper design by Frank Foti, and a high-quality composite stereo generator. Dozens of modern presets give you an awesome sound straight out of the box. Run studio side to feed your STL, or generate FM composite at the transmitter.

**VOLT AM** - Is specially designed for the challenges of AM radio. Versatile pre- and post-limiting equalization plus superior narrow and wide-band presets created for today's AM stations give you the cleanest and most powerful signal on the band. Asymmetrical Modulation and Tilt, applied after the clipper, help you get better performance even from older transmitters!

**VOLT HD PRO** - Is purpose-built for HD Radio, DRM, DAB, web streams, and other compressed media, as well as syndicated program and studio productions. Selectable bandwidths and crossover points, plus our exclusive Sensus algorithms, help reduce lossy compression artifacts even at low bitrates. Put it in your syndicated program production chain before the uplink: every episode will be clear, clean, and have a consistency listeners can recognize. Super-low latency for processed headphone monitoring applications. Use VOLT HD PRO as a general-purpose processor for, gain control, limiting, and program distribution.

**VOLT SG (Stereo Generator)** - For use in cases where you want to split your system between the main processor—usually at the station—and a dedicated MPX stereo generator with advanced composite features at the transmitter. VOLT SG can be paired with a VOLT FM, one of our other Omnia processors, or with any other processor from another manufacturer. VOLT SG uniquely features the same “One Louder” embedded pilot as the Omnia 11.

# FEATURES

## VOLT FM

- A new generation Frank Foti-designed Clipper for stronger on-air sound.
- Flexible Pre-Emphasis Switching. This makes it easy to fit VOLT into any existing FM airchain.
- Dual Variable Composite Outputs to feed a main and backup transmitter.
- Variable Pilot Level and Phase let you fine-tune the signal for transmission.
- Adjustable SCA input for additional services, including RDS and specialty networks.
- 19 kHz sync output to synchronize external generators.
- Bass Pre-Clipper - Fully adjustable with Tightness and Girth controls. You'll have strong, listener-pleasing bass without worrying about intermodulation distortion.
- Adjustable BS-412 Threshold and Processing for full compliance with ITU standards.
- BS-412 and Low Latency settings that can be turned on as needed.
- Automatic Mono "Dry Voice" Sensing - Ideal for FM Analog Stereo stations using extreme processing: it keeps an extra hand on the clipper, to stop distortion when the L+R channel gets boosted by mono signals.
- Low Latency FM mode - lets you fine-tune the tradeoffs between processor latency and ultra-high quality.
- Stereo Enhancement for FM Analog, without Adding Multipath - You'll get a wider, more exciting signal that jumps out of the radio.
- Optional expansion module to support Kantar watermarking
- MIB2 compliant SNMP support

## VOLT AM

- Extra equalization to control or enhance highs in two critical places, both before and after the multiband limiter.
- Wide and Narrow bandwidth options and presets to let you get the best combination of coverage and quality for your station's format.
- Crossover system is re-tuned for various narrow-band options so that all five bands of processing are used within the bandwidth constraints for maximum performance at all bandwidth settings.
- Adjustable Tilt to compensate for low-frequency 'droop' in older plate-modulated transmitters.
- Asymmetrical modulation for maximum AM power.
- Flexible Pre-Emphasis Switching on audio inputs and outputs. This makes it easy to fit VOLT into any existing AM airchain.

## VOLT HD PRO

- Sensus® Processing for Digital Program Streams - Omnia's exclusive Sensus algorithms predict how HD, DRM, DAB, or streaming data reduction will affect your sound. They precondition your signal, making digital compression sound better—even at low bitrates, actually reducing the distortion added by psychoacoustic compression schemes.
- Switchable bandwidths with eight choices between 4 kHz – 24 kHz. They reconfigure VOLT's multiband processing frequencies as well as limit high frequencies, to give you the cleanest signal for your distribution medium.
- Crossover system is re-tuned for various narrow-band options so that all five bands of processing are used within the bandwidth constraints for maximum performance at all bandwidth settings.
- Look-ahead wideband limiter in addition to five fully adjustable band limiters guard against quick transients that can add distortion.

## VOLT SG

- SSBSC support lets you select Single Sideband suppressed carrier for more multipath immunity, less noise, and more robust HD radio.
- "One Louder" technology embeds the stereo pilot directly into the composite signal. This frees up power, giving you a full decibel more loudness—effectively, 10% additional modulation—without exceeding legal limits.
- Flexible Composite Limiter can be calibrated to control overshoots from nonlinearities in your STL.
- Pilot Phase adjustment of  $\pm 32^\circ$ , compared to the 38 kHz suppressed carrier, to compensate for timing errors elsewhere in your system.
- Advanced single sideband suppressed carrier processing [SSBSC] - for reduced multipath and more robust HD transmission.

## FM, AM, and HD-Pro VOLT processors commonly feature:

- **Optimized Dynamics Engine and time-aligned crossover system** designed by our best Omnia engineers.
- **Six Separate AGC Sections** - Tunable midband crossover, one wideband, plus five separate time-aligned narrow band sections, each with separate controls for every important parameter give your station the loudness and consistent sound you want!
- **Five Separate Time-Aligned Limiter Sections** - each with separate Drive, Hold, Threshold, and Attack/ Decay controls. They give you protection against over-modulation while maintaining a loud signature sound.
- **QuickTweak™ Adjustment System** - lets you fine-tune your sound like a processing genius. Get exactly the processing you want in minutes, while you're on the air, right from the front panel or a connected computer or tablet.
- **Variable Deep Bass, Phat Bass, and Warmth enhancers** - Get that meaty Omnia sound, fine-tuned the way you want.

- **Clipper Silk Adjustment** - (FM & AM) If your format is prone to treble distortion, you can add just enough Silk to clean up those high frequencies.
- **Variable High-Pass and Switchable Phase Rotator** - Special processing in VOLT's input makes sure that ultra-low frequencies, too low to be perceived as bass by listeners, don't rob you of on-air power.
- **Totally Flexible Input / Output** - Use analog, AES/EBU digital, or Livewire® AoIP inputs; analog, AES/EBU digital, Livewire, or composite outputs (FM & SG only). Adjust channel balance and correct polarity separately on each input. Save and recall input/output setups for different applications. All outputs are always active, regardless of input type.
- **Switchable Insert Points for Voltair®, Watermark Encoders, or Other Downstream Encoding** - Optimize your airchain and eliminate the need for external pre-processing! You can feed encoders with a pre-processed signal from VOLT's multiband AGC and limiters, so your encoder sees a stronger, more reliable signal. Then feed the encoder's output back into VOLT for post-encoding clipping that protects you against overmodulation.
- **Automatic "Failover" signal switching** - Designate a backup input to use if your main signal drops out or STL fails. Switch to this source automatically, with adjustable sensitivity, or trigger it as needed.
- **Graphic User Interface** - is easy to navigate, but gives you the deep level of control you need.
- **Built-in HTML-5 Server** - for full control from any modern browser, tablet, or smartphone... without special plug-ins.
- **Rugged 1RU Construction** - fits any control room, technical center, or transmitter shack, with easy-to-see LED meters.
- **Cool Running, Fanless Operation** - VOLT can even be used near live mics.
- **Flexible Pre-Emphasis Switching** - makes it easy to fit VOLT into any airchain.
- **Built-In Tone Generator** - provides for quick setup and calibration.
- **Multiple Selectable Bandwidths for Digital Data Streams** - More than simple low-pass filters, HD Pro also modifies the VOLT's crossover to get the best results for any bitrate.

## IN DEPTH

### Nail Your Signature Sound Faster with QuickTweak™

Whether you are a processing novice or expert, Omnia VOLT gives you the tools to create a superior signature sound. Choose from some of the best factory presets available, designed by Omnia's processing experts, and by our favorite "insider" guest programmers. For those who want to push beyond stock presets, Omnia's new QuickTweak system lets you fine-tune your sound quickly. For experts, drill down into deeper parameter adjustments. Get exactly the processing you want, while you're on the air, whether you're at the front panel, or sitting in your car controlling VOLT over the web.

Nobody knows processing like Omnia. We've designed QuickTweak based on our decades of experience and market leadership, algorithmically linking complex and interactive parameters to create a core set of "meta" controls.

- QuickTweak is easy to understand: You can tune it by ear, and hear the results instantly.
- QuickTweak's six master controls allow millions of recallable variations, right from the front panel.
- You can use QuickTweak on the factory presets, or on your own custom presets.
- You can save your own settings after using QuickTweak to easily A/B compare preset modifications.
- Any preset can be adjusted with QuickTweak, or you can fine-tune using even deeper control layers. Presets can always be refined, then saved under a new title.
- Share presets by importing or exporting them with others in your company. Back-up preset files on common media.

## Total Versatility with DSP|Core Firmware

VOLT's DSP|Core firmware modules rearrange and modify VOLT as your needs change. DSP|Cores aren't extra cost add-ons! Download the functionality you need for free, install the DSP|Core firmware package from a connected computer, and reboot. It's that simple.

- Use VOLT for FM Analog Stereo at the station, with high-quality baseband clipping to feed uncompressed STLs, or at the transmitter, with dual composite outputs.
- Use VOLT for AM Broadcast, with purpose-built presets for the challenges of AM radio. VOLT's Tunable Asymmetrical Modulation and Tilt controls help you get modern results, even from older transmitters!
- Use VOLT for Studio and Program Production or Syndication. It comes with the tools and presets you need for modern production styles.
- Use VOLT for HD/DAB/DRM/Web Streaming. Our exclusive Sensus algorithms reduce compression artifacts even at low bitrates.
- Use VOLT as a standalone FM Stereo Generator at the transmitter for direct connection to transmitters.
- Use VOLT for low-latency FM Stereo to comply with local regulations, using a high-efficiency clipper that's optimized for this kind of broadcast.

## Front Panel



## Rear Panel



# SPECIFICATIONS

## Frequency Response

- User selection of flat, 50  $\mu$ s, or 75  $\mu$ s pre-emphasis curve within  $\pm 0.50$  dB, 30 Hz to 15 kHz.

## Signal-to-Noise Ratio

- Audio >95 dB analog, >120 dB digital I/O.

## System Distortion

- Less than 0.01% THD, 20 Hz – 7.5 kHz (second harmonic distortion above 7.5 kHz is not audible in the FM system).

## Latency

- 16ms nominal,  $\pm 0.5$ ms depending on IO selection. Low Latency FM version 10ms

## Input / Output

- Composite: Output impedance 75 $\Omega$ , single-ended and floating over chassis ground. BNC connectors with EMI suppression. Maximum cable 100' / 30M RG-58U.
- Output level: Separately adjustable for each of two outputs, 0V - 10V in 0.05V steps.
- Pilot Level: Adjustable from 4.0% to 12.0% in 0.1% steps and OFF. Pilot Stability: 19 kHz,  $\pm 0.5$  Hz. S/N: -85 dB typical, 75  $\mu$ S de-emphasized across 15 kHz, at 100% modulation Distortion: < 0.02% THD 20 Hz – 15 kHz, 75  $\mu$ S de-emphasized @ 100%.
- Stereo Separation: > 65 dB, 30 Hz – 15 kHz. Linear Crosstalk: > -80 dB, main to sub or sub to main channel @ 100%. Non-linear Crosstalk: > -80 dB, main to sub or sub to main @ 100%. 38 kHz Suppression: > 70 dB @ 100%. 76 kHz Suppression: > 80 dB @ 100%. Pilot Protection: > -65 dB relative to 9% pilot injection,  $\pm 1$  kHz. 57 kHz (RDS/RBDS) Protection: > -50 dB.

## Analog

- Left and Right Stereo on EMI-suppressed XLR-3, balanced with "pin 2 hot."
- Input: Electronic balanced, impedance 10k $\Omega$ , nominal +4 dBu, max +22 dBu.
- Output: Impedance 20 $\Omega$  for >600 $\Omega$  load, +4 dBu nominal, +22 dBu peak. Converters: 24 bit, 128x oversampled with linear-phase anti-aliasing filter.
- Crystal Semiconductor CS5361, 24-bit 128x over-sampled delta sigma converter with linear-phase anti-aliasing filter.
- Pre-ADC anti-alias filter, with high-pass filter at <10 Hz.
- Delta sigma converter with linear-phase and anti-aliasing filter.

## Digital

- Stereo per AES/EBU standard, 24-bit resolution. Input locks to any rate 32 kHz – 108 kHz. Output locks to input, internal 48 kHz, or separate external AES/EBU “digital black” reference 32 kHz – 96 kHz.

## Audio over IP

- LiveWire Audio and control over IP, on the same RJ-45 used for Ethernet control.

## Remote Control

- GPI: EMI suppressed DB-9 at logic levels, +5 V and ground supplied. Ethernet: 10/100BaseTX.
- Ethernet on EMI-suppressed RJ-45. TCP/IP control via HTML-5 internal web server, password protected. Manual addressing and port selection.

## SNMP

- MIB 2 compliant SNMP support for remote monitoring and control

## Electrical/Physical

- Power: 100 – 250 VAC, 47-63 Hz. < 40 VA. Typical draw 12W RMS, maximum 15W RMS. Internal supply with overVOLTage and short circuit protection. Meets EN55022, EN55011 Level B Conducted Emissions. EN61000-4-2, -3, -4, -5, -6 level 3 immunity compliant. Full international safety approval. CE marked. EMI suppressed IEC male connector. Detachable 3-wire power cords supplied for US and European use. Temperature: 32° to 122° F / 0° to 50° C for all operating VOLTage ranges.
- Humidity: 0-95% RH, non-condensing.
- Dimensions: 19" wide x 1.75" high x 16" deep (48.26cm x 13.335 cm x 40.64 cm) including connectors. Unit requires one EIA rack space for mounting.
- Shipping Weight: 12 lbs. / 5.5 kg

## Regulatory

- North America: FCC and CE tested and compliant, power supply is UL approved.
- Europe: Complies with the European Union Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), as amended by Commission Decisions 2005/618/EC, 2005/717/EC, 2005/747/EC (RoHS Directive), and WEEE.



# Omnia.9sg

## Your Processor's Secret Weapon



## OVERVIEW

### For split audio processing applications, no one does it better than the processor-agnostic 9sg!

We know that the main processor must be installed at either the studio or at the transmitter. Each location has its advantages and disadvantages. Placing a processor at the studio is often more convenient as some transmitter sites are difficult to access, but doing so can compromise quality and loudness as STL audio quality varies and the clippers found in other stereo generators are often mediocre at best. Some transmitters have built-in stereo generators but quality and features vary.

Placing the processor at the transmitter site allows the composite signal from the processor to be fed directly into the transmitter, which provides the best audio quality and the most loudness, but not all transmitter sites have adequate network connectivity for remote control and are often located in remote or difficult-to-access areas. This means making adjustments to the processing is often a challenge.

Split processing—placing the main processor at the studio and performing final stage limiting and stereo generation at the transmitter—can be an ideal, no-compromise solution with the Omnia 9sg.

The processor-agnostic Omnia.9sg was always more than just a stereo generator. With the latest software, this final-stage processor takes its next leap forward with a new clipper design, Livewire+ AES67, audio payout with internal processing for localization or backup, and more.

# FEATURES

- Full IP remote with remote audio streaming. Because transmitters are often located in hard-to-reach locations, full-featured remote access is critical.
- Optional RDS encoder supports UECP protocol, allowing each Omnia.9sg to be individually addressed to customize and localize RDS information.
- Built-in http server with push support for dynamic RDS data (with optional internal RDS encoder option).
- Selectable SSB (single sideband) stereo encoding makes SSB compatible with nearly all receivers.
- RF bandwidth controller reduces multipath distortion.
- ITU-R BS.412 power limiter for European countries.
- Auto Pilot turns off pilot for mono content, reducing noise, great for spoken word/news/talk/sports formats.
- Relay bypass including composite pass-through. Should Omnia.9sg fail or lose power, a backup standalone processor can be fed through it and be put on-air automatically and immediately.
- Built-in internal playback capability with processing. Should normal audio be lost, the built-in player in Omnia.9sg can immediately and automatically provide back-up content and audio processing until the problem is resolved.
- Optional local audio insertion allows each Omnia.9sg to interrupt normal program audio and insert local content such as traffic, weather, and geo-targeting advertising, with audio processing.
- “Omnia Toolbox” features including oscilloscope, FFT, and RTA, valuable signal-analysis tools built right into the product, eliminating the need for standalone engineering tools.
- Dual redundant power supplies. Back up if one supply fails. Each supply can be fed from a different electrical circuit; if one circuit fails, the unit stays on air.
- Two composite inputs, two composite outputs. A “hot” backup processor can be looped through the Omnia.9sg and be automatically and immediately placed on air should the 9sg fail or lose power; also makes it possible to use an external RDS encoder if desired.
- Built in stream receiver allows for a web stream to serve as an additional audio source
- Optional Kantar-certified watermarking support

## IN DEPTH

### New Clipper Design

Audio processing architect Hans van Zutphen designed the new clipper now featured in the Omnia.9sg. This psychoacoustically controlled distortion masking clipper is louder, cleaner, and more efficient. It takes into account how the human ear perceives distortion and uses that information to effectively mask it, leaving only clean, distortion-free audio on the air. The new clipper also uses less internal processing power from the CPU to get the job done faster, resulting in lower latency.

### Omnia.9sg Is Processor Agnostic

Omnia.9sg is processor agnostic, making the processor you love even more loveable. That is, it can be used to improve the audio quality and loudness of any station with any processor from any manufacturer. If a station can't afford a brand new top-of-the-line processor, or if they like the sound of the front end of their current processor but want better back-end performance, they can add a 9sg for less than half the cost of a new all-in-one box.

### No-Compromise Split Processing

We know that the main processor must be installed at either the studio or at the transmitter. Each location has its advantages and disadvantages. Placing a processor at the studio is often more convenient as some transmitter sites are difficult to access, but doing so can compromise quality and loudness as STL audio quality varies and the clippers found in other stereo generators are often mediocre at best. Some transmitters have built-in stereo generators but quality and features vary.

Placing the processor at the transmitter site allows the composite signal from the processor to be fed directly into the transmitter, which provides the best audio quality and the most loudness, but not all transmitter sites have adequate network connectivity for remote control and are often located in remote or difficult-to-access areas. This means making adjustments to the processing is often a challenge.

Split processing—placing the main processor at the studio and performing final stage limiting and stereo generation at the transmitter—can be an ideal, no-compromise solution with the Omnia 9sg.

## Multiple Transmitter Sites

Many FM broadcasters have their main transmitter at one tower site and their backup transmitter at another. A stereo generator is required at both transmitters, which often means two complete standalone processors. Installing an Omnia.9sg at each transmitter site allows a station to use the same main processor at the studio to feed both sites, which represents a potential cost savings and consistent processing between the main and auxiliary sites. This applies to applications where a common STL is shared between the sites or when individual STLs are used.

In Europe, it is common for a national broadcaster to work from a single studio location and have dozens or even hundreds of transmitter sites located throughout the country. The appeal of having one main processor at the studio and an Omnia.9sg at each transmitter site works brilliantly on this larger scale as well.

When configured with the local audio insertion option, these national broadcasters can also interrupt network content and insert localized content at each transmitter site such as local traffic, weather, or geo-targeted advertising.

## Internal Playback with Processing

Omnia.9sg can now store audio on its SSD for internal file playback. The playback system can be used as a backup source in case something upstream in the chain fails (STL, studio, playback automation system), or for the insertion of local ads, IDs, weather, etc. To support local playout at the transmitter, Omnia.9sg includes a highly capable built-in 4-band processor of its own. Based upon the dynamics processing found in Omnia.7 and Omnia.9, it includes over 20 newly created presets designed specifically to work with Omnia.9sg's clipper.

Optionally, this internal processing can be licensed to process auxiliary input streams, turning your 9SG into a fully functional backup processor.

## Ratings Encoder & Enhancement Applications

Research shows that ratings encoders and/or enhancement devices such as Voltair benefit from being fed processed audio. Some processors have special "insert points" that make this possible internally, but many do not. Placing the main processor and the encoder at the studio and using Omnia.9sg at the transmitter can help facilitate this.

# SPECIFICATIONS

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## Frequency Response:

+/- .5 dB 20 Hz to 15 kHz

## Signal-Noise Ratio:

Greater than -80 dBu de-emphasized, 20 Hz to 15 kHz

## Stereo Separation:

65 dB minimum, 20 Hz to 15 kHz, 70 dB typical

## Stereo Baseband Output:

Adjustable from -2 dBu to +22 dBu (0.1 dB increments) into 600-Ohms, 20-Ohm output impedance

## AoIP Networking

Livewire+ AES67 Compatible

## Analog Inputs:

Two balanced, EMI filtered XLR connectors

## Digital Inputs:

AES/EBU In & External Sync

## Composite I/O:

Four 75-Ohm BNC female, two inputs, two outputs

## Remote Control:

RJ45 supporting 100BASE-T Ethernet connections

## Power Requirements:

100-264 VAC, 47-63Hz autosensing, dual PSU

## Power Connector:

Dual IEC male, detachable 3-wire power cords supplied

## Environmental:

Operating: 0 to 50 degrees C

Non-Operating: -20 to 70 degrees C

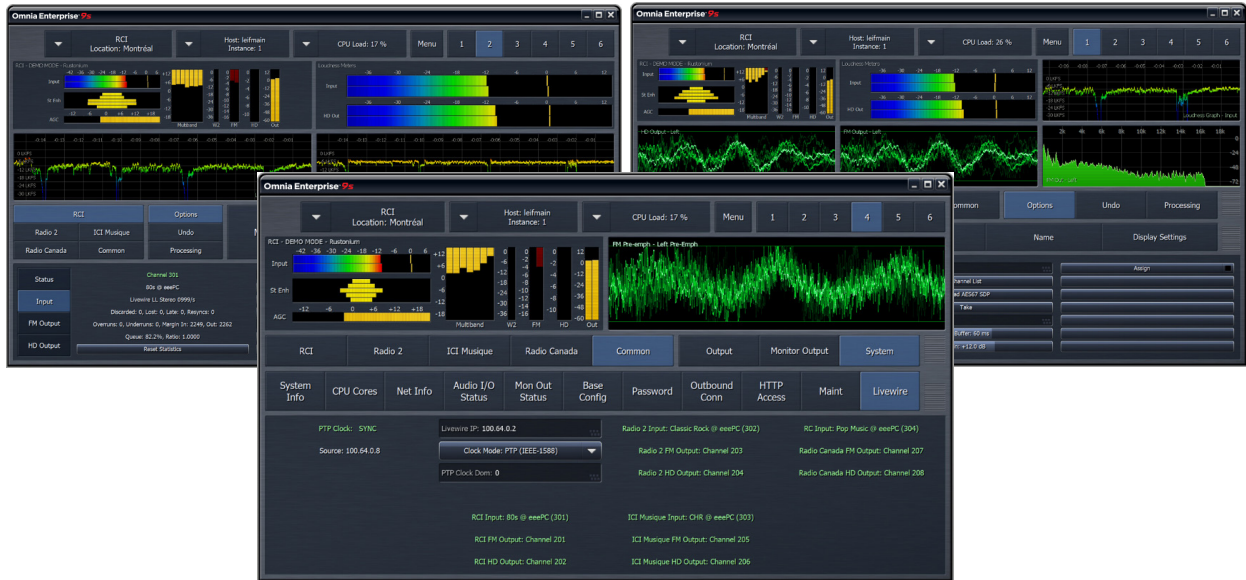
## Regulatory

**North America:** FCC and CE tested and compliant, power supply is UL approved.

**Europe:** Complies with the European Union Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), as amended by Commission Decisions 2005/618/EC, 2005/717/EC, 2005/747/EC (RoHS Directive), and WEEE.

# Omnia Enterprise™ 9s

## High-Density Audio Processing Software



## OVERVIEW

### Omnia Enterprise 9s Audio Processing Software Overview

Omnia Enterprise 9s is a software-based audio processing solution for Windows designed for broadcasters whose needs are best served by a server-based virtualized application. Whether for AM, FM, HD/DAB, streaming audio, or any combination thereof, customers with a large volume of signals and diverse audio processing needs - or those who can simply benefit from the advantages of a virtualized approach to processing - will find E9s an ideal approach.

#### Scalable, Customizable, Centralized

Enterprise 9s carries forward the proven features and sound of the legendary Omnia.9 hardware processor into a software-only, high-density solution valued by today's leading broadcasters. Each system can be configured for AM, FM, HD, and streaming endpoints to suit your needs today and scale up as you grow and your requirements change - including the ability to quickly add channels for special events or seasonal programming.

As an FM processor, E9s allows for centralized processing at your network operation center for distribution to one or more transmitter sites, outputting either a pre-emphasized, peak-limited L/R audio signal or a full complete composite signal using  $\mu$ MPX, which can be decoded at the transmitter site by the Omnia MPX node.

## Complete Control of Your Virtual Airchain

Each stereo program instance (referred to as a "station") is separately licensed and assigned its own audio processing engine. The base processing license comes in two different models.

The FM version includes a single audio input ("station"), one FM processing core (which includes a L/R peak-limited pre-emphasized output plus two  $\mu$ MPX outputs, including RDS with UECP support), one AM processing core, and one stereo L/R processing core for HD, DAB, or streaming, including streaming encoders.

The HD/DAB/Streaming version includes a single audio input ("station") and one stereo processing core for HD-2/3/4, DAB, and other L/R outputs, plus streaming encoders. HD/DAB/Streaming versions can be field-upgraded to FM with a license key.

Processing for each station can be uniquely tailored to suit the program material, audience, and delivery method. Enterprise 9s includes a wide variety of factory presets, which can be used as-is or serve as starting points for custom user presets. The "Basic" adjustment mode greatly simplifies dialing in the desired sound by combining multiple processing parameters into a handful of controls, while "Intermediate" and "Expert" modes provide access to every available individual control where a high degree of customization is needed.

Nielsen and Kantar audience measurement watermarking are optionally available for each station. Additional processing instances and options can be added at any time by purchasing the appropriate license key.

## FEATURES

### Omnia Enterprise 9s Audio Processing Software Features

Both base processor types include:

- "Undo," a two-stage process that consists of a declipper paired with a multiband expander. This unique combination removes distortion and restores dynamic range to source material damaged by clipping and excessive compression during mastering.
- Unrivaled control over processing, featuring basic, intermediate, and expert adjustment levels
- Input conditioner and input AGC
- 2 to 7 band processing, adjustable for each Station instance, including
  - Wideband AGC
  - Deep bass, Solar Plexus, and Stereo Enhancement
  - Multiband AGC, Expansion & look-ahead limiting
  - Dry Voice detection
- Proven, portable factory presets, created by some of the best ears in the business, and shareable between E9s, your Omnia.9 hardware unit, Z/IPStream instance, or Omnia Tools file-based processing



- Stream encoding, including MP2, MP3, AAC, HE-AAC, FLAC encoders
- Metadata support over HTTP
- Internal file recorder
- Flexible monitoring outputs to listen to any patch point in the air chain

AM/FM processor licensing includes all the above, plus:

- Pre-emphasized final output with adjustable Low Pass filtering
- Stereo Generator with Auto Pilot
- L/R and MPX clipper
- Diversity delay to align FM & HD-1 outputs
- $\mu$ MPX Encoding
- Embedded RDS encoding with UECP support
- AM processing core with custom AM presets

## IN-DEPTH TAB

### Omnia Enterprise 9s Audio Processing Software In-Depth

#### Flexible AoIP Routing

Each LW+ AES67 source available on the AoIP network is selectable from a Channel List and can be routed to the input of any Station for processing. Processed instances can be output to multiple parallel endpoints.

#### Livewire+™ AES67 and SMPTE ST 2110

Telos created its original Livewire AoIP technology in 2001, then we drove the creation of the AES67 standard by initiating the proposal of the standards project to the Audio Engineering Society in 2008, and contributing our intellectual property to the effort.

Whereas AES67 strictly focuses on the audio stream format and clocking, Livewire+ can be thought of as a more complete network-based digital ecosystem for creating a “facility over IP” model that includes control, advertising, discovery, and GPIO contact closures.

Omnia Enterprise 9s implements SMPTE ST 2110 IS-04 and IS-05 protocols for discovery and control as well as ST2022-7 for redundant stream support.

#### Stream Receiver Support

Primary and Secondary Input streams can serve as backup or primary audio sources for any Station input.

## Customized Displays

The unique “NfRemote” software client runs on any Windows computer and provides access to all systems, I/O, and processing parameters anywhere a network connection is available. Multiple users can connect to the same processor at the same time, and a single user can connect to more than one processor simultaneously, making remote management of multiple program paths comprehensive and efficient.

NfRemote also features a highly customizable display to facilitate setup and processing adjustment, including I/O levels, processing activity, LUFS loudness readings and graphs, and signal-specific analysis from various patchpoints using tools such as a digital oscilloscope, FFT spectrum analyzer, and audio frequency RTA (real-time analyzer). Up to six unique display pages can be built for each processing engine.

The patchpoints in each display can also be aurally monitored. Whether you want to listen to a raw input, a mid-stage processed signal, or isolate the signal feeding the final limiter, these flexible monitor points provide unrivaled oversight, measurement, and monitoring of your signal chain.

## Additional Configuration and Control

All functions included in the NfRemote app are also available through the HTTP-based API. E9s also supports Ember+ capability as well as IS-05.D and MIB II SNMP.

## Watermarking Options

Omnia Enterprise 9s integrates watermarking SDKs from Kantar and Nielsen, the giants of the audience measurement world. Separate codes can be added to each Station instance, providing complete flexibility in watermarking management.

## Flexible Licensing Support

Whether you run an air-gapped facility or have a persistent Internet connection, Omnia E9s has you covered with flexible methods for license validation

## Preset Sharing

Custom presets, which are often painstakingly developed and curated over time, make up the “signature sound” of any processor. For the thousands of broadcasters who have invested in Omnia.9, these “crown jewels” are portable between the different deployments in the Omnia.9 family. For instance, presets developed on an Omnia.9 hardware unit can be copied and used in Enterprise 9s, utilized for file-based processing with OmniaTools, or employed by the Telos Z/IPStream X/20 and R/20 platforms using Omnia.9 processing. This portability and sonic consistency provide an unparalleled return on investment among different Omnia.9-based deployments.

## Changes As Your Needs Change

With Enterprise 9s and the suite of Telos Alliance customized software solutions, installation, deployment, and software updates across your network have never been easier or faster, especially compared to making such changes in a traditional hardware-based ecosystem. As you outgrow your server’s capability or upgrade server units, licenses can be transferred to new hardware at a fraction of the cost of upgrading appliance hardware across your network.

# Omnia® Forza

## Audio Processing Software



## OVERVIEW



Omnia Forza breathes new life into the traditional five-band processor design, featuring all-new AGCs and multiband limiters. As a software processor, Forza is delivered via a Docker container that can be deployed on-premises on a COTS (commercial off-the-shelf) server or cloud-hosted.

The use of expertly crafted launch point presets and an intuitive yet powerful user interface based on “smart controls” seamlessly maintains harmony between under-the-hood controls and settings. This integrated control design means anyone can drive Forza with confidence, and ensures instant sonic excellence for listeners. More advanced users will find the tools they need to craft their unique signature sound.

Forza is an AoIP-native processor utilizing Livewire+AES67 standards, and built for server-based, scalable facility designs embraced by forward-thinking professionals. Forza comes in two base versions, covering every broadcast scenario and workflow. For those wanting the benefits of a virtualized software processor but with the simplicity of pre-configured hardware, up to two instances of Forza FM processing with  $\mu$ MPX can be pre-installed on the Telos Alliance AP-3000 platform.

## Forza HDS

Forza HDS is specifically designed for L/R audio applications like HD-2/3/4, DAB, and streaming. It provides a consistent and polished audio signature without sounding overly processed. An integrated, target-driven ITU-R BS.1770 loudness controller makes conforming to emerging streaming loudness requirements a set-and-forget process. For those wanting the benefits of a virtualized software processor but with the simplicity of pre-configured hardware, up to four instances of Forza HDS processing can be pre-installed on the Telos Alliance AP-3000 platform.

## Forza FM

Forza FM builds upon the foundation of the HDS (HD/DAB/Streaming) version by adding features necessary for FM broadcast applications, including HD-1/DAB. The Frank Foti-designed Silvio FM clipper from Omnia.11 delivers the powerful on-air sound users have come to expect from Omnia processors. A built-in diversity delay is included to time-align the FM signal to the HD-1 output. The integrated stereo generator includes RDS, and outputs include FM composite over IP and  $\mu$ MPX.

## FEATURES

- Legendary Omnia audio quality
- Wideband AGC, 5 bands of multiband AGC, 5 bands of multiband limiting, plus soft and hard bass clippers
- Stereo enhancer
- Comprehensive bass management controls
- Dual AoIP inputs for mixing two sources or for automatic failover switching (Forza HDS)
- LUFS target-driven ITU-R BS.1770 loudness controller and True Peak limiter for compliance with streaming platform requirements (Forza HDS)
- Frank Foti-designed Silvio FM clipper and stereo generator with integrated RDS (Forza FM)
- FM/HD-1 diversity delay (Forza FM)
- Omnia's highly regarded Sensus® conditioning for low bitrate streams and HD Radio
- Carefully crafted Omnia presets ensure great-sounding audio on all types of formats and programs
- "Smart Controls" combine the adjustment of multiple, interrelated parameters into a single knob or slider
- Innovative single-page GUI welcomes less-experienced users while still providing the tools processing experts expect and need
- Browser-based HTML5 UI works on any device, including Windows and MacOS computers and Android and iOS smartphones and tablets
- Optional Kantar and Nielsen watermarking

## OMNIA FORZA IN DEPTH

Audio processing software isn't a new idea, nor is it a totally new concept for Telos Alliance. But historically, software processors have been based upon existing hardware products and often limited to a single deployment style. Forza breaks from that tradition as a processor that was purpose-built as software.

It can be delivered as a Docker container, allowing it to take advantage of the many benefits of virtualization, whether on-premises, cloud-hosted, or available in 3rd party integrations. For those wanting the benefits of virtualization but with the simplicity of pre-configured hardware, up to two instances of Forza FM with  $\mu$ MPX or up to four instances of Forza HDS processing can be pre-installed on the Telos Alliance AP-3000 platform. For developers interested in integrating Omnia's best-of-breed processing into their own offerings, an API is also available for custom OEM integration.

### Forza for HD/DAB/Streaming and FM

Forza HDS is an L/R stereo processor optimized for HD-2/3/4, DAB, and streaming audio applications. Its integrated, target-driven ITU-R BS.1770 loudness controller makes conforming to emerging streaming loudness requirements a set-and-forget process. As an ever-increasing number of listeners move to online listening and Internet streams are natively available on automotive dashboards, proper audio processing becomes just as essential for this platform as it is for FM transmission. Sonically, Forza HDS is consistent, polished, natural, and seemingly unprocessed.

Forza FM employs the same fundamental five-band approach but is optimized for the unique demands of FM, taking into account the pre-emphasis curve and the need to build loudness and RMS energy. The built-in stereo generator with integrated RDS includes Frank Foti's Silvio clipper from the Omnia.11 to provide the clean, open, yet dial-dominating loudness users expect from an Omnia processor. A separate processed L/R peak-limited output is included for HD-1 and DAB.

## Forza's Simple But Powerful UI

Omnia presets can be used as-is or as a starting point for creating your custom sound.

Smart Controls quickly adjust multiple interrelated parameters with a single knob or slider.



Forza's innovative GUI welcomes less-experienced users while providing plenty of tools processing experts need for customizing their sound, all in a single platform-agnostic, browser-based HTML5 page.

Anyone can design a complex user interface, and that's one of the problems with many specialized products. Audio processing is a particularly challenging example, where hundreds of interrelated parameters spread across multiple tabs, layers, and screens can result in a UI that many users find intimidating or frustrating. Combine this with the inherent difficulties of sonic tuning, where you can't see the goal, only hear it, and must rely on language borrowed from the visual fields to describe the sound with words like "clear", "muddy", or "bright", and things become even more challenging. Moreover, what constitutes "great sound" can be highly subjective.

Historically, the answer has been to call on an audio processing “guru” to wrangle all this complexity into a cohesive sonic goal, but such expertise is becoming increasingly rare. The truth is that the broadcasting industry is experiencing an engineering shift, and the presence of “traditional” radio engineers who have learned even the basics of audio processing through time-consuming experimentation, apprenticing, and good old-fashioned trial and error is no longer a given. In many of today’s operations, digital and streaming audio is deployed and managed by an IT-centric department completely separate from terrestrial broadcast.

These are the realities that led the Omnia team to take an unconventional design approach with Forza, refining our decades of processing experience into a democratized tool. Forza’s UI is purposefully engineered to distill a complex system with hundreds of underlying parameters into a lean, high-level control set where the entire user interface - including all meters and controls - is presented on a single HTML5 web page. To support this, we leveraged the concept of interdependent “smart controls.” With this approach, a single control intelligently drives dozens of related parameters in parallel, making the same kind of individual adjustments to multiple parameters that a processing expert would make serially and laboriously, by turning one knob or slider at a time. Forza’s approach to processing ensures that even the most inexperienced user can quickly and easily create a successful sound by choosing one of the carefully crafted Omnia presets and adjusting just one or two high-level controls. Experienced users will benefit from this powerful foundation, providing a faster, more efficient path to success. Forza’s deeper control layers allow them to leverage their expertise to bring their own sonic vision to life.

## OMNIA FORZA REQUIREMENTS

The information below is intended to provide general operational guidance for software container deployment on a Linux Server and is subject to change. When running multiple instances, assume a single core allocation for OS & overhead tasks. It should be noted that Forza FM is more resource-intensive compared to Forza HDS and requires later-generation CPU microarchitectures. Broadly, four HDS processing instances can run in the compute footprint required to run a single Forza FM instance

### HDS instance requirements:

- Cores needed per instance: 1 core (x86-64 V3, 6th generation “Skylake” or preferably later Intel Core architecture, or Gen 1 Xeon server CPU)
- CPU speed requirement: 2 GHz
- Memory requirements: 256 MB RAM per instance
- Latency: 50ms typical; CPU speed, AoIP setup, and other factors will affect system latency
- Required Linux distribution: Ubuntu Server v20.04 or 22.04 (64-bit)

## Forza FM Instance requirements:

- Cores needed per instance: 2 cores (x86-64 V3, 11th generation "Tiger Lake" or later Intel core architecture, or Gen 3 Xeon server CPU)
- CPU speed requirement: 2.4 GHz
- Memory requirements: 512 MB RAM per instance
- Latency: 50ms typical; CPU speed, AoIP setup, and other factors will affect system latency
- Required Linux distribution: Ubuntu Server v20.04 or 22.04 (64-bit)

## SUPPORT EVERY STEP OF THE WAY

Compared to traditional hardware products, software solutions require a very different approach to ensure success, and Telos Alliance is prepared to help every step of the way. Before purchase, we'll assist with designing your system to ensure it suits your workflow and meets your current and anticipated future needs. Our Professional Services team stands ready to work with you throughout the deployment and configuration phase to provide a smooth onboarding experience. Afterward, the TelosCare PLUS Service Level Agreement (SLA) provides 24/7 priority access to our Customer Success Team for support whenever you need it, plus immediate access to the software and security updates that are an inevitable part of the virtualized world. Wherever you are on your software and virtualization path, we're here to help.



# OmniaSST

## Audio Processing Software



## OVERVIEW

This full-featured, professional audio processing software transforms Windows PCs into high-end audio processors. Based on a powerful processing engine designed by Hans van Zutphen, OmniaSST is the first processor to support the Telos Alliance's revolutionary Omnia  $\mu$ MPX<sup>®</sup> codec.  $\mu$ MPX, a specialized codec purpose-built for FM radio, is able to transport high-quality Multiplexed FM signals over a small 320kbps data pipe. Reduced data requirements mean high-quality multiplexed audio and RDS signals can be directly routed over IP from your processor into a decoder application, opening up tremendous possibilities for efficient MPX audio transport.

Omnia SST audio processing software is the only processor with the 3 Ds for your audio needs: Declipper, Delossifer, and Dehummer. With Declipper, OmniaSST repairs incoming audio, optimizing it before it hits compression, limiting, and final processing stages, Delossifer repairs the sound of lossy compressed audio such as MPEG2/MP3 material. While Dehummer removes unwanted sounds such as 50/60 Hz hum from bad cables. These remarkable pre-processing tools result in clean, loud, and open sound.

Finally, OmniaSST audio processing software includes purpose-built Omnia presets, FM pre-emphasis, stereo and RDS encoding, and shares the same FM reception-improving composite final clipper as found on the Omnia 95G. Using an i7 class processor, latency can be reduced to as low as 5ms. A streamlined, HTML-5 based GUI means easy, intuitive operation.

# FEATURES

## Audio Processing Features

- **Low-Latency Performance** – Using an i7 class processor, latency can be reduced to as low as 5ms.
- **The Perfect Declipper** – A unique filter, also found in our Omnia.9 and 11 flagship processors. It detects and reconstructs clipping-damaged audio (distortion caused by too-loud input levels and overly aggressive mastering), prevalent in music.
- **Delossifier** – Improves the sound of lossy encoded audio, such as MP3- and MPEG2-encoded audio.
- **Dehummer** – Removes constant tones such as a 50/60 Hz hum on the fly.
- **Hiss Reduction Filter** – A powerful hiss-reduction filter that tackles hiss while leaving adjacent content alone. Especially useful when playing older songs or other noisy content.
- **Natural Dynamics** – Boosts transients. This mainly boosts percussion instruments, adding more dynamics, which gives the rest of the processing chain more to work with.
- **Automatic Gain Control (AGC)** – The ITU.1770-based AGC keeps the sound compliant to a defined loudness level.
- **Bass Harmonics** – This filter increases the bass level without increasing the maximum amplitude of the bass, and adds harmonics that make the bass more audible on speakers with poor bass reproduction.
- **Phase Delay** – Purposely adds phase-nonlinearity. Can be used among others to generate a more boomy bass.
- **Bass in Your Face** – Intelligently adds missing subharmonics.
- **Absolute Highs** – Reconstructs missing highs if damaged or removed by lowpass filters.
- **2-9-Band Multiband Compressor / Limiter, x2** – OmniaSST has two multiband compressors that can be used in series. They have a very natural, pleasant, and non-fatiguing sound. Depending on the content, they move very quickly when they need to and slowly when they can.
- **Phasing Error (AZIMUTH) Correction Filter** – Detects and repairs phase-shift errors that are often present on tape recordings and some badly mastered CDs. These phasing errors can make listening very unpleasant, and can also cause severe artifacts when converting sound to mono, encoding it using a lossy codec, or when playing it on a surround system. This filter automatically detects and repairs such errors. For FM transmissions this can reduce multipath distortion and improve the audio quality when the radio blends to mono.
- **Stereo Booster** – Boosts the stereo width. It can be configured to not alter the total sound content.
- **Stereo to Mono Conversion** – Converts stereo to mono without removing sounds that normally cancel out during a mono sum. This leaves mono sounding just as full and powerful as the original stereo sound.
- **Distortion Masking Clipper** – The same clipper that's available in the Omnia.9sg. Now with a louder and cleaner "Rules are made to be broken" mode.

- **Lowpass Filter** – The extremely steep phase linear lowpass filter can be used to cut off frequencies that cannot be broadcast, removing unneeded signals from streaming audio, FM and AM transmission.
- **Auto EQ** —Automatically control the spectrum before the AGC, making it possible to use the multibands to precisely control how deep each band will go down and thus how much density you add, regardless of how the input material sounds.
- **µMPX**—Allows you to send a full multiplexed FM signal with RDS through a narrow 360kbps pipe.
- **Automatic Phase Repair**—Utilizes advanced DSP to allow the restoration and control of pure anti-phase signals, rivaling processors costing thousands more.

## FM Transmitter Features

OmniaSST audio processing software is the first product to generate and decode Omnia's proprietary µMPX™ multiplex audio codec, allowing you to transport high-quality Multiplexed FM signals over a small 320kbps data pipe, slashing bandwidth needed for MPX by 83%! Reduced data requirements mean high-quality multiplexed audio can be economically routed from an audio processor, over IP, and directly to a decoder application, opening completely new possibilities for studio to transmitter links.

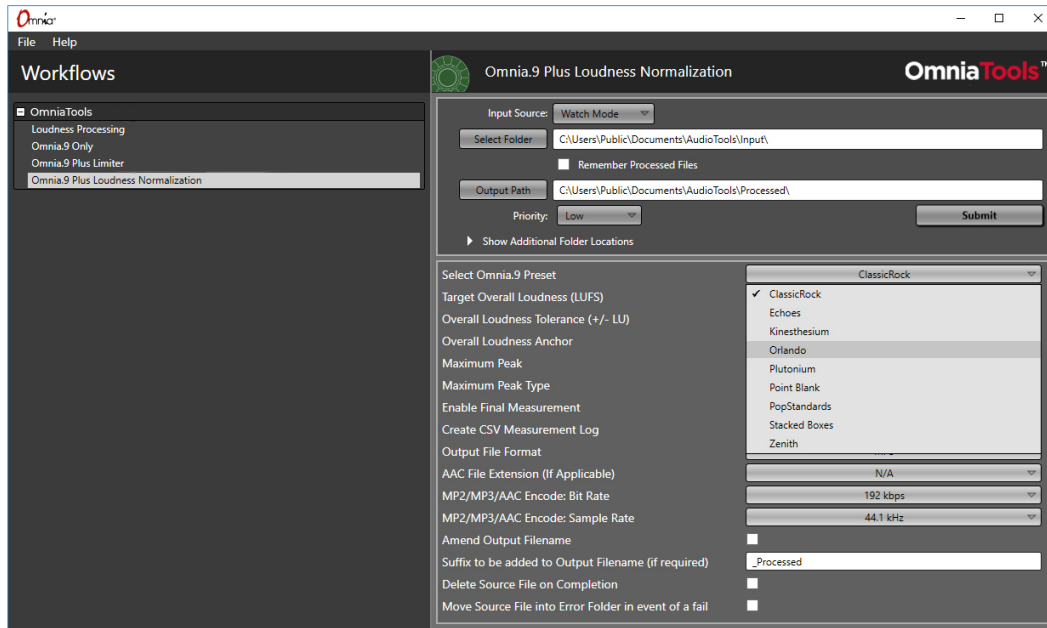
µMPX includes stereo and RDS data, which can be sent to the FM transmitter using a good-quality 192kHz capable sound card. No separate hardware stereo coder or hardware RDS encoder is needed.

The following FM transmitter specific options are provided:

- **FM Pre-Emphasis Filter** – Pre-emphasizes the sound, which is needed for FM transmissions.
- **Flexible Outputs** – Flexible outputs mean OmniaSST can output both the pre-emphasized and the de-emphasized sound, or the pre-emphasized sound and a partially separately processed streaming sound.
- **FM Stereo Encoder** – The software FM stereo encoder generates a high-quality MPX signal including stereo information, which can be fed directly into an FM transmitter.
- **FM RDS Encoder** – The software RDS encoder enables broadcasting RDS text without using a separate hardware RDS encoder.
- **Composite Clipper** – The composite clipper in OmniaSST can squeeze out multiple dBs of extra loudness with highest sonic quality. The stereo pilot tone and RDS signal are not affected by this filter, and the upper and lower sideband are perfectly symmetrical, so the MPX signal that comes out complies perfectly to loudness standards.
- **ITU-R.BS-412 Limiter** – Mandatory for several European countries. The BS412 limiter in OmniaSST has virtually no effect on the sound (no extra clipping, no pumping, no gain riding), but still holds the output level up to the allowed maximum.
- **ITU-R SM.1268 Clipper, Multipath Clipper** – OmniaSST contains a built-in software based exciter and spectrum analyzer, which are used to analyze what the output signal will look like after FM modulation. The spectrum analyzer feeds back into the clipper in multiple stages, to very precisely control the resulting spectrum, strictly adhering to and even exceeding what ITU-R SM.1268 recommends.

# OmniaTools™

Podcast and on-demand audio that stands out and keeps your audience engaged

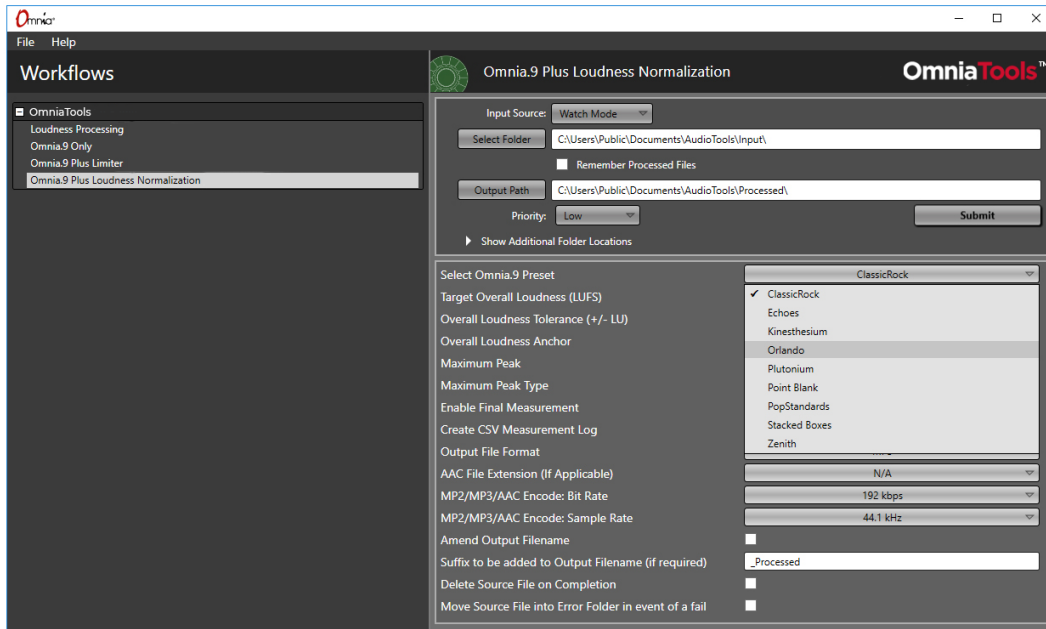


Poor quality sound is fatiguing and creates the risk of listeners tuning out. Like a dirty windshield, compromised audio quality obscures the sonic landscape. Details get lost, speech can be more difficult to comprehend, and content can suffer as a result. Omnia processing makes audio more listenable, less fatiguing and more consistent. If you care about your Podcast content getting through to the listener, you need to care about sound quality.

As more audio is produced remotely and consumed on-demand, the challenge of consistent audio levels is becoming even greater. In fact, it is the number one complaint of podcast listeners!

OmniaTools™ allows you to automatically manage loudness levels on all content and create your signature sound on podcasts, helping you stand out and keep your audience engaged.

This easy-to-use, enterprise-class Windows Service makes it simple to create consistent loudness for all your audio files while improving the quality of the audio.



## Happy Listeners Are Loyal Listeners

Our OmniaTools™ solution ensures that your listeners don't need to constantly adjust sound volume while listening. Your audience will get to enjoy the story or content, rather than being distracted by inconsistent levels and poor clarity. OmniaTools brings consistency to both your loudness levels and our world-renowned Omnia.9 processing module can help your content stand out sonically as well.

## Your Sound Signature Is Your Brand

Leading on-air broadcasters devote a lot of time creating just the right sonic signature to give them a competitive edge. With OmniaTools, your on-demand content and podcasts can have that same sound, thanks to the built in Omnia.9 processing engine. You can even use your exact same on-air preset for all your on-demand material. Your podcast listeners will immediately recognize your content thanks to that signature sound. Bringing your signature sound to your podcasts and on-demand content lets your audio stand out from the over 1 million podcasts available! Even if you have the most unique and fascinating content around, if your podcast is hard to listen to, you'll be bleeding listeners episode after episode.

## Simplicity - It's in the Details

OmniaTools does all of this work delivering a consistent signature sound automatically without the need for human intervention. It's designed to be truly simple enough for anyone to use. You just drop your audio files into a watch folder and OmniaTools creates a new, improved version. Producers save time by processing large numbers of audio files quickly and automatically.

- Loudness levels managed while preserving artistic intent
- Complete compliance with North American and International Loudness control standards
- APTO® loudness processing

### **OmniaTools provides:**

- File-based Omnia.9 processing
- Hot folder or API-driven processing
- File type auto-detect
- Clearly labeled, proven presets based on our Omnia.9 hardware processor

### **OmniaTools supports:**

- Up to 4 concurrent jobs at once
- Automation through watch folders
- Automation through REST API
- Preset editing via graphical UI
- Supports PCM, MP2, MP3, & AAC audio formats
- Audio program presets
- ITU-1770 and EBU R 128 loudness control
- Momentary and Short-Term loudness adjustment
- Loudness range adjustment
- Omnia.9 processing with your preset

# Omnia<sup>®</sup> MPX Node

## FM Multiplex / RDS over IP at data rates as low as 320kbps.

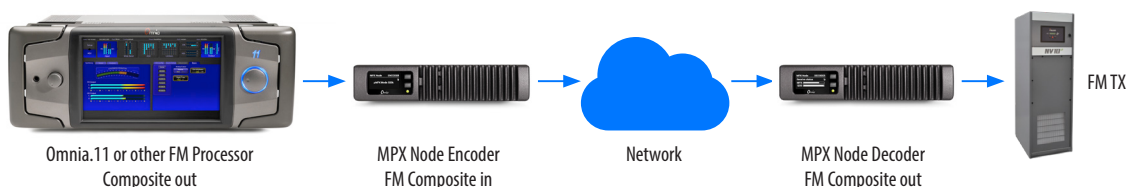


## OVERVIEW

The Telos Alliance<sup>®</sup> revolutionized the modern broadcast facility with the invention of Audio over IP. We proudly extend the AoIP revolution we began in the studio out to the transmitter with the Omnia MPX Node.

Like its namesake—the classic Axia<sup>®</sup> xNode<sup>™</sup>—Omnia MPX Node is a building-block technology that helps stations leverage the growing power and capability of data networking. The Omnia MPX Node is the first purpose-built hardware codec capable of sending or receiving full FM signals at data rates as low as 320 kbps utilizing the Omnia µMPX<sup>™</sup> algorithm, ideal for networks with limited capacity (including IP radios). MPX Node makes peak-controlled L/R baseband, stereo pilot, and RDS data routable from a studio to one or many FM transmitters.

By transporting an FM composite signal rather than left/right audio, broadcasters can keep their on-air processing and RDS encoding at the studio, then deliver a transmission-ready, peak controlled FM multiplex signal directly to an FM transmitter without the need for transmitter-side peak limiting or stereo generation. The MPX Node is available as either an encoder or decoder, and a pair of units creates an end-to-end system.



# FEATURES

- MPX Node is available as either an Encoder or Decoder
- Omnia  $\mu$ MPX algorithm can transport FM composite (MPX) and RDS/RBDS at selecta variable rates from 320 kbps up to 576 kbps —perfect for IP radios and DSL IP circuits and other lower bandwidth connections
- Built-in, configurable error correction
- Processor agnostic design: Encoder can be fed by any brand of FM audio processor
- Omnia.9 or OmniaSST™ processing software can serve as the Encoder front end
- MPX Node Decoder outputs a standard analog MPX signal to feed any FM transmitter
- Full FM signals (including RDS/RBDS) can be sent over IP networks
- 5 In x 5 Out GPIO
- A single Encoder can transmit the same signal to multiple decoders
- Separate Ethernet ports support independent, dual networks
- Redundant networking allows the same signal be sent/received over two ISP's
- Simple HTML.5-based web GUI allows you to control MPX Node from your desktop, tablet, or smartphone
- Dual bank firmware update design, for secure upgrading
- Integrated test signal generator
- Cool-running, fanless operation
- Half RU, xNode form factor

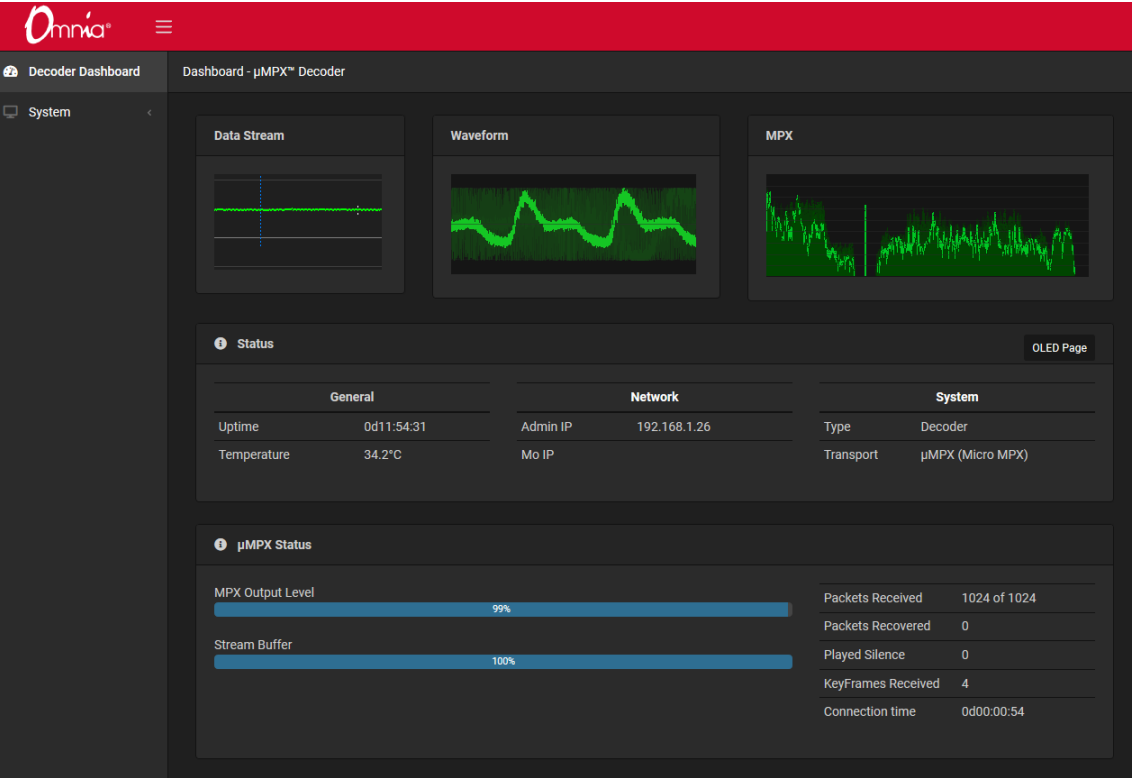


# IN DEPTH

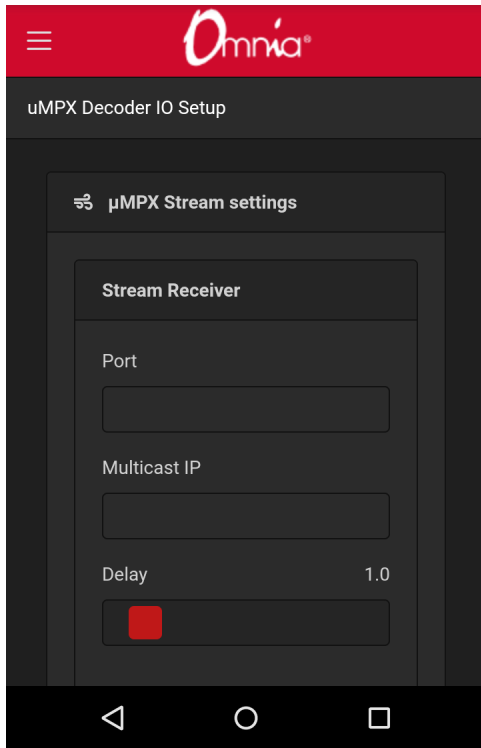
## Advanced GUI

The Omnia MPX Node’s HTML5-based GUI provides powerful, scalable, and secure control of the unit on all modern browser devices, from laptops to tablets to smartphones. Password-protected, continuously updated displays provide real-time metering and instant status of all parameters and settings.

### PC Browser Control



## Scaleable Control on a Smartphone Display

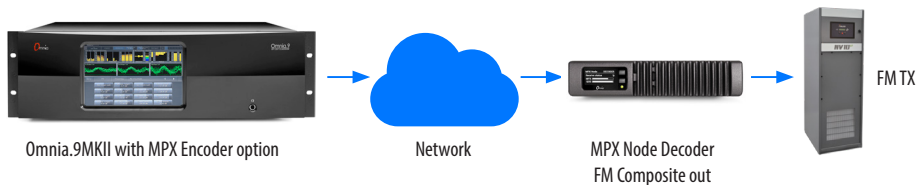


## APPLICATIONS

### Your Processor Is the STL

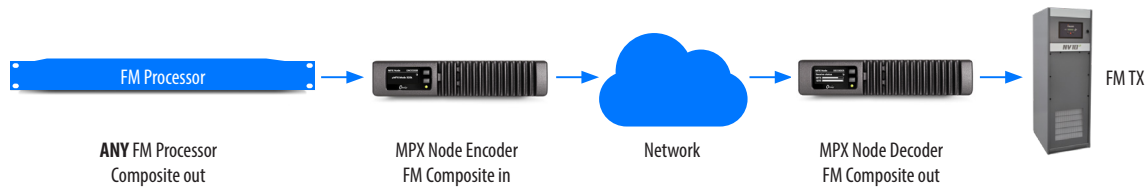
Imagine if your FM processor was also the front end of your transmission link. With an Omnia.9 at the studio, a stable IP link, and an MPX Node Decoder, you have a complete STL!

In this scenario, your Omnia.9 FM processor (with  $\mu$ MPX license installed) can be located at the studio. With IP addresses correctly set, Omnia.9 routes MPX/RDS data to one or many Omnia MPX Node Decoder(s) at one or more transmitter sites. The MPX Node (Decoder) then feeds your FM transmitter with a standard analog MPX signal. The Omnia MPX Node preserves all the complex peak limiting, stereo generation, and RDS (if provided), as if your FM processor were at the transmitter. The result is less equipment, fewer steps, and fewer points of failure between your processed signal and your transmitter.



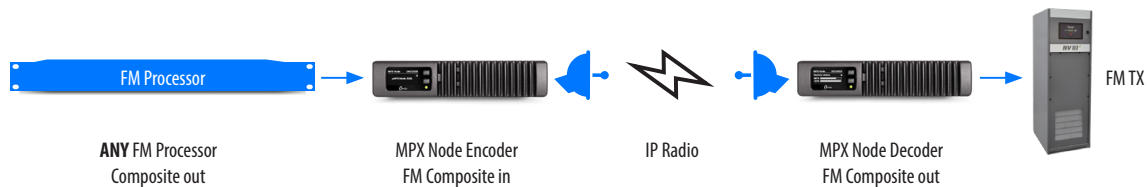
## Works with Any Audio Processor

If you don't have an Omnia.9, no worries. A pair of MPX Nodes is all you need to transport the MPX signal (and RDS data) from your FM processor to your transmitter. MPX Node works with any FM processor with a stereo generator to transport a composite (MPX) signal over IP.



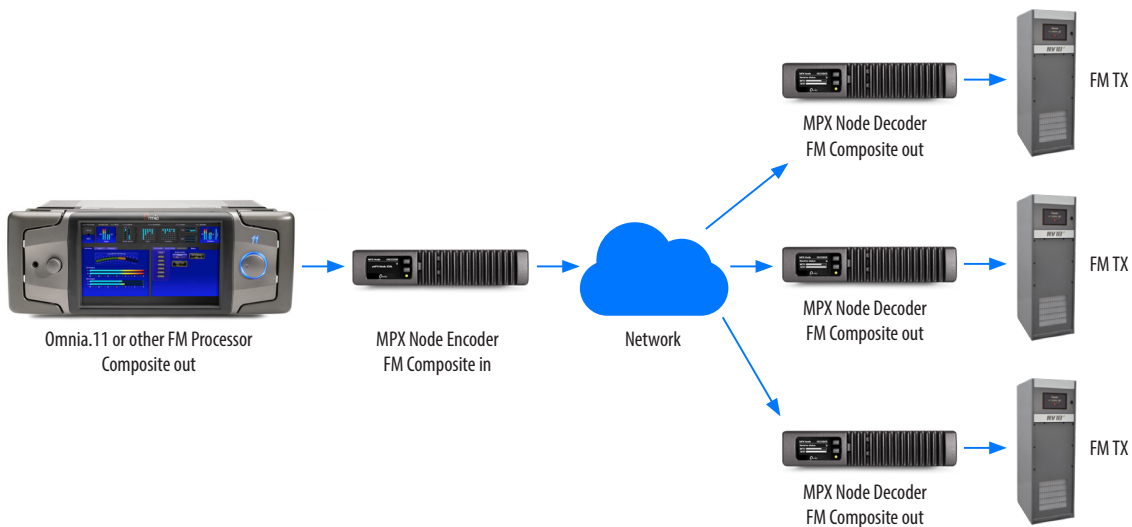
## Backup STL or Translator Link

The Omnia MPX Node makes a perfect backup link to your main studio or translator. With  $\mu$ MPX, lower bandwidth connections, such as IP radios can be employed to get a composite signal from studio to transmitter, without the need for further peak control or stereo generation on the transmitter end.



## Multi-Frequency Networks or Multiple Sites

With UDP (unicast) distribution, a single encoder can feed multiple decoders. Your FM signal can be routed point to multipoint over different IP connection types and carriers, including over the Internet. A base unit can send 2 streams. Up to 16 streams are supported with 2 and 4 stream licenses.



## Multicast Support

With an optional license, Decoders can subscribe to multicast streams generated by MPX Node encoders, for private networks supporting multicast traffic.

## Redundant Network support

With 2 independent network ports and internal stream replication, duplicate streams can be sent over 2 separate IP links from an Encoder. In the event of packet loss on one carrier, data is seamlessly spliced in from the second link on the Decoder for full redundancy.

# SPECIFICATIONS

- Analog composite FM in/out on (BNC connector)
- Composite connector impedance 5 or 75 ohm (switch selectable)
- Net 1 port provides 10/100/1000 Ethernet
- Net 2 port provides 10/100 Ethernet
- Both Network ports support MPX transmission, web control and redundant streaming
- 5 in x 5 out GPIO on a DB15 connector
- 100-240 VAC input 50-60 Hz external power supply with 12VDC, 3.4A output on locking connector
- 8.5" (22 cm) wide; two may be mounted side-by-side in a standard 1RU rack space with accessory mounting kit; 1.72" (4.4 cm) height, 11.75" (30 cm) depth
- Operating temp range 0 to +40 degrees C, <90% humidity
- Shipping weight 7 lbs. (3.2 kg.)

# Omnia $\mu$ MPX<sup>®</sup> Standalone Software

## Audio Processing Software



## OVERVIEW

Omnia  $\mu$ MPX is a specially designed audio codec that is able to transport high-quality Multiplexed FM signals (including RDS data) over a relatively small 320kbps data pipe. This specialized codec is purpose-built for FM radio. By reducing data requirements, high-quality multiplexed audio can be economically routed from an audio processor, over IP, and directly into an exciter. Lower bandwidth IP connections and narrow band STL channels can now be put into play to transport MPX signals.

OmniaSST was the first processor to include integrated  $\mu$ MPX capabilities. Omnia.9 now offers optional  $\mu$ MPX encoding capability.

Standalone Windows Encoder and Decoder applications are now available, and you can demo the software by downloading the Omnia SST installer. Unlicensed versions serve as a great “work bench” demo of the actual applications, but until a license is purchased, these versions play periodic tones and are not suitable for air. Refer to the SST manual  $\mu$ MPX section starting on page 59 for more information on configuration. Please note that to order a license you will need to generate a license key from the exact machine you plan to run the software on.

# Axia Quasar™

## The Ultimate Mixing Machines



## REALIZE THE POWER OF AOIP



Tap into the power of AoIP with Axia Quasar™, our sixth-generation of AoIP consoles and the industry-standard in mixing excellence. Powered by mature and sophisticated AoIP technology from Telos Alliance®—the inventor of AoIP for broadcast—Quasar is designed for steadfast reliability with no single point of failure.

Quasar is part of the vast Livewire+™ AES67 ecosystem, making communication with other devices on the network easy by allowing detection, sharing, and control of audio resources across multiple studios connected to the network. With Quasar, AoIP's promises of built-in redundancy, cost-efficiency, ease of use and setup, and system scalability are fully realized.

## THE PINNACLE OF CONSOLE DESIGN

Designed based on extensive global customer feedback and ergonomic studies, Quasar consoles deliver pride of ownership with their exquisite appearance and high-quality architecture, including scratch-resistant work surfaces and components rugged enough for a lifetime of use. All parts subject to wear are industrial-, automotive-, or even avionics-grade.

The absence of an overbridge makes for easy desk installation, and the console is fanless for quiet operation, with redundant load-sharing power supply units. High-resolution color TFT displays and RGB pushbuttons are used throughout.

Reinforcing its innovative design, Quasar received the RedTech Award for Ergonomics and the IBC Best of Show Award.

## TOUCH CONTROL AND TOUCH SENSORS BUILT-IN

Quasar consoles have a sleek, easy-to-operate, industrial-grade 12.1-inch touchscreen user interface that is so familiar, you'll be acquainted with the operation of the console within minutes. Two types of UIs are available—Expert and Simplified—to cover all user workflow requirements. Quasar does not require an external display to function thanks to its touchscreen, although you can connect an external monitor via the rear HDMI port to show a duplicate of the touchscreen interface. In addition, all Quasar consoles offer touch-sensitive Encoders, Faders, and User Buttons, offering responsive user interaction and bringing Quasar's dynamic UI closer to your fingertips.

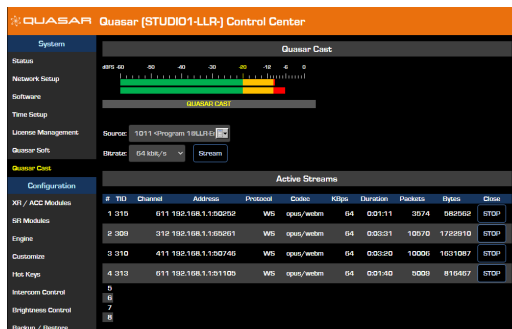
## CUSTOMIZABLE AND EASY TO USE

Whether you are a seasoned broadcast engineer or a guest board operator, the Quasar family has a console for you that extends the right mix of features and customization to allow your content to shine. Expert Source Profile controls allow power users a granular definition of custom logic associated with each source. The user can program GPIO control, mix-minus routing, talkback, and other functions based upon console channel state. Flexible Record Mode gives complete control of monitors, meters, headphone feeds, program bus assignments, and more. Additionally, Show Profiles allow up to 4,000 console "snapshots" with different settings, layouts, and defaults loaded instantly, customizing the board to each show requirement or talent preference, if desired. Finally, automatic mix-minus and automixing are available on all channels.

## REMOTE CONTROL & MONITORING



**Quasar Soft** - Unlock your XR or SR's remote capabilities with the optional Quasar Soft Software Upgrade. This customizable remote control solution lets you control your Quasar surface from a browser. You can generate up to eight HTML-5 pages and configure them to display any of the 64 input channels, plus a small monitor section, or even the entire master section of the console.



**Quasar Cast** - Included as part of the Quasar Soft license, Quasar Cast is a remote monitoring solution that lets you listen to any Livewire stream in the network through the same web browser. Quasar Cast generates a compressed OPUS stream from a source in the Livewire® network and can serve up to eight clients (including Quasar Soft instances). With Quasar Cast, you can listen to what is happening in the studio, and on the air, while you operate the console remotely using Quasar Soft.

# QUASAR AOIP CONSOLES

## Quasar XR - Unlimited Production Possibilities



Quasar XR is our top-of-the-line mixer. As such, it features extensive metering built into the surface right where it needs to be—on every channel display and next to each fader, as well as on the monitor module. These LED meters allow users to live mix rather than merely confidence monitor, giving users active control over their environments for the best possible outcome.

Quasar XR also includes standard motorized faders – a must for addressing complex workflows requiring the use of layers, recalling entire console configurations which include pre-set fader positions, or when controlling the surface remotely. XR also features dynamic fader module assignment, allowing the user to freely assign Fader modules to a Master module, and making it possible to connect Fader modules between two consoles.

Quasar offers Quasar Soft and Quasar Cast remote control and monitoring solutions, delivers full integration with Telos Infinity® IP Intercom products, and adds support for new Quasar Accessory Modules, along with numerous other powerful features. This advanced scalability addresses new workflows, like Work from Home, and gives broadcasters more flexibility when it comes to the number of channels they need in their Quasar Engine, starting at 16 channels and scaling up in blocks of 16 channels up to 64 channels.



## Quasar SR - The Power of Simplicity



Quasar SR is the direct replacement for Axia's best-selling Fusion console. If you like Fusion, you'll love Quasar SR—which is comparable to the Fusion console in both price and feature set but also delivers all the power, ergonomics, industrial design, and star appeal of our flagship Quasar XR console.

Quasar SR is not reserved for the most knowledgeable broadcaster but is approachable to any board operator thanks to its streamlined surface design. Quasar SR uses the same frame, power supply, and master module as Quasar XR, but the fader modules are non-motorized, and there are fewer, larger, and easier-to-reach buttons on each channel strip. If the LED meters next to each fader on the Quasar XR console are a bit too much functionality for your surface, then Quasar SR might be the solution for you, featuring Confidence Class Metering only. For a complete comparison between Quasar XR and SR, see our Quasar Consoles Comparison Chart below on the next page.

# QUASAR CONSOLE FEATURES

## Control Surface Dimensions (XR & SR)

Width: from 428mm / 16.85" (4 faders+Master) to 1360mm / 53.54" (28 faders+Master)

Depth: 580mm / 22.83"

Height: 110 95mm / 4.33 3.74" (table-top frame with rubber feet)

## Configurations

Available in sizes from 4 to 24 faders per frame, with support for up to 64 faders with Quasar XR and up to 32 faders with Quasar SR in multiple linked frames. Frames are available in both tabletop or flush-mount versions and can be converted from one type to the other with a special kit.

Feature	Quasar XR	Quasar SR
Use	Broadcast studios of any size OB Vans	Broadcast studios of any size
Surface Scalability	Up to 64 faders 16 XR-4FAD Modules per logical console	Up to 32 faders 8 XR-4FAD Modules per logical console
Built-in, modular fanless PSUs with redundant option	Up to 4 PSU modules per console frame	Up to 4 PSU modules per console frame
Quasar Soft & Quasar Cast	Optional license	Optional license
User-Assignable Buttons	All channel strip buttons user-assignable	All channel strip buttons user-assignable
Faders	High-quality motorized	High-quality non-motorized
Surface Layout	Extensive set of hardware controls available. Four User Keys available on each channel strip	Simpler surface layout for self-operated workflows. Fewer, bigger, and easier-to-reach buttons. One User Key per channel strip
Channel Strip Audio Meters	High-Res LED bars + confidence meters in display	Confidence class meters only
Build Quality	High-quality components, rugged, ergonomically designed, industrial PCAP touchscreen, no overbridge	High-quality components, rugged, ergonomically designed, industrial PCAP touchscreen, no overbridge
Touchscreen	Included with console	Included with console
Frame Type	Up to 8.5U, single or split	Up to 8.5U, single or split
Dynamic Assignment of Fader Modules	Possible	Not possible

# QUASAR SYSTEM COMPONENTS

## Quasar Engine



Quasar XR and SR surfaces are powered by the Quasar Engine, a native AoIP powerhouse with 16 stereo channels, expandable to 64 channels. It offers 4-band fully parametric EQ and powerful dynamics processing including talent headphone processing, True Peak limiting on Program, Record, and Phone buses, a dedicated low-latency peak limiter on every input channel, variable position insert sends and returns, and automixer on every channel. Quasar Engine includes four program buses and eight auxiliary buses, four Surface Layers, and a Virtual Mixer (VMix) with 16 independent 5-channel VMixers to extend the mixing capacity of your Quasar console far beyond the physical fader count. Extended AES67 functionality brings full compliance to all engine inputs, outputs, and monitoring sections, and adds PTP synchronization. Redundant power is standard with this mix-engine platform. The Quasar Engine is fan-cooled, while the Quasar console is completely fanless.

## Quasar Engine RPS



Based on the proven Quasar Engine, Quasar Engine RPS brings many of the features and functions normally managed in the control surface to the engine itself. This makes it possible to create a standalone mixer without the need for an actual XR or SR surface, instead using the browser-based Quasar Soft user interface.



## Quasar Mic Control/Headphone Selector Accessory Module (optional)

The Quasar Mic Control/Headphone Selector Module can be mounted in tabletops or turrets. Studio Guest Position control provides remote control of mic on/off functions; dedicated Mute and Talkback buttons give talent full control of their position.

A volume/selection knob allows users to select their headphone monitor source; display readout confirms their choice. You can also use the module as an additional channel strip for your surface, mountable in a remote location.



## Quasar Motorized Fader Accessory Module (optional)

The Quasar Motorized Fader Accessory Module is similar to the Mic/Headphone Selector module but includes a high-quality motorized fader that allows control of any of the Quasar Mic channels.



## Quasar SmartKey Module

The Quasar SmartKey Module is a 2-channel wide surface module for Quasar XR and SR surfaces which adds up to four blocks of six programmable user keys. Each key can be programmed to display user-defined text using Axia Pathfinder Core PRO.



## Quasar Mic In / Headphone Out Console Module

The Quasar Mic in/HP out Module is an optional 1ch-wide module that can be placed anywhere on the surface to add a convenient Talkback Input and headphone Output to your Quasar. It comes with its own headphone amp board that must be plugged into the Quasar Rear I/O module, to let the console receive any line signal and turn it into a high-quality, hi-power headphone output.



## Axia Console GPIO Accessory Module

The Quasar GPIO Accessory Module is an in-studio accessory for remote control of mic on/off functions including Mute and Talkback buttons. The GPIO Module can be mounted in tabletops or turrets. Requires one free Axia® GPIO port per module and works with legacy Axia Fusion® consoles, the iQ family of consoles, and Quasar XR and SR consoles.

# Axia® SoftSurface

## Software for Axia® Fusion™ Consoles



## OVERVIEW

SoftSurface Virtual Console software for Windows gives you powerful real-time control of your Axia Fusion mixing console from home, office, or anywhere an Internet connection is available. Take direct remote control of your console, or, match SoftSurface directly to an Axia mixing engine to create a “virtual console” without a physical mixing surface. SoftSurface makes an ideal companion for existing consoles and it’s also the perfect audio mixing solution for limited-space locations.

# FEATURES

- Gives full remote control of Fusion consoles paired with Axia StudioEngine mixing engines.
- Pair directly with an Axia StudioEngine or PowerStation® to create a standalone “soft” console without a physical mixing surface. Supports from 4 to 48 faders in this mode.
- NTP-capable on-screen time of day clock/calendar.
- On-screen count-up event timer.
- Supports up to four Show Profiles console “snapshots” for instant recall of frequently-used configurations.
- Control all four program buses and all auxiliary mix buses.
- Remote control of mic compression, de-essing and expansion capabilities.
- On-screen control of per-source three-band parametric EQ.
- Excellent IFB Talkback capabilities let operators talk to other studios, external remote feeds, phone callers or any other source with its own backfeed.
- Full control of GPIO functions.
- When paired with Axia consoles equipped with motorized faders, physical fader position automatically mirrors that of the “virtual” SoftSurface fader.



## IN DEPTH

### Control at the Click of a Mouse.

You asked for a way to remotely control your console. Axia heard you! Meet SoftSurface, the audio mixing application for Windows.

You can use SoftSurface two ways. As a remote control, it gives powerful real-time control of premium Axia mixing consoles, utilizing an Axia StudioEngine or PowerStation that's connected to a Livewire® network. It's perfect for remote diagnostics or off-site operation of a mixing console from remotes, transmitter sites — even from home, via an Internet gateway.

As a virtual console, SoftSurface combines with an Axia StudioEngine or PowerStation to create a “soft” mixing surface. It's perfect for those limited-space situations where there's no room for a real console. With SoftSurface, if you've got a Windows laptop and an IP connection, you're good to go.

Now, when we say SoftSurface lets you control a console, we don't mean a wimpy console. You get all the functionality and features of Axia's extremely popular Fusion modular mixing surface, the board at the heart of thousands of superb broadcast facilities around the world.

SoftSurface opens up new dimensions of creative applications for broadcasters. Remote broadcasts get easier: your talent can take a tablet with SoftSurface, a USB mic and a Telos® Z/IP ONE IP Codec into the field, link up with the Fusion console at your studio, and have its entire suite of capabilities at their fingertips — leave those CDs and MP3 players at home.

Or, pair SoftSurface with a StudioEngine or PowerStation mixing engine for a “virtual console” installation in personal studios, or areas where space restrictions don't permit a physical control surface.

The SoftSurface display is divided into a virtual mixing surface and a control section. The mixing section's onscreen width varies based on the number of channels you wish to display, while the context-sensitive control section is fixed in size, and navigation is via a series of intuitive tabs.



The Main Monitor tab provides control of the monitor speakers, operator headphones, external monitor speakers, and preview volume.



The Show Profiles tab reveals the profiles that have been configured and allows the user to select a show and load it. As few as one or as many as 99 Show Profiles are supported.



Monitor Options provides control over dimming values and control of the channel feeding the monitors and headphone.



The Meter Options tab provides control over the presentation of the meters, including choice of metering ballistics styles: VU, BBC and DIN-style PPM, EBU Digital and Nordic.



Auxiliary Send and Return provides control of the final AUX send mix, as well as two auxiliary returns, as defined in the Show Profile. The returns can be assigned to a program bus. These options are defined in a Show Profile and controlled as needed by the user. Individual sources can be assigned to feed one or all AUX Send buses from the Channel Options Aux Send screen.



EQ curves are adjustable for each audio source. EQ can be adjusted on the fly, or saved as part of a source's Source Profile and automatically recalled whenever that source is loaded to a fader.



Mic, Codec and Phone sources can be sweetened with Voice Dynamics from Omnia®. Expansion, Compression and De-Essing are part of the toolkit; Like EQ, dynamics settings can be adjusted at will or preset and saved with sources for automatic recall.



SoftSurface's signal processing toolkit is completed with comprehensive Pan, Summing and Phase control, available on a per-source basis.

# SPECIFICATIONS

## Hardware Requirements

- A PC with Microsoft™ Windows XP or higher operating system installed.
- A display screen with a minimum resolution of 1280x1024 pixels.
- A mouse, touch-screen, or other suitable pointing device.
- A 100BASE-T LAN connection with a static IP address.
- 20Mb free disk space.

## Audio Processing

### Equalizer

- Frequency Bands: 20Hz to 320Hz, 125Hz to 2KHz, 1.25KHz to 20KHz.
- Cut/Boost range on each band: -25dB to +15dB.
- Q-factor: Automatic - bandwidth varies based on amount of cut or boost.

### Compressor

- Threshold: -30dB to 0dB Ratio: 1:1 to 16:1
- Post-processor Trim Level: Adjustable from -20dB to +20dB

### Expander/Noise Gate

- Threshold: -50dB to 0dB Ratio: -30dB to 0dB

### De-esser

- Threshold: -20dB to 0dB Ratio: 1:1 to 8:1



# Axia® Altus

## Virtual Mixing Console



## Overview



The slide of a fader, the twist of a knob, the press of a button...all familiar controls that create the modern notion of an audio mixing console. Large or small, the console sits at the center of the production, directing audio that makes its way out to audiences everywhere. What happens when you move the console out of the studio and into a virtualized environment? A whole new way of thinking about production emerges. Introducing Axia® Altus. This is more than a console. This is an opportunity.



## Capture that "I didn't know I could do that!" Feeling.

Imagine mixing/producing audio on a tablet or a smartphone anywhere, at any time! Imagine a console that has no hardware and runs entirely on any reliable and easily sourced computer platform. Now imagine it can also interface with all the equipment you have now.

Axia Altus—a software-based audio mixing console controlled by any device with a modern web browser. Altus represents the future of innovation where both advanced audio mixing and flexible deployment converge.

## Put Yourself in the Center of your Production.

Made with built-in capability for remote contribution and monitoring, Altus allows broadcasters like you to control the mix, while simultaneously monitoring audio and contributing content from any browser, anywhere. Altus brings audio production into the virtual age.

## Imagine a Console That:

- Offers full-function mixing for your distributed and remote workforce
- Offers control in any modern web browser with no need for a physical surface
- Enables concurrent collaboration from multiple users on a single live
  - or recorded program
- Allows temporary studios to be deployed anywhere in minutes
- Can be controlled by computers and tablets that your team already has
- Takes up no counter space in the studio
- Provides an easy low cost option for disaster recovery



## Built for the Hybrid Work Environment.

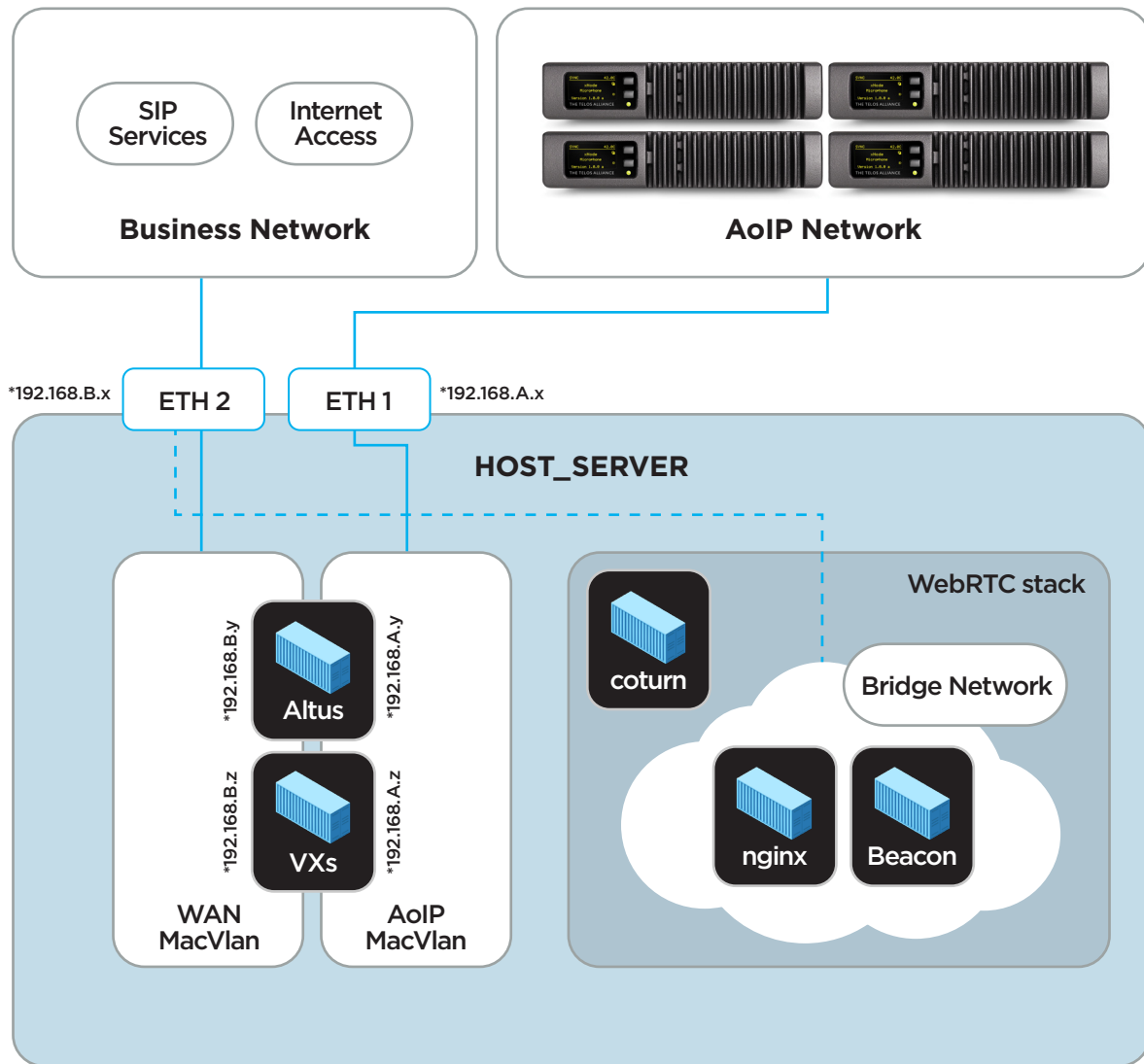
If phone callers are a part of your program, Altus' built-in phone controller integrates with the entire family of Telos VX Broadcast phone systems for clean and clear caller audio. Altus allows multiple users to collaborate on a show, regardless of their location. If you, your co-hosts, or guests are remote and need to contribute audio, hear each other, or even engage with callers, Altus has the option to provide real-time two way audio via webRTC, all without the added hassle of external codecs and other hardware.

Because Altus is deployed entirely as software, it provides enormous flexibility in studio design. Save your counter space as Altus appears on a screen when you need it providing the ability to turn any workspace into a temporary studio. It even opens up new ways of protecting against disasters, as you can deploy Altus in the cloud and have a backup studio available anywhere at any time.

Nearly 20 years ago, broadcasters began to experience the benefits of Axia AoIP consoles, known to deliver a powerful and flexible mixing experience. Now, the power of our virtual solutions are providing broadcasters with the best of what IT technology has to offer which allows even more flexibility in how stations create their content and enable their talent.

# The Benefits of Virtualization

Virtualization - made possible by today's advanced IT capabilities - brings scalability, remote work capability, security and flexible cost structures—but more than anything, the technology itself empowers you to work in brand new ways you never thought possible before. That's what we've done with Altus.



## Flexible Deployment Options

Virtualization provides more options when it comes to designing your system. Altus can be installed on-premises on a COTS (commercial off-the-shelf) server or cloud-hosted. Additionally, up to four Altus virtual consoles - including the WebRTC contribution and monitoring options - can be pre-installed on the Telos Alliance AP-3000 hardware platform, combining the benefits of virtualization with the simplicity of pre-configured hardware.

## Future-proof Your Facility

Virtualized environments have built-in flexibility to work in concert with existing infrastructure so you can use the gear you have today. Virtualization allows you to grow your infrastructure over time while continuing to interoperate with your existing facilities and workflows. Organizations can create and utilize their content more effectively. Scale up or down “at speed” to accommodate events, workflows or pop up channels.

## Reliable and Resilient

Create infrastructure anywhere because you have choices that never existed before through virtualization. For the first time ever, you are free to decide on the correct balance of on-premises, private cloud and public cloud for best balance of flexibility, cost and resilience.

## Control Your Costs

Flexible business models work for you in virtualized environments. You can develop your shows “on the fly” to test new concepts quickly and only pay for what you need. Virtualization also requires less maintenance, infrastructure, and space.

## Easier Upgrades

Altus allows remote administration and updates over the internet or in a centralized data center to eliminate site visits. Altus is available either as a one-time buyout or as a subscription. OEM integration is also available for custom solutions. Please contact Telos Alliance for more information.

## Altus is Scalable - Now and Later

Altus is also more flexible than its physical counterparts, starting with a base Altus 4-fader software module and growing in increments of 4 faders (instead of 6 or 8), up to 24 faders. This flexibility allows you to precisely dial in exactly what you need in your soft console without paying for extra faders. If remote contribution or monitoring is required, then add in the WebRTC option that best suits your needs. Altus also comes standard with 8 virtual auxiliary mixers providing even more power to manage your audio.

## Expand Altus Capabilities with Axia® Pathfinder Core™ PRO

Livewire+™ AES67 is Telos Alliance's AoIP protocol that not only enables high-reliability, low-latency uncompressed digital audio over Ethernet, but incorporates logic, control, and program associated data (PAD) abilities. Want to control the system more effectively? Telos Alliance Pathfinder Core PRO is the key to unlocking the full potential of a Livewire+ AES67 ecosystem.

By discovering and identifying all compatible devices connected to the system, Pathfinder identifies each available AoIP source and destination. As a middleware layer using its onboard protocol translator to connect with many commonly used third-party controllers, it serves as an AoIP router, an ideal core infrastructure component for diverse broadcast audio applications. Pathfinder can schedule and trigger events, detect audio silence, issue alarms, and instruct failover routing. It even allows the user to create custom screen-based control and monitoring panels.

Due to an unprecedented level of control included in the Altus platform, you can vastly expand your system capabilities by using Pathfinder Core PRO in concert with Altus. Need to automatically dial your Z/IP ONE when you load your show? Change your program bus assignments depending on whether you are on the air or not? Fire automation system automatically when you turn your mic off? Load a show profile every day at 3:30? Raise an alert if audio is not being received correctly? Pathfinder can do it all. Additionally, use the HTML-5 panels in Pathfinder to customize and develop your own user interface for Altus.

## Support Every Step of the Way

Compared to traditional hardware products, software solutions require a very different approach to ensure success, and Telos Alliance is prepared to help every step of the way. Prior to purchase, we'll assist with the design of your system to ensure it suits your workflow and meets both your current and anticipated future needs. Our Professional Services team stands ready to work with you throughout the deployment and configuration phase to provide a smooth on-boarding experience. Afterwards, the TelosCare PLUS Service Level Agreement (SLA) provides 24/7 priority access to our Customer Success Team for support whenever you need it, plus immediate access to the software and security updates that are an inevitable part of the virtualized world. Wherever you are on your software and virtualization path, we're here to help.

# Features



## Flexible

- Browser-based control (HTML-5) and therefore accessible from any device (Windows, Mac, Tablet, Smartphone)
- Control from Pathfinder Core PRO
- Control from Axia IP-Tablet

## Interoperable

- Standards-based console supports AES67 and SMPTE ST-2110-30A; works with any AES67, Livewire+ AES67, or Livewire® source
- Assign any AoIP source to any channel, like having more than 16 million patch points

## Easy to Use

- Familiar console interface in a software format allows users to get up and running fast, on any HTML-5 device
- Smooth handoff from one operator to the next, even in remote locations
- Use Altus with Axia Pathfinder (not included) to easily route, monitor, and control AoIP sources

## Broadcast Ready

- Configurable from 4 to 24 faders, each with instant access to any source
- VX Call Controller built in for integrated control of VX Phone systems
- 4 dedicated stereo Program mixes, plus 2 stereo Utility mixes that can be used for phone calls and off-air recording, or whatever you imagine
- Automatic mix-minus on each fader, plus talkback functions
- Automix automatically balances levels of on-air-microphones when more than one mic is open at a time in a studio
- Off-Air Record Mode Trigger
- Studio and Control Room monitor controls
- Each fader channel with stereo three-band EQs
- Microphone source types with dynamic processing capabilities.
- Channel-input confidence meters assure the operator of audio presence before taking sources to air
- Profile context-sensitive Soft key can be used to activate talkback, start delivery system events, or perform other special functions

- Stereo PFL ("cue") functions for every fader with a unique interlock system for the fast cueing of multiple sources
- Reconfigurable CR monitor section with direct selection of 4 program busses and re-assignable buttons that allow instant monitoring of external sources
- Additional monitor section provides separate monitor volume, source selection, and talkback controls for an associated studio
- Flexible built-in mix-minus and talkback system lets operators talk to phone/codec sources, each with an associated, automatically created backfeed mix-minus
- Unlimited Source Profiles allow inputs to the system to be configured to precisely meet the needs of operators
- Twenty Six quick recall show profiles serving as console snapshots allow for easy configuration changes between shows or dayparts
- Eight Auxiliary "MiniMixes" - a remotely controllable 5-input virtual mixer, for whatever extra audio needs you may have
- WebRTC options for true virtual studio operations

## Specifications

### Minimum Requirements for Docker Deployment

- Server-class multi-core CPU(s), 2.0Ghz minimum
- Memory: 1GB of RAM per each Altus, minimum
- Docker hosting platform: Docker Engine on Linux (Ubuntu 18.04 LTS and 20.04) server.
- Number of server CPU cores required for Altus instances with 24 fader channels
  - For up to 3 Altus instances in the server: one reserved core for each Altus, plus one core system base.
  - For 3 up to 8 Altus instances in the server: one reserved core for each, plus 2 system cores.
  - For more than 8 Altus instances in the server: one reserved core for each, plus 3 system base cores.
- For smaller Altus instances with up to 12 faders, two Altus instances can be run per each reserved core.
  - For up to 6 small Altus instances: one reserved core for each two small Altus, plus one core system base.
  - For 8 up to 16 small Altus instances: one reserved core for each two small Altus, plus 2 cores system base
  - For more than 16 small instances in the server: one reserved core for each two Altus, plus 3 cores system base.

# Virtualization Platforms

## Docker Container

When Altus is delivered as a Docker container, the Docker host (Docker engine) can be run either on a bare metal server or inside of a virtual machine. When deployed in the cloud, Docker is always run inside a cloud-hosted VM.

When Docker is run inside of a VM, there are performance requirements on the virtualization platform in order not to introduce latencies and throughput bottlenecks underneath Docker, which would affect the real-time audio.

If Virtualization is used, a type 1 Virtualization host capable of:

- Exclusive allocation (i.e., pinning) of CPU cores to virtual machines
- Allocation of CPU resources to network I/O traffic

Note: The number of server CPU cores required is the same as listed above in the Docker Deployment section.

## Telos Alliance AP-3000

Up to four Altus virtual consoles - including the WebRTC contribution and monitoring options - can be pre-installed on the Telos Alliance AP-3000 hardware platform, combining the benefits of virtualization with the simplicity of pre-configured hardware.

# Axia® iQx AoIP Console

## Look Below the Surface



**AES67**  
**Livewire+**

## OVERVIEW

Appearances can be deceiving. Axia® iQx looks like a traditional console, but it's actually a surface and mix engine rolled into one —at a surprisingly affordable price. We dove deep with AES67, giving you access to every source, anywhere on the network. With nearly limitless connections, we can't even fathom the possibilities.



# FEATURES

## AoIP Features

- Standards-based console supports AES67 and SMPTE 2110-30.
- Configurable from 8 to 24 faders, each with instant access to any AoIP source.
- Works with any AES67, Livewire+™ AES67, or Livewire source.
- Assign any AoIP source to any channel, like having over 16 million patch points!

## Console Features

- 24 built-in stereo three-band EQs.
- Channel-input confidence meters assure operator of audio presence before taking sources to air.
- Fader's context-sensitive Soft key can be used to activate talkback, start delivery system events, or perform other special functions.
- Stereo Preview ("cue") function for every fader with unique interlock system for fast cueing of multiple sources.
- Reconfigurable CR monitor section with direct selection of 4 program busses and re-assignable buttons that allow instant monitoring of external sources.
- Additional monitor section provides separate monitor volume, source selection, and talkback controls for an associated studio.
- Flexible built-in mix-minus and talkback system lets operator talk to guests and phone/codec sources, each with an associated, automatically created backfeed mix-minus.
- Precision event timer can be operated manually or triggered by starting preselected sources.
- Time-of-day clock synchronized to network PTP time or NTP, with time zone and daylight savings settings.
- Unlimited source profiles with four quick-recall snapshots (show profiles).
- Remote access for configuration, management, and diagnostics using standard Web browser. No proprietary software required.
- Auxiliary "V-Mix" remotely controllable 5-input virtual mixer, for whatever extra audio need you may have.
- Automixer available on all channels.

## Telco Features

- Unique Record Mode enables one-button setup of record mixes for phone bits or off-air interviews.
- Optional Telco Expansion Frame provides direct, on-the-console control of Telos multiline phone systems. High-resolution displays for instant call status information. Dump key for profanity delay.

## Design Features

- Smooth, long-life 100mm conductive-plastic faders resist dirt and contamination.
- High-resolution displays provide responsive, readable VU or PPM metering styles. Displays can be switched to display 2, 3, or 4 meters at once.
- Alphanumeric displays below each fader show current audio source and other features without panel clutter or intimidating controls.
- Up to 2 additional iQ side frames can be joined to produce a single large control surface or operated separately to suit studio design.
- Tabletop mounting.
- Fan-free, convection-cooled operation, quiet enough for on-air mics.

## IN DEPTH

### Surface Meet Engine...Engine, Surface

Traditionally, surfaces need to be connected to a separate mix engine, the so-called “brains” of the system. Axia iQx combines the mix engine and surface into one unit. That’s one less component and connection you need to worry about when building your studio, allowing you to get up and running quickly and easily.

### Standards-Based for Easy Connectivity

Built from the ground up as an AoIP console, iQx is AES67-compliant and stands fully capable of supporting emerging standards including SMPTE 2110-30. There’s no limit to the number of sources and connections you can access on the network. Well, OK, 16 million...but who’s counting?

### Don’t Pay for I/O You Don’t Need!

If you already have an existing AoIP network, you may not even need to add additional I/O. You can connect your iQx and access any audio source, anywhere on the network, from anywhere in the world. Have iQ consoles or QOR engines on your network? Drop in an iQx and share resources without having to add additional equipment. By piggybacking off existing resources like an Axia QOR engine, a station on a budget can suddenly build an additional studio for far less. This is a first and changes the game.

### Affordable Yet Impeccable

Not only does iQx allow you to utilize existing network resources without breaking the budget in ancillary I/O, it is very affordable, bridging the gap between a lower-end \$2K console and a higher-end, \$8K model, while retaining all the craftsmanship, build quality, and innovation that Axia is known for.

## Instant Studio

Create an instant studio by adding a Telos Alliance xNode to support local microphones, headphones, and any other sources you might want, and you're ready to rock in a flash. Add additional xNodes to expand I/O capabilities as needed. While iQx is sophisticated inside, it's familiar on the outside so there's no steep learning curve.

## Plug-and-Play Installation

Configuration is a no-brainer thanks to a built-in web GUI—no proprietary application required. And while some locations where consoles are installed can be tight on rack space, iQx doesn't require any thanks to the integrated engine. The console can be placed tabletop, without the need to modify furniture. All while offering network and power redundancy expected by world-class broadcast facilities.

## Ready for the Future, Even If You Aren't

iQx is great for nontraditional studio setups too. Need a temporary studio for a special event or to add or move a studio quickly? Mixing sports, remote talent, or audio that isn't located in your studio? iQx is your console, letting you bring in sources from all over the world. Control is not just a local thing either; an iQx can be controlled from the remote site, so no in-studio operator is required. With iQx, you have access to everything, everywhere. While we can't predict the future, we know change is in store, and iQx is flexible enough to support you today and tomorrow.

## Get the Benefits of an AoIP Network

New to AoIP? In addition to its own unique advantages, iQx is an AoIP console at its heart, giving you all the benefits that come with an AoIP network. More flexibility, easier and faster installs, cost efficiency, a decentralized system without a single point of failure, and the ability to upgrade from analog one studio at a time are all upsides of AoIP.

Once a source is on an AoIP audio network, it can be made available to any device on that same network. In the analog days, this could only be accomplished with costly routing switchers or stacks of distribution amps. Now, any station with an AoIP network has this capability built in.

Finally, with no analog audio physically inside an AoIP console, you reduce or even eliminate interference that can compromise sound. With AoIP, stations enjoy much cleaner audio throughout the studio facility.

# SPECIFICATIONS

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## Inputs/Outputs

- Four main stereo program bus outputs, plus bus outputs for Record, Phone, CR Monitor, CR Monitor Direct, CR Headphones, Preview, Talkback to CR, Talkback to External, Studio Guest HP, Studio Monitor, Studio Talent HP.
- Automatic mix-minus provided for any source input.
- 5 stereo input to 1 stereo output, auxiliary "V-Mix" mixer.
- 2 network ports, 1 for link to the AoIP network and 1 for a local I/O.
- Fanless power supply standard; second redundant power supply optional.

## Dimensions

- Unit weight: 12 lbs / 5.5 kg.
- Shipping weight: 25 lbs / 11.4 kg.
- W: 20.4"(518.5mm), L: 18.2"(463.3mm), H: 4.4"(111.4mm)

# Axia® iQs

## AES67 Mixing Console Software



**AES67**  
**Livewire+**

## OVERVIEW

The Axia iQ family takes a step into the virtual future with iQs virtual mixing console—the software version of iQx that does not require a physical surface. iQs is a soft console controlled by a full HTML-5 interface, allowing you to not only control the mix from anywhere, but on any device.

# APPLICATIONS

- Console capability without the physical surface
- Distributed / remote workforce
- Temporary studio anywhere (nontraditional studio space)
- Studios lacking physical space
- Multiple users who need concurrent collaboration on a single mix

Telos Alliance® was there for you when you made the leap to IP, and now we're here to help you on the journey to virtualization, wherever you are on that path. Our goal is to give you broadcasting options that are familiar while creating new ways of working that deliver on virtualization's promise of added scalability, adaptability, cost efficiency, simple deployment, and reliability. And that's just what we've done with our new Axia® iQs AES67 Mixing Console Software.

More than a decade ago, Telos Alliance created the Axia iQ AoIP console, now known for its ability to deliver a powerful and flexible mixing experience. Rather than pay for unwanted extras and faders, iQ allowed broadcasters to work smarter, offering the 'just right' functionality to mix content how they wanted, without sacrificing features.

Then we took the iQ philosophy and upgraded its underlying technology to create the Axia iQx AES67 console, the first AES67 AoIP console to combine the mix engine and console into one chassis. iQx lets you plug right into your AoIP network—with complete AES67 / SMPTE ST-2110-30 compliance—and enjoy the same capable, easy-to-use experience of the iQ.

Now, the Axia iQ family takes a step into the virtual AoIP future with iQs, the software version of iQx that does not require a physical surface. iQs is a soft console controlled by a full HTML-5 interface, allowing you to not only control a mix from anywhere, but on any device—Mac, Windows, tablet, laptop, even your phone!

## iQs + AE-1000 for Easy Virtualization

Telos Alliance understands that virtualizing studio operations can be an overwhelming prospect. That's why we are eliminating some of the legwork by *pre-installing* the iQs AES67 Mixing Console Software on a 1RU Telos Alliance AE-1000 Application Engine—our new line of universal servers—to help you ease into the virtual studio and prepare for the future. You can centralize the AE-1000 at the studio, yet give board operators the flexibility to control the iQs mix from a bedroom, a coffee shop, a makeshift studio... anywhere with an Internet connection.

## SCALABLE TO FIT YOUR NEEDS

iQs is also more flexible than its physical counterparts, starting with a base iQs 4-fader software module and growing in increments of 4 faders (instead of 6 or 8), up to 24 faders. This flexibility allows you to precisely dial in your soft console, without paying for extra faders you don't need.

With iQs, you get all the functionality and flexibility of our popular iQ and iQx physical consoles in a more convenient, scalable, and flexible format that delivers the mixing capability you need, where you need it, on any device.

## EXPAND IQS CAPABILITIES WITH AXIA® PATHFINDER CORE™ PRO

Livewire+™ AES67 is Telos Alliance's AoIP protocol that not only enables high-reliability, low-latency uncompressed digital audio over Ethernet, but incorporates logic, control, and program associated data (PAD) abilities. Since no signal routing solution is useful unless you can control and manage the system effectively, Telos Alliance Pathfinder Core PRO is the key to unlocking the true potential of a Livewire+ AES67 ecosystem.

By discovering and identifying all compatible devices connected to the system, Pathfinder identifies each available AoIP source and destination. As a middleware layer using its onboard protocol translator to connect with many commonly used third-party controllers, it serves as an AoIP router, an ideal core infrastructure component for diverse broadcast audio applications. Pathfinder can schedule and trigger events, detect audio silence, issue alarms, and instruct failover routing. It even allows the user to create custom screen-based control and monitoring panels.

Due to an unprecedented level of control included in the iQs platform, you can vastly expand your system capabilities by using Pathfinder Core PRO in concert with iQs. Need to automatically dial your Z/ IP ONE when you load your show? Change your program bus assignments depending on whether you are on the air or not? Fire automation system automatically when you turn your mic off? Load a show profile every day at 3:30? Raise an alert if audio is not being received correctly? Pathfinder can do it all. Additionally, use the HTML-5 panels in Pathfinder or Axia IP-Tablet to customize and develop your own user interface for iQs.

## TelosCare PLUS SLA

A TelosCare™ PLUS Service-Level Agreement provides the proactive, holistic service that broadcasters need most. You'll get 24/7 PRIORITY support and guaranteed access to software updates, patches, and releases as they become available, as well as the many other membership benefits. If you need assistance troubleshooting a workflow issue, need to install the latest version of iQs or need training on how to use iQs, you're covered with TelosCare PLUS because our priority is to keep you on air.

## iQs FEATURES

### Flexible

- Browser-based (HTML-5) and therefore accessible from any device (Windows, Mac, Tablet, Smartphone)

### Interoperable

- Standards-based console supports AES67 and SMPTE ST-2110-30; works with any AES67, Livewire+ AES67, or Livewire® source
- Assign any AoIP source to any channel, like having more than 16 million patch points!

### Easy to Use

- Familiar console interface in a software format allows users to get up and running fast, on any HTML-5 device!
- Smooth handoff from one operator to the next, even in remote locations
- Use iQs with Axia Pathfinder (not included) to easily route, monitor, and control AoIP sources

### Feature-Rich

- 3 dedicated stereo Program busses, plus a stereo Utility bus that can be used for phone calls, off-air recording, or as a fourth Program bus
- Automatic mix-minus on each fader, plus talkback functions
- Automix automatically balances levels of on-air-microphones when more than one mic is open at a time in a studio
- Off-Air Record Mode Trigger
- Studio and Control Room monitor controls
- 24 built-in stereo three-band EQs



- Channel-input confidence meters assure the operator of audio presence before taking sources to air
- Profile context-sensitive Soft key can be used to activate talkback, start delivery system events, or perform other special functions
- Stereo PFL ("cue") functions for every fader with a unique interlock system for the fast cueing of multiple sources
- Reconfigurable CR monitor section with direct selection of 4 program busses and re-assignable buttons that allow instant monitoring of external sources
- Additional monitor section provides separate monitor volume, source selection, and talkback controls for an associated studio
- Flexible built-in mix-minus and talkback system lets operators talk to phone/codec sources, each with an associated, automatically created backfeed mix-minus
- Precision event timer can be operated manually or triggered by starting preselected sources
- Unlimited Source Profiles with four quick-recall snapshots (show profiles)
- Auxiliary "V-Mix" remotely controllable 5-input virtual mixer, for whatever extra audio needs you may have

## SPECIFICATIONS FOR iQs + AE-1000 SERVER



### AE-1000 Inputs/Outputs

- AE-1000 supports a single instance of iQs, which will accommodate up to 24 faders. Start with the base 4-fader module, add faders in increments of 4 up to 24, each with instant access to any AoIP source
- 34 inputs x 24 outputs total, all AoIP, including four main stereo program bus outputs, plus bus outputs for Record, Phone, CR Monitor, CR Monitor Direct, CR Headphones, Preview, Talkback to CR, Talkback to External, Studio Guest HP, Studio Monitor, Studio Talent HP
- Automatic mix-minus provided for any source input
- Fanless
- PoE or DC 12 volt

## AE-1000 Dimensions

- 1RU
- Unit weight: 6 lbs
- Shipping weight: 8 lbs
- W:~482.6mm, L:~88mm, H: ~43mm
- Shipping dimension = 20L x 9W x 6H inches

# Axia® iQ

## The Smarter IP Console



**AES67**  
**Livewire+**

## OVERVIEW

The Axia® iQ console system can be used to build custom consoles of sizes from 8 to 24 faders. A basic system consists of one iQ 8-Fader Main Frame and one QOR.32 integrated console engine, a DSP-based mixing engine which also incorporates analog and digital audio I/O, GPIO and a custom, zero-configuration Ethernet switch. Faders and control capabilities can be expanded by adding one or more iQ Expansion Frames (up to a maximum of 3 frames per console installation). iQ console frames may be placed on top of desk surface, or mounted drop-in style. Multiple frames may be physically joined if desired.

iQ operates as a standalone console, but can also connect to Axia networks. The iQ mixing surface plugs into the QOR.32 engine using a single cable. Setup couldn't be simpler: connect the iQ control surface to the QOR.32, add audio inputs using CAT-5, perform some fast Web-based configuration, and your iQ system is ready to broadcast. It really is that simple!

iQ features 3 dedicated stereo Program buses, plus a stereo Utility bus that can be used for phone calls, off-air recording, or as a fourth Program bus. Automatic mix-minus is provided on each fader, plus talkback functions, one-button off-air Record Mode, Show Profile functions for instant recall of up to 4 pre-defined console "snapshots", high-resolution OLED program meters switchable between VU and PPM metering styles, OLED option and source name displays on each fader strip, Studio and Control Room monitor controls. Add redundant power to your iQ system with the Axia Console Power Supply. This single-cable connection to the QOR.32 console engine provides backup power with automatic switching.

# FEATURES

- Configurable from 8 to 24 faders, each with instant access to any source.
- Proven surface-and-core architecture separates control from mixing processes. No audio passes directly through iQ; all mixing and processing is performed in the QOR.32 Integrated Console Engine – so studio “accidents” don’t turn into off-air events.
- Software upgrade for QOR.32 integrated console makes iQ AoIP console AES67-compliant.
- Assign any type of source to any channel with a twist of the Options knob.
- Four main stereo outputs (Program-1 through Program-4).
- Built-in three-band per-source EQ.
- Alpha-numeric OLED displays below each fader always show the current audio source, and, when the Options knob is pressed, offer fast adjustment of fader gain trim, voice EQ, pan and balance, phase correction and other features without panel clutter or intimidating controls.
- Channel-input confidence meters assure talent of audio presence before taking sources to air.
- Each fader’s context-sensitive Soft key can be used to activate talkback, start delivery system events, or perform other special functions.
- Every fader has a stereo Preview (“cue”) function, with a unique interlock system for fast cuing of multiple sources.
- Smooth, long-life 100mm. conductive-plastic faders resist dirt and contamination.
- Reconfigurable CR monitor section with direct-selection of Program buses and reassignable buttons that allow instant monitoring of external sources.
- An additional monitor section provides monitor volume, source selection and talkback controls for an associated air studio.
- Flexible talkback system lets board op talk to studio guests or any Phone or Codec source with an associated backfeed.
- Up to 8 automatic mix-minuses may be used simultaneously for phones, remote talent, etc.
- Unique Record Mode enables one-button setup of record mixes for phone bits or off-air interviews.
- High-resolution OLED displays provide responsive, readable VU or PPM metering styles. Displays can be switched to display 2, 3 or 4 meters at once.
- Precision event timer that can be operated manually or triggered by starting pre-selected sources.
- Time-of-day clock can be synchronized to network time using NTP.
- Four custom Show Profile “snapshots” can be saved to instantly recall frequently-used console setups – useful to quickly prepare for interview segments, music-intensive programming, call-in talk shows, etc.
- All functions can be accessed remotely for configuration, management and diagnostic purposes using any standard Web browser.
- Multiple iQ frames can be joined to produce a single, large control surface, or operated separately if desired to suit studio design.

- Optional Telco Expansion frame provides direct, on-the-console control of matching Telos® iQ6 six-line telephone system, or other Telos talkshow systems. High-resolution OLED displays use exclusive Telos Status Symbols for instant call status information. Includes a Dump key to trigger user-supplied profanity delay unit using GPIO closures.
- Easy-to-deploy QOR.32 integrated console engine includes console CPU and power supply, DSP mixing engine, custom Ethernet switch with 6 Livewire® ports and 2 Gigabit ports for studio networking, 16 analog inputs and 8 analog outputs, 2 AES inputs and 2 AES outputs, 4 Mic inputs with switchable Phantom power, and 8 GPIO ports for machine control. I/O can be expanded using Telos Alliance® xNodes.
- Integrated zero-configuration network switch is custom-designed for broadcasting — no switch setup required.
- QOR.32's built-in Ethernet switch supports Simple Networking, allowing up to 4 iQ consoles to be daisy-chained without the need for a separate core switch.
- Fan-free, convection-cooled power supply for noiseless in-studio operation.
- Optional backup Axia Console Power Supply with automatic failover for complete peace of mind.
- Configurable network gateway allows loading of networked as well as local audio sources while simultaneously exporting audio streams for network use elsewhere. Gateway can be configured for 12-in, 4-out or 8-in, 8-out modes.
- Automixer available on all channels.

## IN DEPTH

### Control at the Click of a Mouse. Easy Installation. Fast Configuration. Intuitive Operation.

For today's broadcast engineer, there aren't enough hours in the day. You're looking for a console that makes the most of your resources. One that installs quickly, with a minimum of fuss. One that works smart, with features that help talent to do smoother, more error-free shows. One that's perfectly happy in a standalone studio — but that also connects quickly and easily to a larger studio network.

iQ is the console you're looking for. More than just a pretty face, iQ is a broadcast console with mixing engine, analog and AES audio I/O, Livewire audio connections, machine-control logic and a zero-configuration built-for-broadcast Ethernet switch, all rolled into one easy-to-deploy package. Connect the iQ control surface to the QOR.32 integrated console engine with just one cable. Then add audio inputs using CAT-5, perform some fast Web-based configuration and, presto! your new iQ console is ready to broadcast. Optional Axia Console Backup Power Supply adds redundant power to your iQ system for complete peace of mind.

Thanks to all those built-in goodies, iQ is the perfect self-contained, standalone console for an individual studio. But should you wish to expand and network with other studios, iQ can grow with you. Simple Networking lets you daisy-chain up to four QOR.32 engines without the need for an external Ethernet switch. You can add iQ expansion frames to create consoles as large as 24 faders. Other optional frames add control for Telos telephone systems and GPIO routing functions to the console.

More smart stuff: iQ remembers. Four Show Profile memory positions let you set, save and recall snapshots of console settings for later use. High-resolution Organic LED meters (bright, high-resolution displays that are bright and legible, even under direct lighting) offer switchable VU or PPM metering styles, and the ability to meter two, three, or all four buses at once.

There are also OLED displays on every fader that provide source assignments, pan & balance settings, fader options and more — which means no additional computer monitors or mice to clutter up your studio. The display can also work with the Soft Keys just below to trigger GPIO events, step automation events, and adjust source input options.

iQ saves your studio furniture, too. Its desktop design lets you place it atop any solid surface — no templates to decipher or countertops to cut (unless you really want to). Since iQ only requires a single cable to connect control surface to mixing engine, even cable access holes can be small and unobtrusive. And iQ lets you choose between freestanding or contiguous console designs: you can easily join iQ expansion frames into one unit, or leave them separate to deploy a split-console design.

Like all Axia consoles, iQ is over-engineered for long life. It's built with sturdy, premium materials, to withstand even the beatings a weekend overnight jock can give. It's got sturdy, machined aluminum frame construction, LED button lighting, long-life conductive-plastic faders, and anodized — not painted! — surfaces with laser-etched markings that can't ever rub off. But the most clever thing about iQ might just be its price. A 16-fader iQ costs about half what you'd expect to pay for a console with all these features. Now that's pretty smart, don't you think?

## iQ System Components

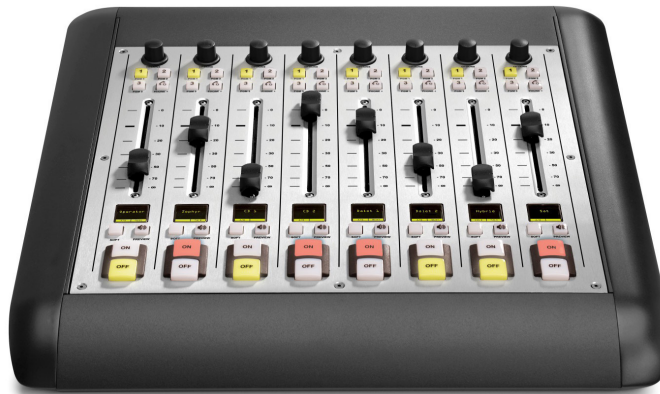
Like all Axia systems, iQ is customizable and scalable. The QOR.32 integrated console engine contains the console's mix engine, CPU, power supply and 32 audio I/O connections, and supports console sizes from 8 to 24 faders. Start with an eight-fader iQ Main Frame, then add expansion frames with more faders and capabilities to tailor iQ to your studio's needs. Gigabit Ethernet lets you connect to a larger Axia network; Simple Networking lets you daisy-chain up to four QOR.32 without the need for an external Ethernet switch.

### iQ Main Frame



The heart of your iQ console; can be installed as a standalone console or connected to an Axia studio network. Has three dedicated stereo Program buses, plus a stereo utility bus that can be used for phone calls, off-air recording, or as a fourth Program bus, eight faders, automatic per-fader mix-minus, high-res OLED program meters and channel displays, Studio and Control Room monitor controls and an integrated Talkback system. For bigger consoles, add one or two iQ expansion frames to build boards of up to 24 faders. Flexible mounting system allows desktop, drop-in and even rack-mounted operation.

## 8-Fader Expansion Frame



The iQ 8-Fader frame doubles the size of your iQ instantly. It's simple to expand the capacity of iQ consoles, even after they've been in service, so you can easily grow your iQ system; expansion frames plug right into the QOR.32 integrated console engine. Like all iQ frames, the 8-Fader expansion comes equipped with Axia's rugged, anodized machined-aluminum surface, conductive-plastic faders, aircraft-quality switches and LED button lighting. Can be physically joined to Main Frame or left separate.

## 6-Fader Expansion Frame with User Keys



Put machine control and GPIO-triggered routing commands at your operators' fingertips with this iQ expansion frame. In addition to the six additional faders, 10 User Keys can be software-mapped to control audio delivery systems, send contact closures or route GPIO commands to studio devices.



## 6-Fader Telco Expansion Frame



Puts integrated phone system control right where it belongs: on the console, to help eliminate distractions and errors. Along with six silky-smooth conductive-plastic faders, this frame includes on-the-board hybrid controls for the matching Telos iQ6 six-line telephone hybrid (it works with other Telos phone systems, too). The learning curve is low: exclusive Telos Status Symbols readouts on sharp-as-a-tack OLED displays, along with familiar twin hybrid controls, make easy work of busy call-in segments.

## iQ6 6-Line Telco Gateway



The iQ6 broadcast phone system was custom-designed by the phone experts at Telos specifically for iQ consoles. It works with the hybrid controls built into your iQ's Telco expansion frame (and with Telos VSet6 phone controllers). Connect it to the QOR.32 console engine with a CAT-6 cable, plug in your phone lines, and start taking calls.

## QOR.32 Integrated Console Engine



The QOR.32 integrated console engine is a DSP-based mixing engine with onboard I/O, GPIO, console power supply and custom-built, configuration-free Ethernet switch. You'll find plenty of I/O, including 4 mic inputs with selectable Phantom power, 16 analog inputs, 2 AES/EBU inputs, 8 Analog outputs, 2 AES/EBU outputs, 8 GPIO machine-control logic ports (each with 5 opto-isolated inputs and 5 outputs), and that powerful integrated Ethernet switch with 6 Livewire 100BASE-T ports (4 with PoE), 2 Gigabit ports (RJ-45 & SFP), and 4 CANBus ports for console expansion (maximum cable length 40 feet). Sure, that's plenty of I/O, but if you need more you can instantly add it just by plugging in Telos Alliance xNodes. QOR.32 is convection-cooled for utterly silent, fan-free operation.

## Axia Console Backup Power Supply



Add redundant power to your iQ system! Single-cable connection to QOR.32 console engine provides backup power with automatic switching. Auto-sensing power supply, 90VAC to 240VAC, 50 Hz to 60 Hz. 250 Watts. Rackmount, 2RU.

# SPECIFICATIONS

## QOR.32 Connections

- Microphone Inputs: 4x balanced XLR-F, with selectable Phantom power
- Analog Inputs: 16x RJ-45, StudioHub+ standard.
- Analog Outputs: 8x RJ-45, StudioHub+ standard.
- AES/EBU Inputs: 2x RJ-45, StudioHub+ standard.
- AES/EBU Outputs: 2x RJ-45, StudioHub+ standard.
- GPIO: 8x DB-15
- Livewire:
  - 4x 100BASE-T with PoE, RJ-45
  - 2x 100BASE-T, RJ-45
  - 2x 1000BASE-T, RJ-45
  - 2x Gigabit, SFP (Small Form Pluggable)
- Console Frame Connections: 3x, 6-pin "latch and lock" style
- Accessory Connections: 1x, 6-pin "latch and lock" style

## Microphone Preamplifiers

- Source Impedance: 150 Ohms
- Input Impedance: 4 k Ohms minimum, balanced
- Nominal Level Range: Adjustable, -75 dBu to -20 dBu
- Input Headroom: >20 dB above nominal input
- Output Level: +4 dBu, nominal

## Analog Line Inputs

- Input Impedance: 20 k Ohms
- Nominal Level Range: Selectable, +4 dBu or -10dBv
- Input Headroom: 20 dB above nominal input

## Analog Line Outputs

- Output Source Impedance: <50 Ohms balanced
- Output Load Impedance: 600 Ohms, minimum
- Nominal Output Level: +4 dBu
- Maximum Output Level: +24 dBu

## Digital Audio Inputs And Outputs

- Reference Level: +4 dBu (-20 dB FSD)
- Impedance: 110 Ohm, balanced (XLR)
- Signal Format: AES-3 (AES/EBU)
- AES-3 Input Compliance: 24-bit with selectable sample rate conversion, 20 kHz to 216kHz input sample rate capable.
- AES-3 Output Compliance: 24-bit
- Digital Reference: Internal (network timebase) or external reference 48 kHz, +/- 2 ppm
- Internal Sampling Rate: 48 kHz
- Output Sample Rate: 48 kHz
- A/D Conversions: 24-bit, Delta-Sigma, 256x oversampling
- D/A Conversions: 24-bit, Delta-Sigma, 256x oversampling
- Latency <3 ms, mic in to monitor out, including network and processor loop

## Frequency Response

- Any input to any output: +0.5 / -0.5 dB, 20 Hz to 20 kHz

## Dynamic Range

- Analog Input to Analog Output: 102 dB referenced to 0 dBFS, 105 dB "A" weighted to 0 dBFS
- Analog Input to Digital Output: 105 dB referenced to 0 dBFS
- Digital Input to Analog Output: 103 dB referenced to 0 dBFS, 106 dB "A" weighted
- Digital Input to Digital Output: 125 dB

## Equivalent Input Noise

- Microphone Preamp: -128 dBu, 150 Ohm source, reference -50 dBu input level

## Total Harmonic Distortion + Noise

- Mic Pre Input to Analog Line Output: <0.005%, 1 kHz, -38 dBu input, +18 dBu output
- Analog Input to Analog Output: <0.008%, 1 kHz, +18 dBu input, +18 dBu output
- Digital Input to Digital Output: <0.0003%, 1 kHz, -20 dBFS
- Digital Input to Analog Output: <0.005%, 1 kHz, -6 dBFS input, +18 dBu output

## Crosstalk Isolation, Stereo Separation And CMRR

- Analog Line channel to channel isolation: 90 dB isolation minimum, 20 Hz to 20 kHz
- Microphone channel to channel isolation: 80 dB isolation minimum, 20 Hz to 20 kHz
- Analog Line Stereo separation: 85 dB isolation minimum, 20Hz to 20 kHz
- Analog Line Input CMRR: >50 dB, 20 Hz to 20 kHz Microphone Input CMRR: >50 dB, 20 Hz to 20 kHz

## Audio Processing

- Mic Equalizer (applicable to up to 6 faders)
- Frequency Bands: 20Hz to 320Hz, 125Hz to 2KHz, 1.25KHz to 20KHz.
- Cut/Boost range on each band: -25dB to +15dB.
- Q-factor: Automatic - bandwidth varies based on amount of cut or boost.

## Power Supply AC Input, QOR.32 with iQ Console

- Auto-sensing supply, 90VAC to 240VAC, 50 Hz to 60 Hz, IEC receptacle, internal fuse
- Power consumption: 100 Watts

## Operating Temperatures

- -10 degrees C to +40 degrees C, <90% humidity, no condensation

## Dimensions

- iQ Main Frame 20.5" x 19" x 4.5" (desktop to meter bridge)
- iQ Expansion Frames 17.5" x 18.25" x 3" (desktop to tallest control)

## Regulatory

**North America:** FCC and CE tested and compliant, power supply is UL approved.

**Europe:** Complies with the European Union Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), as amended by Commission Decisions 2005/618/EC, 2005/717/EC, 2005/747/EC (RoHS Directive), and WEEE.

# Axia® Radius

## Throw Your Budget A Curve



**AES67**  
**Livewire+**

## OVERVIEW

Radius is an all-in-one console system designed for small standalone or networked studios, where no more than eight faders are needed. Like all Axia® consoles, it's easy to deploy: each Radius control surface is powered by a burly QOR.16 integrated console engine with DSP-powered mixing engine, analog and digital audio I/O, custom Ethernet switch and GPIO ports. The Radius surface connects to the QOR.16 engine with a single CANBus cable.

Radius includes 4 stereo Program buses — 3 dedicated Program, Audition and Utility mixing outputs; the fourth a stereo Utility bus for recording phone callers or other off-air bits. The fourth bus may also be used as an additional Program bus. Automatic mix-minus is provided on each fader, plus talkback functions, one-button off-air Record Mode, Show Profile instant recall of up to 4 pre-defined console "snapshots", LED bar-graph program meters switchable between VU and PPM meter styles, high-resolution OLED option displays on each fader, and Studio and Control Room monitor controls. Radius can be placed on top of desk surfaces, mounted drop-in style, or rack-mounted using included hardware.

# FEATURES

- 8 faders, each with instant access to any source. Assign any type of source to any channel with a simple twist of the Options knob.
- Proven surface-and-core architecture separates control from mixing processes. No audio passes directly through Radius; all mixing and processing is performed in the QOR.16 Integrated Console Engine – so studio “accidents” don’t turn into off-air events.
- Four main stereo outputs (Program-1 through Program-4).
- Software upgrade for QOR.16 integrated console makes Radius AoIP console AES67-compliant.
- Built-in three-band per-source EQ.
- Alpha-numeric OLED displays below each fader always show the current audio source, and, when the Options knob is pressed, offer fast adjustment of fader gain trim, voice EQ, pan and balance, phase correction and other features without panel clutter or intimidating controls.
- Channel-input confidence meters assure talent of audio presence before taking sources to air.
- Each fader’s context-sensitive Soft key can be used to activate talkback, start delivery system events, or perform other special functions.
- Every fader has a stereo Preview (“cue”) function, with a unique interlock system for fast cuing of multiple sources.
- Smooth, long-life 100mm. conductive-plastic faders resist dirt and contamination.
- Reconfigurable CR monitor section with direct-selection of Program buses and reassignable buttons that allow instant monitoring of external sources.
- An additional monitor section provides monitor volume, source selection and talkback controls for an associated air studio.
- Flexible talkback system lets board op talk to studio guests or any Phone or Codec source with an associated backfeed.
- Up to 8 automatic mix-minuses may be used simultaneously for phones, remote talent, etc.
- Unique Record Mode enables one-button setup of record mixes for phone bits or off-air interviews.
- Bright, readable bar-graph displays provide responsive, readable VU or PPM metering styles. Switchable displays allow metering any Program bus or monitor selection.
- Meter-bridge display includes a precision event timer that may be operated manually or triggered by starting preselected sources, and a time-of-day clock that can be synchronized to network time using NTP.
- Four custom Show Profile “snapshots” can be saved to instantly recall frequently-used console setups – useful to quickly prepare for interview segments, music-intensive programming, call-in talk shows, etc.
- Automixer available on all channels.

- All functions can be accessed remotely for configuration, management and diagnostic purposes using any standard Web browser.
- Radius surface is field-convertible to rack-mounted operation. Special faders provide smooth operation, yet hold their positions in vertical orientation.
- Easy-to-deploy QOR.16 integrated console engine includes console CPU and power supply, DSP mixing engine, custom Ethernet switch with 6 Livewire® ports and 2 Gigabit ports for studio networking, 8 analog inputs and 4 analog outputs, 1 AES input and 1 AES output, 2 Mic inputs with switchable Phantom power, and 4 GPIO ports for machine control. I/O can be expanded using Telos Alliance® xNodes.
- Integrated zero-configuration network switch is custom-designed for broadcasting — no switch setup required.
- QOR.16's built-in Ethernet switch supports Simple Networking, allowing up to 4 iQ consoles to be daisy-chained without the need for a separate core switch.
- Fan-free, convection-cooled power supply for noiseless in-studio operation.
- Configurable network gateway allows loading of networked as well as local audio sources while simultaneously exporting audio streams for network use elsewhere. Gateway can be configured for 12-in, 4-out or 8-in, 8-out modes.

## IN DEPTH

### Spend Less. Get More.

"You get what you pay for," as the saying goes. But sometimes, you actually get less. For example, you've probably noticed how "affordable" radio consoles are usually missing important features and capabilities. Trying to do a radio show with a board like that is like trying to open a can with a spoon: you might succeed eventually, but you sure won't enjoy it.

At Axia, we're broadcasters too, through and through. And we believe that having a reasonable equipment budget shouldn't mean being forced to settle for something less than you deserve. We've decided you should get more than you pay for — much more. Which is why we designed Radius, the IP console that proves you can have your cake and eat it, too. While some console companies try to see how much they can take out of a console to meet a price point, Radius was designed in exactly the opposite way: we challenged ourselves to see just how many features and capabilities we could pack in, while still meeting your budget requirements.

Radius is the easiest AoIP console ever. Just connect the 8-fader mixing surface to the QOR.16 integrated console engine, plug in your sources and power, and you're ready to make great radio. Because it's so compact, Radius is the perfect standalone console, but Gigabit ports on its QOR.16 integrated console engine let you connect it to other studios too. Radius' network gateway lets you load up to 12 audio sources from anywhere in your Livewire network, while simultaneously sending your locally produced streams back out to the net.



Radius is loaded with features you'd expect to pay much more for. You'll find three stereo Program buses, and a stereo utility bus that can be used for recording phone calls and off-air bits (or as a fourth Program bus). Automatic mix-minus for every phone caller and remote talent means never having to fiddle with making a manual backfeed. Bright multi-segment LED meters are switchable between VU and PPM styles. High-resolution OLED displays for each fader show source assignments, audio options and more. And Show Profiles that you can program to instantly load talent's most frequently-used console configurations.

Like all Axia consoles, Radius is built for long-lasting reliability, ready to stand up to anything your operators throw at it, with an EM-tight steel frame, anodized machined aluminum work surface with etched markings that can never rub off, silky-smooth conductive-plastic faders, aircraft-quality switches and rotary controls, and integrated clock/event timer. There are even monitor source and volume controls for an associated studio — something you'd expect to find only in bigger consoles costing much more.



There are also OLED displays on every fader that provide source assignments, pan & balance settings, fader options and more — which means no additional computer monitors or mice to clutter up your studio. The display can also work with the Soft Keys just below to trigger GPIO events, step automation events, and adjust source input options.

Like its big brother, iQ, Radius is designed to sit atop any solid surface — no templates to decipher or countertops to cut (unless you really want to). A single cable connects it to the QOR.16 mixing engine. Also like iQ, Radius is built with premium materials like a machined aluminum frame construction, LED button lighting, long-life conductive-plastic faders, and anodized – not painted! – surfaces with laser-etched markings that can't ever rub off.



Audio I/O, GPIO, console CPU, super-duty power supply, and even a network switch are all built into the QOR.16. Just plug in your mics, CD players, codecs, profanity delays, whatever. There are 16 audio I/O ports: two Mic inputs with switchable Phantom power, eight analog inputs and four analog outputs, and one AES/EBU input and output. QOR.16 also has four GPIO logic ports for machine control of studio peripherals, six 100BASE-T ports for Livewire devices, and two Gigabit ports with SFP for connection to the outside world. For more I/O, just add Telos Alliance xNode interfaces. And you can daisy chain as many as four QOR engines without the need for an external Ethernet switch, making installation even more economical.

# SPECIFICATIONS

## QOR.16 Connections

- Microphone Inputs: 2x balanced XLR-F, with selectable Phantom power
- Analog Inputs: 8x RJ-45, StudioHub+ standard.
- Analog Outputs: 4x RJ-45, StudioHub+ standard.
- AES/EBU Inputs: 1x RJ-45, StudioHub+ standard.
- AES/EBU Outputs: 1x RJ-45, StudioHub+ standard.
- GPIO: 4x DB-15
- Livewire:
  - 4x 100BASE-T with PoE, RJ-45
  - 2x 100BASE-T, RJ-45
  - 2x 1000BASE-T, RJ-45
  - 2x Gigabit, SFP (Small Form Pluggable)
- Console Frame Connections: 1x, 6-pin "latch and lock" style
- Accessory Connections: 1x, 6-pin "latch and lock" style

## Microphone Preamplifiers

- Source Impedance: 150 Ohms
- Input Impedance: 4 k Ohms minimum, balanced
- Nominal Level Range: Adjustable, -75 dBu to -20 dBu
- Input Headroom: >20 dB above nominal input
- Output Level: +4 dBu, nominal

## Analog Line Inputs

- Input Impedance: 20 k Ohms
- Nominal Level Range: Selectable, +4 dBu or -10dBv
- Input Headroom: 20 dB above nominal input

## Analog Line Outputs

- Output Source Impedance: <50 Ohms balanced
- Output Load Impedance: 600 Ohms, minimum
- Nominal Output Level: +4 dBu
- Maximum Output Level: +24 dBu

## Digital Audio Inputs And Outputs

- Reference Level: +4 dBu (-20 dB FSD)
- Impedance: 110 Ohm, balanced (XLR)
- Signal Format: AES-3 (AES/EBU)
- AES-3 Input Compliance: 24-bit with selectable sample rate conversion, 20 kHz to 216kHz input sample rate capable.
- AES-3 Output Compliance: 24-bit
- Digital Reference: Internal (network timebase) or external reference 48 kHz, +/- 2 ppm
- Internal Sampling Rate: 48 kHz
- Output Sample Rate: 48 kHz
- A/D Conversions: 24-bit, Delta-Sigma, 256x oversampling
- D/A Conversions: 24-bit, Delta-Sigma, 256x oversampling
- Latency <3 ms, mic in to monitor out, including network and processor loop

## Frequency Response

- Any input to any output: +0.5 / -0.5 dB, 20 Hz to 20 kHz

## Dynamic Range

- Analog Input to Analog Output: 102 dB referenced to 0 dBFS, 105 dB "A" weighted to 0 dBFS
- Analog Input to Digital Output: 105 dB referenced to 0 dBFS
- Digital Input to Analog Output: 103 dB referenced to 0 dBFS, 106 dB "A" weighted
- Digital Input to Digital Output: 125 dB

## Equivalent Input Noise

- Microphone Preamp: -128 dBu, 150 Ohm source, reference -50 dBu input level

## Total Harmonic Distortion + Noise

- Mic Pre Input to Analog Line Output: <0.005%, 1 kHz, -38 dBu input, +18 dBu output
- Analog Input to Analog Output: <0.008%, 1 kHz, +18 dBu input, +18 dBu output
- Digital Input to Digital Output: <0.0003%, 1 kHz, -20 dBFS
- Digital Input to Analog Output: <0.005%, 1 kHz, -6 dBFS input, +18 dBu output

## Crosstalk Isolation, Stereo Separation And CMRR

- Analog Line channel to channel isolation: 90 dB isolation minimum, 20 Hz to 20 kHz
- Microphone channel to channel isolation: 80 dB isolation minimum, 20 Hz to 20 kHz
- Analog Line Stereo separation: 85 dB isolation minimum, 20Hz to 20 kHz
- Analog Line Input CMRR: >50 dB, 20 Hz to 20 kHz
- Microphone Input CMRR: >50 dB, 20 Hz to 20 kHz

## Audio Processing

- Mic Equalizer (applicable to up to 6 faders)
- Frequency Bands: 20Hz to 320Hz, 125Hz to 2KHz, 1.25KHz to 20KHz.
- Cut/Boost range on each band: -25dB to +15dB.
- Q-factor: Automatic - bandwidth varies based on amount of cut or boost.

## Power Supply AC Input, QOR.16 with Radius Console

- Auto-sensing supply, 90VAC to 240VAC, 50 Hz to 60 Hz, IEC receptacle, internal fuse
- Power consumption: 100 Watts

## Operating Temperatures

- -10 degrees C to +40 degrees C, <90% humidity, no condensation

## Dimensions

- 20.5" x 19" x 4.5" (desktop to meter bridge)

## Regulatory

**North America:** FCC and CE tested and compliant, power supply is UL approved.

**Europe:** Complies with the European Union Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), as amended by Commission Decisions 2005/618/EC, 2005/717/EC, 2005/747/EC (RoHS Directive), and WEEE.

# Axia® RAQ

## Rack-Mount IP Console



**AES67**  
**Livewire+**

## OVERVIEW

Six-fader Axia® RAQ console provides a convenient way to add a physical mixing surface nearly anywhere, no matter how space-limited. RAQ has six rotary faders with OLED channel options displays, two stereo mixing buses and Preview (cue) bus, a high-resolution OLED meter display with switchable VU / PPM ballistics, and monitor / headphone controls for auditioning of Program buses or two assignable External monitor source selections.

RAQ is built for heavy duty work. Aircraft-quality switches feature all-LED lighting. The anodized metal work surface features rub-proof, etched markings that can't rub off. Smooth, accurate rotary faders with push-on/push-off channel switches make fast work of audio control. And RAQ features Axia's famous fully-automatic mix-minus for phone callers and codec sources, too. Show Profiles give instant recall of up to 4 pre-defined console "snapshots".

RAQ is ideal for standalone installation, but networks with larger Axia networks too. A RAQ control surface and a QOR.16 integrated console engine constitute a complete RAQ system, but two RAQ consoles, or one RAQ and one DESQ console, may be paired with a single QOR.16 for cost-effective multi-console deployment.

# FEATURES

- 6 faders, each with instant access to any source. Assign any type of source to any channel with a simple twist of the Options knob.
- Proven surface-and-core architecture separates control from mixing processes. No audio passes directly through RAQ; all mixing and processing is performed in the QOR.16 Integrated Console Engine – so studio “accidents” don’t turn into off-air events.
- Software upgrade for QOR.16 integrated console makes the RAQ AoIP console AES67-compliant.
- Two stereo mix buses and a Preview (cue) bus.
- Alpha-numeric OLED displays below each fader always show the current audio source with audio confidence meter, and, when the Options knob is pressed, offer fast adjustment of fader gain trim, EQ, pan and balance and other features without panel clutter or intimidating controls.
- Channel-input confidence meters assure talent of audio presence before taking sources to air.
- Built-in three-band per-source EQ.
- Each fader’s context-sensitive Soft key can be used to activate talkback, start delivery system events, or perform other special functions.
- Every channel strip has a stereo Preview (“cue”) function, with a unique interlock system for fast cuing of multiple sources.
- Reconfigurable CR monitor section with direct-selection of Program buses and reassignable buttons that allow instant monitoring of external sources.
- Four custom Show Profile “snapshots” can be saved to instantly recall frequently-used console setups – useful to quickly prepare for interview segments, music-intensive programming, call-in talk shows, etc.
- Automatic mix-minuses for phones, remote talent, etc.
- Bright OLED meter display provides responsive, readable VU or PPM metering styles. Switchable display allows metering either Program bus.
- All functions can be accessed remotely for configuration, management and diagnostic purposes using any standard Web browser.
- Network gateway enables loading networked sources while simultaneously exporting outputs back to the network.
- Easy-to-deploy QOR.16 integrated console engine includes console CPU and power supply, DSP mixing engine, custom Ethernet switch with 6 Livewire® ports and 2 Gigabit ports for studio networking, 8 analog inputs and 4 analog outputs, 1 AES input and 1 AES output, 2 Mic inputs with switchable Phantom power, and 4 GPIO ports for machine control. I/O can be expanded using Telos Alliance® xNodes.
- QOR.16’s integrated zero-configuration network switch is custom-designed for broadcasting — no switch setup required. Supports Simple Networking, allowing up to 4 QOR engines to be daisy-chained without the need for a separate core switch.
- Each QOR.16 can support two connected RAQ or DESQ consoles, or one of each.
- Fan-free, convection-cooled power supply for noiseless in-studio operation.
- Automixer available on all channels.

## IN DEPTH

### A big console for small spaces.

Not every studio requires a full-size mixing console. Not every studio is full-size, itself! But you still want the advantages of IP-Audio networking: the ability to send program audio to other studios, the ability to consume audio from satellite downlinks, remote codecs and phone hybrids, or to trigger routing scene changes from a user-mapped control panel. And you don't want a toylike plastic pro-audio mixer — you want a real broadcast console that fits into a rack or turret, or on a small desktop space. A console with a small footprint, but big capabilities.

RAQ is a compact, special-purpose IP console from Axia. It may be compact in stature, but it's big on features and performance. RAQ has “big board” capabilities you won't find in other consoles of this size — automatic per-fader mix-minus, built-in EQ for voice and codec sources, and the ability to instantly load new local or networked sources to any fader with just the turn of a knob. Which means RAQ easily out-classes mixers with similar form factors — and even ones that take up much more room.



RAQ is a six-channel mixer over-engineered the Axia way, with super-duty rotary faders, aluminum front-panel, high-resolution OLED displays for channel assignment and metering, heavy-duty switches with LED lighting, and four Show Profile snapshot locations you can use to store and instantly recall favorite console configurations. One touch, and presto! Talent's favorite sources are loaded, monitor source configured, and bus assignments made.

RAQ has two stereo mixing buses, plus a Preview (cue) bus, which makes it the perfect rack-mount utility mixer, whether in the studio, in an OB van, or in a road case. It fits in just 4 RU of space, so you can place it anywhere you need a full-featured, rack-mounted mixer: News booths, editors' workstations,



voice-over booths, dubbing stations, even small remote studios or club installations.

RAQ also features something else you won't find on other compact consoles: a full-featured Monitor section. Along with headphone and Preview volume controls, you'll also find a selector that lets you hear either Program 1, Program 2, or one of two External sources —helpful for monitoring off-air feeds, a processed headphone chain, or another studio. And you can finally say goodbye to Dymo labels and masking tape: each channel has an OLED display to show exactly what source is loaded.



Audio I/O, GPIO, console CPU, super-duty power supply, and even a network switch are all built into the QOR.16. Just plug in your mics, CD players, codecs, profanity delays, whatever. There are 16 audio I/O ports: two Mic inputs with switchable Phantom power, eight analog inputs and four analog outputs, and one AES/EBU input and output. QOR.16 also has four GPIO logic ports for machine control of studio peripherals, six 100BASE-T ports for Livewire devices, and two Gigabit ports with SFP for connection to the outside world. For more I/O, just add Telos Alliance xNode interfaces. And you can daisy chain as many as four QOR engines without the need for an external Ethernet switch, making installation even more economical.

And here's the kicker: one QOR.16 can power two RAQ mixers — or a RAQ and a DESQ (RAQ's six-fader, desktop-mount cousin)! Despite all these features, RAQ is so cost-effective, broadcasters are coming up with creative, new uses for them. We figured folks would use them for news booths, dubbing stations and guest performance mixers, but audio pros are also telling us they'd be ideal for broadcast remote kits, mobile trucks, for shipboard broadcasting, or as personal mixers. What else could you use them for?

The possibilities are endless...

## SPECIFICATIONS

### QOR.16 Connections

- Microphone Inputs: 2x balanced XLR-F, with selectable Phantom power
- Analog Inputs: 8x RJ-45, StudioHub+ standard.
- Analog Outputs: 4x RJ-45, StudioHub+ standard.
- AES/EBU Inputs: 1x RJ-45, StudioHub+ standard.
- AES/EBU Outputs: 1x RJ-45, StudioHub+ standard.
- GPIO: 4x DB-15
- Livewire:
  - 4x 100BASE-T with PoE, RJ-45
  - 2x 100BASE-T, RJ-45
  - 2x 1000BASE-T, RJ-45
  - 2x Gigabit, SFP (Small Form Pluggable)
- Console Frame Connections: 1x, 6-pin "latch and lock" style
- Accessory Connections: 1x, 6-pin "latch and lock" style

### Microphone Preamplifiers

- Source Impedance: 150 Ohms
- Input Impedance: 4 k Ohms minimum, balanced
- Nominal Level Range: Adjustable, -75 dBu to -20 dBu
- Input Headroom: >20 dB above nominal input
- Output Level: +4 dBu, nominal

### Analog Line Inputs

- Input Impedance: 20 k Ohms
- Nominal Level Range: Selectable, +4 dBu or -10dBv
- Input Headroom: 20 dB above nominal input

### Analog Line Outputs

- Output Source Impedance: <50 Ohms balanced
- Output Load Impedance: 600 Ohms, minimum
- Nominal Output Level: +4 dBu
- Maximum Output Level: +24 dBu

## Digital Audio Inputs and Outputs

- Reference Level: +4 dBu (-20 dB FSD)
- Impedance: 110 Ohm, balanced (XLR)
- Signal Format: AES-3 (AES/EBU)
- AES-3 Input Compliance: 24-bit with selectable sample rate conversion, 20 kHz to 216kHz input sample rate capable.
- AES-3 Output Compliance: 24-bit
- Digital Reference: Internal (network timebase) or external reference 48 kHz, +/- 2 ppm
- Internal Sampling Rate: 48 kHz
- Output Sample Rate: 48 kHz
- A/D Conversions: 24-bit, Delta-Sigma, 256x oversampling
- D/A Conversions: 24-bit, Delta-Sigma, 256x oversampling
- Latency <3 ms, mic in to monitor out, including network and processor loop

## Frequency Response

- Any input to any output: +0.5 / -0.5 dB, 20 Hz to 20 kHz

## Dynamic Range

- Analog Input to Analog Output: 102 dB referenced to 0 dBFS, 105 dB "A" weighted to 0 dBFS
- Analog Input to Digital Output: 105 dB referenced to 0 dBFS
- Digital Input to Analog Output: 103 dB referenced to 0 dBFS, 106 dB "A" weighted
- Digital Input to Digital Output: 125 dB

## Equivalent Input Noise

- Microphone Preamp: -128 dBu, 150 Ohm source, reference -50 dBu input level

## Total Harmonic Distortion + Noise

- Mic Pre Input to Analog Line Output: <0.005%, 1 kHz, -38 dBu input, +18 dBu output
- Analog Input to Analog Output: <0.008%, 1 kHz, +18 dBu input, +18 dBu output
- Digital Input to Digital Output: <0.0003%, 1 kHz, -20 dBFS
- Digital Input to Analog Output: <0.005%, 1 kHz, -6 dBFS input, +18 dBu output

## Crosstalk Isolation, Stereo Separation And CMRR

- Analog Line channel to channel isolation: 90 dB isolation minimum, 20 Hz to 20 kHz
- Microphone channel to channel isolation: 80 dB isolation minimum, 20 Hz to 20 kHz
- Analog Line Stereo separation: 85 dB isolation minimum, 20Hz to 20 kHz
- Analog Line Input CMRR: >50 dB, 20 Hz to 20 kHz
- Microphone Input CMRR: >50 dB, 20 Hz to 20 kHz

## Audio Processing

- Mic Equalizer (applicable to up to 6 faders)
- Frequency Bands: 20Hz to 320Hz, 125Hz to 2KHz, 1.25KHz to 20KHz.
- Cut/Boost range on each band: -25dB to +15dB.
- Q-factor: Automatic - bandwidth varies based on amount of cut or boost.

## Power Supply AC Input, QOR.16 with RAQ Console

- Auto-sensing supply, 90VAC to 240VAC, 50 Hz to 60 Hz, IEC receptacle, internal fuse
- Power consumption: 100 Watts

## Operating Temperatures

- -10 degrees C to +40 degrees C, <90% humidity, no condensation

## Dimensions

- W 19.0 in (48 cm), H 3RU, 6.97 in (177.0 cm), D 2.54 in (64.50 cm)

## Regulatory

**North America:** FCC and CE tested and compliant, power supply is UL approved.

**Europe:** Complies with the European Union Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), as amended by Commission Decisions 2005/618/EC, 2005/717/ EC, 2005/747/EC (RoHS Directive), and WEEE.

# Axia® DESQ

## Compact Desktop IP Console



## OVERVIEW

**AES67**  
**Livewire+**

Six-fader, two-bus Axia DESQ console is a cost-effective, small-footprint console option perfect for small production studios, remote vehicles, content ingest stations, etc. DESQ has two stereo mixing buses and a Preview (cue) bus, six high-quality 100mm conductive-plastic faders for silky-smooth operation and long life, razor-sharp OLED channel options displays, an OLED meter display with switchable VU / PPM ballistics, and monitor / headphone controls for auditioning of Program buses or two assignable External monitor source selections.

There's also an OLED time-of-day clock + timer display, with auto / manual reset option. As with all Axia consoles, aircraft-quality switches feature all-LED lighting; the anodized work surface has rub-proof etched markings that can't rub off. Additional features include automatic mix-minus for phone callers and codec sources, EQ for voice sources, and Show Profile instant recall of up to four pre-defined console "snapshots".

DESQ requires no countertop cutout and takes only 16" square of desk space; it connects to the QOR.16 integrated console engine with a single power/control cable. DESQ is ideal for standalone installation, but works with larger Axia networks too. A DESQ control surface and a QOR.16 integrated console engine constitute a complete RAQ system, but two DESQ consoles, or one RAQ and one DESQ console, may be paired with a single QOR.16 for cost-effective multi-console deployment.

# FEATURES

- 6 faders, each with instant access to any source. Assign any type of source to any channel with a simple twist of the Options knob.
- Proven surface-and-core architecture separates control from mixing processes. No audio passes directly through DESQ; all mixing and processing is performed in the QOR.16 Integrated Console Engine – so studio “accidents” don’t turn into off-air events.
- Software upgrade for QOR.16 integrated console makes DESQ AoIP console AES67-compliant.
- Two stereo mix buses and a Preview (cue) bus.
- Alpha-numeric OLED displays below each fader always show the current audio source with audio confidence meter, and, when the Options knob is pressed, offer fast adjustment of fader gain trim, EQ, pan and balance and other features without panel clutter or intimidating controls.
- Channel-input confidence meters assure talent of audio presence before taking sources to air.
- Built-in three-band per-source EQ.
- Each fader’s context-sensitive Soft key can be used to activate talkback, start delivery system events, or perform other special functions.
- Every channel strip has a stereo Preview (“cue”) function, with a unique interlock system for fast cuing of multiple sources.
- Reconfigurable CR monitor section with direct-selection of Program buses and reassignable buttons that allow instant monitoring of external sources.
- Four custom Show Profile “snapshots” can be saved to instantly recall frequently-used console setups – useful to quickly prepare for interview segments, music-intensive programming, call-in talk shows, etc.
- Automatic mix-minuses for phones, remote talent, etc.
- Bright OLED meter display provides responsive, readable VU or PPM metering styles. Switchable display allows metering either Program bus.
- All functions can be accessed remotely for configuration, management and diagnostic purposes using any standard Web browser.
- Separate OLED clock/timer display features NTP-capable time-of-day clock and event timer that can be manually or automatically reset via source activation.
- Network gateway enables loading networked sources while simultaneously exporting outputs back to the network.
- Easy-to-deploy QOR.16 integrated console engine includes console CPU and power supply, DSP mixing engine, custom Ethernet switch with 6 Livewire ports and 2 Gigabit ports for studio networking, 8 analog inputs and 4 analog outputs, 1 AES input and 1 AES output, 2 Mic inputs with switchable Phantom power, and 4 GPIO ports for machine control. I/O can be expanded using Telos Alliance® xNodes.
- QOR.16’s integrated zero-configuration network switch is custom-designed for broadcasting — no switch setup required. Supports Simple Networking, allowing up to 4 QOR engines to be daisy-chained without the need for a separate core switch.
- Each QOR.16 can support two connected RAQ or DESQ consoles, or one of each.
- Fan-free, convection-cooled power supply for noiseless in-studio operation.
- Automixer available on all channels.

## IN DEPTH

### A big console for small spaces.

Not every studio requires a full-size mixing console. Not every studio is full-size, itself! But you still want the advantages of IP-Audio networking: the ability to send program audio to other studios, the ability to consume audio from satellite downlinks, remote codecs and phone hybrids, or to trigger routing scene changes from a user-mapped control panel. And you don't want a toylike plastic pro-audio mixer — you want a real broadcast console that fits into a rack or turret, or on a small desktop space. A console with a small footprint, but big capabilities.



DESQ is a compact, special-purpose IP console from Axia. It may be compact in stature, but it's big on features and performance. DESQ has “big board” capabilities you won't find in other consoles of this size — automatic per-fader mix-minus, built-in EQ for voice and codec sources, and the ability to instantly load new local or networked sources to any fader with just the turn of a knob. Which means DESQ easily out-classes mixers with similar form factors — and even ones that take up much more room.



DESQ is a six-fader console in a form-factor that lets it fit just about anywhere there's a few inches of spare space: DESQ is only 16 inches (39.9 cm) square. It's built Axia-tough, with a machined-aluminum work surface that takes the rough stuff jocks can dish out. Our familiar 100 mm. conductive-plastic faders feel like silk under the fingertips, and you'll also find the avionics-grade switches with LED lighting

that have become an Axia hallmark.

Other features include OLED channel and meter displays, four-source monitor section with two external locations that can be reassigned “on the fly”, and an OLED time-of-day clock and event timer. Like its rackmount cousin, RAQ, DESQ also has four Show Profile console snapshot locations, and push-and-turn Options knobs at the top of each fader that give instant access to fader source assignments, pan/balance, and input gain trim.

Despite all these features, DESQ is so cost-effective, broadcasters are coming up with creative, new uses for them. Its big features and small footprint make DESQ the perfect console for interview studios, live performance spaces for on-air broadcast, news and feature production — whatever. Take it on road trip remotes, or to sporting events where multiple mics are required. Or put it in mobile units or ENG kits. Perfect for personal production studios, too.



Audio I/O, GPIO, console CPU, super-duty power supply, and even a network switch are all built into the QOR.16. Just plug in your mics, CD players, codecs, profanity delays, whatever. There are 16 audio I/O ports: two Mic inputs with switchable Phantom power, eight analog inputs and four analog outputs, and one AES/EBU input and output. QOR.16 also has four GPIO logic ports for machine control of studio peripherals, six 100Base-T ports for Livewire devices, and two Gigabit ports with SFP for connection to the outside world. For more I/O, just add Telos Alliance xNode interfaces. And you can daisy chain as many as four QOR engines without the need for an external Ethernet switch, making installation even more economical. And here’s the kicker: one QOR.16 can power two DESQ mixers — or a DESQ and a



RAQ (DESQ's six-fader, rackmount cousin)!

## SPECIFICATIONS

### QOR.16 Connections

- Microphone Inputs: 2x balanced XLR-F, with selectable Phantom power
- Analog Inputs: 8x RJ-45, StudioHub+ standard.
- Analog Outputs: 4x RJ-45, StudioHub+ standard.
- AES/EBU Inputs: 1x RJ-45, StudioHub+ standard.
- AES/EBU Outputs: 1x RJ-45, StudioHub+ standard.
- GPIO: 4x DB-15
- Livewire:
  - 4x 100Base-T with PoE, RJ-45
  - 2x 100Base-T, RJ-45
  - 2x 1000Base-T, RJ-45
  - 2x Gigabit, SFP (Small Form Pluggable)
- Console Frame Connections: 1x, 6-pin "latch and lock" style
- Accessory Connections: 1x, 6-pin "latch and lock" style

### Microphone Preamplifiers

- Source Impedance: 150 ohms
- Input Impedance: 4 k ohms minimum, balanced
- Nominal Level Range: Adjustable, -75 dBu to -20 dBu
- Input Headroom: >20 dB above nominal input
- Output Level: +4 dBu, nominal

### Analog Line Inputs

- Input Impedance: 20 k Ohms
- Nominal Level Range: Selectable, +4 dBu or -10dBv

- Input Headroom: 20 dB above nominal input

## Analog Line Outputs

- Output Source Impedance: <50 ohms balanced
- Output Load Impedance: 600 ohms, minimum
- Nominal Output Level: +4 dBu
- Maximum Output Level: +24 dBu

## Digital Audio Inputs And Outputs

- Reference Level: +4 dBu (-20 dB FSD)
- Impedance: 110 Ohm, balanced (XLR)
- Signal Format: AES-3 (AES/EBU)
- AES-3 Input Compliance: 24-bit with selectable sample rate conversion, 20 kHz to 216kHz input sample rate capable.
- AES-3 Output Compliance: 24-bit
- Digital Reference: Internal (network timebase) or external reference 48 kHz, +/- 2 ppm
- Internal Sampling Rate: 48 kHz
- Output Sample Rate: 48 kHz
- A/D Conversions: 24-bit, Delta-Sigma, 256x oversampling
- D/A Conversions: 24-bit, Delta-Sigma, 256x oversampling
- Latency <3 ms, mic in to monitor out, including network and processor loop

## Frequency Response

- Any input to any output: +0.5 / -0.5 dB, 20 Hz to 20 kHz

## Dynamic Range

- Analog Input to Analog Output: 102 dB referenced to 0 dBFS, 105 dB "A" weighted to 0 dBFS
- Analog Input to Digital Output: 105 dB referenced to 0 dBFS
- Digital Input to Analog Output: 103 dB referenced to 0 dBFS, 106 dB "A" weighted
- Digital Input to Digital Output: 125 dB

## Equivalent Input Noise

- Microphone Preamp: -128 dBu, 150 ohm source, reference -50 dBu input level

## Total Harmonic Distortion + Noise

- Mic Pre Input to Analog Line Output: <0.005%, 1 kHz, -38 dBu input, +18 dBu output
- Analog Input to Analog Output: <0.008%, 1 kHz, +18 dBu input, +18 dBu output
- Digital Input to Digital Output: <0.0003%, 1 kHz, -20 dBFS
- Digital Input to Analog Output: <0.005%, 1 kHz, -6 dBFS input, +18 dBu output

## Crosstalk Isolation, Stereo Separation And CMRR

- Analog Line channel to channel isolation: 90 dB isolation minimum, 20 Hz to 20 kHz
- Microphone channel to channel isolation: 80 dB isolation minimum, 20 Hz to 20 kHz
- Analog Line Stereo separation: 85 dB isolation minimum, 20Hz to 20 kHz
- Analog Line Input CMRR: >50 dB, 20 Hz to 20 kHz
- Microphone Input CMRR: >50 dB, 20 Hz to 20 kHz

## Audio Processing

- Mic Equalizer (applicable to up to 6 faders)
- Frequency Bands: 20Hz to 320Hz, 125Hz to 2KHz, 1.25KHz to 20KHz.
- Cut/Boost range on each band: -25dB to +15dB.
- Q-factor: Automatic - bandwidth varies based on amount of cut or boost.

## Power Supply AC Input, QOR.16 with DESQ Console

- Auto-sensing supply, 90VAC to 240VAC, 50 Hz to 60 Hz, IEC receptacle, internal fuse
- Power consumption: 100 Watts

## Operating Temperatures

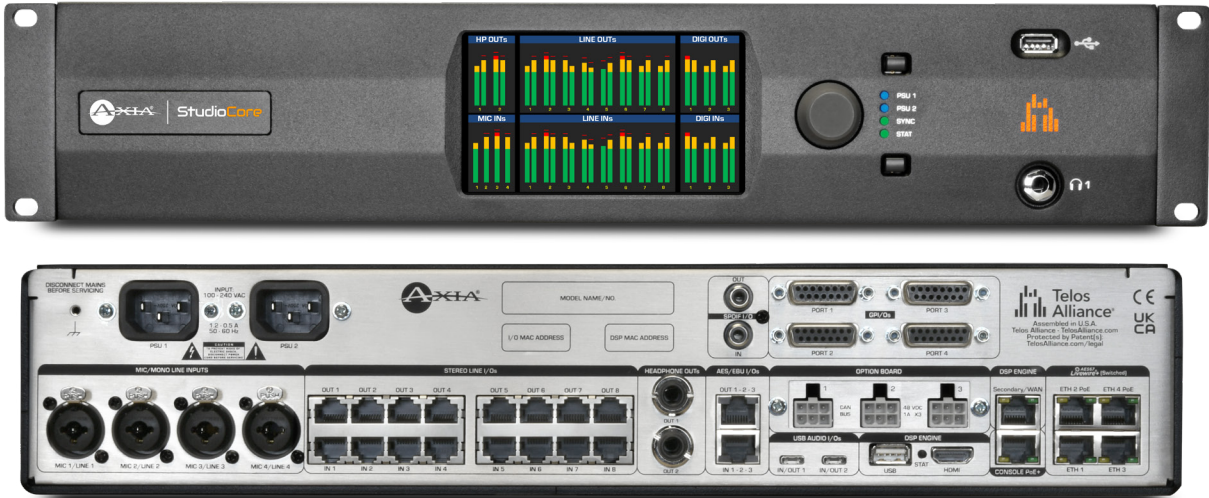
- -10 degrees C to +40 degrees C, <90% humidity, no condensation

## Dimensions

- W 15.31in (38.9 cm), H 15.30 in (38.87 cm), D 2.79 in (7.1 cm)

# Axia® StudioCore™

## Integrated Engine for Axia iQ Consoles



## OVERVIEW

StudioCore is an integrated console engine for Axia iQ, Radius, RAQ, and DESQ mixing consoles that combines audio I/O, a console power supply, a mixing engine, and a dedicated five-port AoIP network switch with PoE into a single fanless 2RU rack-mounted package.

StudioCore provides four selectable mic/line inputs, eight dedicated line inputs and outputs, and three digital inputs and outputs that are user-configurable as AES/EBU, S/PDIF, and USB Audio, which eliminates the need for an IP driver for stereo applications. It also includes two headphone outputs with independent DACs and built-in amplifiers, a built-in audio file player via USB data port, and four GPI/O ports. Optionally, three CAN bus ports provide connectivity with up to three Axia iQ consoles.

The optional Core Soft remote control solution provides HTML5 browser-based control of StudioCore, allowing it to function as a standalone mixer (with or without a hardware control surface), control a connected iQ surface, and serve as an in-browser monitor for the control room monitor output.

A second redundant internal power supply is optionally available.

## FEATURES

- 2RU fanless design for silent in-studio use.
- 5" color IPS LCD touchscreen display
- Front panel UI for local control of routing, I/O, and audio levels
- Single internal power supply (second internal PSU optional)
- Dedicated 5-port AoIP network switch with PoE
- 4 selectable mic/line inputs
- 8 dedicated line inputs/line outputs
- 3 digital inputs/outputs (user-configurable combinations of AES/EBU, USB Audio, and S/PDIF)
- USB Audio I/O eliminates the need for an IP driver for stereo applications
- 2 headphone outputs with independent DACs and built-in amplifiers
- Optional CAN board with 3 CAN connections
- Built-in audio file player via USB data port
- 8 output monitor matrix system
- 24-channel mixing engine
- Livewire+ AES67 stream capacity of 32 inputs and 32 outputs
- Optional Core Soft license provides HTML5 browser-based control of StudioCore as a standalone mixer or to control a connected iQ surface

## IN DEPTH

StudioCore is an integrated console engine for Axia iQ, Radius, RAQ, and DESQ mixing consoles. It combines an abundance of audio I/O, a robust internal console power supply (with a redundant supply available as an option), a full-featured 24-channel mixing engine, and a dedicated five-port AoIP network switch with PoE into a single 2RU rack-mounted package.

Its front panel boasts a 5" color IPS LCD touchscreen display that is viewable from any angle. Its UI provides complete local control of routing, I/O, and audio levels. Two dedicated headphone outputs with independent DACs and built-in amplifiers easily and cleanly drive low- and high-impedance headphones. Its fanless design ensures studio-friendly silent operation.

StudioCore's easy-to-configure built-in 5-port Ethernet switch with PoE makes connecting to other compatible devices on the AoIP network simple and straightforward.

StudioCore provides plenty of input and output options for small- to medium-sized studios. There are four selectable mic/line inputs, eight dedicated line inputs and outputs, three digital inputs and outputs that are user-configurable as AES/EBU, S/PDIF, and USB Audio, which eliminates the need for an IP driver for stereo applications. Its generous Livewire+ AES67 stream capacity offers thirty-two inputs and thirty-two outputs. An eight-output monitor matrix system provides for flexible monitoring. StudioCore also includes a built-in audio file player via its USB data port and four GPI/O ports. Optionally, three CAN bus ports provide connectivity with up to three Axia iQ consoles.

The optional Core Soft license provides HTML5 browser-based control of StudioCore, allowing it to function as a standalone mixer (with or without a hardware control surface), control a connected iQ surface, and serve as an in-browser monitor for the control room monitor output.

## GENERAL SPECIFICATIONS

### Power Supply

- Universal AC Input Range (90 – 264VAC)
- Operating Mains Frequency 47-63Hz
- -10 to +40 degrees Celsius, <70% humidity, no condensation
- IEC receptacle. Internal fuse.
- Mains Outlet rating: 100W minimum (for each PSU module)
- Standard Operating Power consumption: 25W (each PSU module)

### Mechanical Data

- Standard Rack-Mounted chassis, 2RU (Rack Units)
- Overall External Depth: 307mm, Rack depth: 272mm, Height: 89mm
- Unit Weight: 4.8kg
- Shipping Weight: 6.0kg

## EDGE I/O SPECIFICATIONS

### Microphone Inputs 1 - 4

- Input Type: MIC/LINE selectable, electronically balanced
- Input Impedance: 2k ohms minimum, balanced
- Preamp Gain Range: Adjustable, 0dB (Line), 8dB .. 63dB in 1dB steps (Mic)
- Digital Gain Range: Adjustable, -100dB to +27dB on all Line Inputs
- A/D Conversion: 32-Bit Delta-Sigma, 256x oversampling
- Maximum Input Level: +18dBu

- Frequency Response: +/-0.25dB @ 20Hz to 22kHz on all Mic/Line Inputs
- THD: < 0.0012% (-98dB) @ 1kHz, -1dBFS (+17dBu)
- Dynamic Range: -112dB A-Weighted, -110dB unweighted
- Equivalent Input Noise: -128dBu, 150-ohm source, -50dBu input level
- Phantom Power: 48V switchable, 14mA per channel

## Analog Line Inputs 1 - 8

- Input Type: Electronically Balanced
- Input Impedance: 12k Ohms
- A/D Conversion: 32-Bit Delta-Sigma, 256x oversampling
- Digital Gain Range: Adjustable, -100dB to +27dB on all Line Inputs
- Maximum Input Level: +24dBu
- Frequency Response: +/-0.25dB, 20Hz to 22kHz, on all Line Inputs
- THD: < 0.0017% (-95dB) @ 1kHz, -1dBFS (+23dBu)
- Dynamic Range: -112.5 dB (A-Weighted), -109.5dB (Unweighted)
- S/N Ratio: 112dB (Unweighted)
- Idle Noise: -112.5 dB (A-Weighted), -109.5dB (Unweighted)

## Digital Audio Inputs 1 - 3

- Signal Format: Switchable AES/EBU (AES3), S/PDIF, USB Audio (Class 1.0), 24-bit
- ADC Type: 32-bit, Delta-Sigma, 256x oversampling
- Reference Level: +4dBu (-20dBFS)
- Impedance: 110 Ohm balanced (AES3), 75 Ohm (S/PDIF)
- SRC Type: 24-bit switchable on all inputs
- Digital Reference: Internal (network timebase) or external reference 48 kHz, +/- 2 ppm
- Internal Sampling Rate: 48 kHz
- SRC THD+N: -125dB, 22Hz to 24kHz @ -1dBFS

## Analog Line Outputs 1 - 8

- Output Type: Electronically Balanced
- D/A Conversion: 32-bit, Delta-Sigma, 256x oversampling
- Digital Gain Range: Adjustable, -127.5dB to 0dB, 1dB step on all Line Outputs
- Maximum Output Level: +24dBu
- Frequency Response: +/-0.1dB, 10Hz to 22kHz on all Line Outputs

- THD: < 0.013% (-77.5dB) @ 1kHz, -1dBFS (+23dBu)
- Dynamic Range: -114dB (A-Weighted), -111.5dB (Unweighted)
- S/N Ratio: -111dB (Unweighted)
- Output Type: Electronically Balanced

## Headphone Outputs 1-2

- Output Type: Stereo unbalanced, with headphone plug detection
- D/A Conversion: 32-bit Delta-Sigma, 256x oversampling
- S/N Ratio: 128dB A-Weighted.
- THD+N: 108dB @ 1kHz, -1dBFS (+23dBu)
- Continuous output power, 32- $\Omega$  stereo load: 2 W
- Minimum load impedance 8  $\Omega$
- CMRR: 100dB

## Network Switch

- 1x 1000BASE-T with PoE+, RJ-45 port
- 2x 1000BASE-T with PoE, RJ-45 ports
- 2x 1000BASE-T, RJ-45 ports

## CAN Option Board

- Console Frame Connections: 3x, 6-pin Molex ports, "latch and lock" style

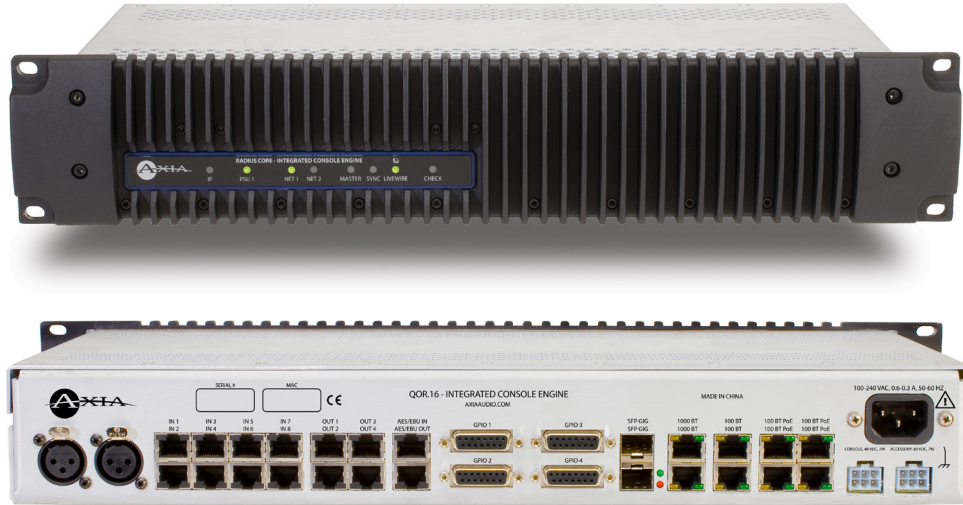
## Latency

- Mic/Line IN to Line/HP OUT: 1.4ms (ADC + Internal AoIP Loopback Routing + DAC)
- Usage scenario: Analog Monitor Matrix
- Mic/Line IN to Network to Line/HP OUT: 2.28ms (ADC + External AoIP Network + DAC)
- Usage scenario: 2x StudioEdge units interconnected via external Network switch
- Mic IN to Monitor OUT: 3.9ms (ADC + Internal AoIP Net + Core DSP + Internal AoIP Net + DAC)
- Usage scenario: Console Mic to Headphone monitoring in a StudioCore
- Digital IN to Digital OUT: 4.0ms (A-SRC input + Internal AoIP Loopback Routing + Digital output)
- Usage scenario: Digital Monitor Matrix



# Axia® QOR.16

## Integrated Console Engine



**AES67**  
**Livewire+**

## OVERVIEW

QOR.16 is an Axia integrated console engine for Radius, DESQ and RAQ mixing consoles. QOR.16 combines audio I/O, a console power supply, mixing engine and built-for-broadcast network switch into one easy-to-deploy package. Each QOR.16 provides 8 Analog inputs and 4 Analog outputs, 1 AES/EBU input and 1 AES/EBU output, 2 Microphone inputs with selectable Phantom power, 4 GPIO machine-control logic ports, each with 5 inputs and 5 outputs, an integrated network switch with 6 Livewire® 100BASE-T Ethernet ports and 2 1000BASE-T (Gigabit) ports with SFP, a heavy-duty Telecom-grade power supply with fanless convection cooling, and an industrial-grade CPU designed for harsh-environment reliability.

Use QOR.16 with a Radius, DESQ or RAQ mixing console as a standalone studio solution, or connect to other Axia equipment as part of a larger IP-Audio network. Simple Networking allows daisy-chain connection of up to 4 QOR-based studios without the use of an external network switch. I/O can easily be expanded using Telos Alliance® xNodes.

## FEATURES

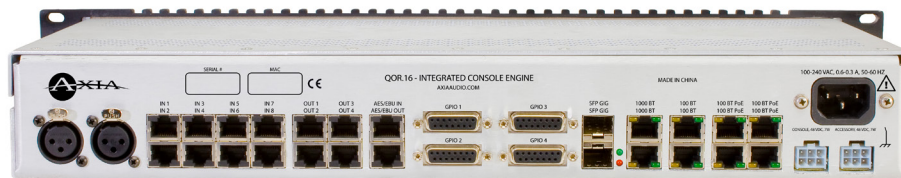
- Fanless design with heavy machined heat-sinks is completely silent in-studio.
- Front-panel LED display monitors power and network status.
- Telecom grade power supply is designed for maximum uptime under harsh conditions.
- PoE (Power over Ethernet) capability can supply power for PoE-compliant studio devices.
- Built-in, zero-configuration network switch with Gigabit and SFP for long-distance fiber connection.
- Large variety of built-in audio I/O boasts studio-grade audio performance specs.
- Add more I/O a la carte using Telos Alliance xNodes.
- Software upgrade adds AES67 support, allowing the QOR.16 integrated console engine to receive and transmit AES67 streams via Livewire+™ AES67.
- Automix allows operators to automatically and efficiently balance the levels of on-air-sources when more than one source is open at a time in a studio.

## IN DEPTH

### QOR.16 Integrated Console Engine

The QOR.16 integrated console engine is a DSP-based mixing engine with onboard I/O, GPIO, console power supply and custom-built, configuration-free Ethernet switch. It's the smaller brother of our QOR.32 integrated console engine, designed and built with the same high-grade components for deployment with Radius, DESQ and RAQ consoles in smaller studios where large amounts of I/O are not required.

QOR.16 comes with a wide variety of I/O, including mic inputs with selectable Phantom power, analog and AES/EBU inputs and outputs, plenty of GPIO machine-control logic ports, and that powerful integrated Ethernet switch with Livewire ports to add local sources, and Gigabit ports for networking with the rest of your plant. If more you I/O is needed, you can instantly add it just by plugging in Telos Alliance xNode audio interfaces. And QOR.16 is convection-cooled for utterly silent, fan-free operation.



QOR.16 has all the analog and digital inputs and outputs an average small studio requires: 2 mic inputs with selectable Phantom power, 8 stereo analog inputs and 4 stereo analog outputs, 1 AES/EBU input and 1 AES/EBU output, and 4 GPIO machine-control logic ports (each with 5 opto-isolated inputs and 5 outputs).

Of course, Livewire connections are built in. The QOR.16 has an integrated Ethernet switch with 6 Livewire 100BASE-T ports. 4 of those ports have PoE (Power over Ethernet) that you can use to connect and power networked devices compatible with the IEEE 802.1af PoE standard (like our xNode audio interfaces, or Telos VSet phones). You'll also find 2 1000BASE-T Gigabit ports (RJ-45 & SFP) that you can use to connect to other studios.

By the way, that zero-configuration Ethernet switch is built specifically to handle IP-Audio. No settings to tweak, no configuration code to upload – just plug it in and go. The built-in configurable network gateway allows loading sources from other studios, while simultaneously exporting audio streams for use elsewhere; the gateway can be configured for 12-in, 4-out or 8-in, 8-out modes. You can even daisy-chain up to four QOR-based studios directly, for a self-contained network that doesn't require an external Ethernet switch. No other console company makes AoIP this easy.

And here's a neat trick: if you're building audio workstations, news bullpens or ingest facilities, where small consoles like Axia DESQ or RAQ shine, a single QOR.16 can provide mixing power for two DESQ or RAQ mixers — or one of each! Just another way choosing Axia helps stretch your equipment budget.

## SPECIFICATIONS

### QOR.16 Connections

- Microphone Inputs: 2x balanced XLR-F, with selectable Phantom power
- Analog Inputs: 8x RJ-45, StudioHub+ standard.
- Analog Outputs: 4x RJ-45, StudioHub+ standard.
- AES/EBU Inputs: 1x RJ-45, StudioHub+ standard.
- AES/EBU Outputs: 1x RJ-45, StudioHub+ standard.
- GPIO: 4x DB-15
- Livewire:
  - 4x 100BASE-T with PoE, RJ-45
  - 2x 100BASE-T, RJ-45
  - 2x 1000BASE-T, RJ-45
  - 2x Gigabit, SFP (Small Form Pluggable)
- Console Frame Connections: 1x, 6-pin "latch and lock" style
- Accessory Connections: 1x, 6-pin "latch and lock" style

## Microphone Preamplifiers

- Source Impedance: 150 ohms
- Input Impedance: 4 k ohms minimum, balanced
- Nominal Level Range: Adjustable, -75 dBu to -20 dBu
- Input Headroom: >20 dB above nominal input
- Output Level: +4 dBu, nominal

## Analog Line Inputs

- Input Impedance: 20 k Ohms
- Nominal Level Range: Selectable, +4 dBu or -10dBv
- Input Headroom: 20 dB above nominal input

## Analog Line Outputs

- Output Source Impedance: <50 ohms balanced
- Output Load Impedance: 600 ohms, minimum
- Nominal Output Level: +4 dBu
- Maximum Output Level: +24 dBu

## Digital Audio Inputs And Outputs

- Reference Level: +4 dBu (-20 dB FSD)
- Impedance: 110 Ohm, balanced (XLR)
- Signal Format: AES-3 (AES/EBU)
- AES-3 Input Compliance: 24-bit with selectable sample rate conversion, 20 kHz to 216kHz input sample rate capable.
- AES-3 Output Compliance: 24-bit
- Digital Reference: Internal (network timebase) or external reference 48 kHz, +/- 2 ppm
- Internal Sampling Rate: 48 kHz
- Output Sample Rate: 48 kHz
- A/D Conversions: 24-bit, Delta-Sigma, 256x oversampling
- D/A Conversions: 24-bit, Delta-Sigma, 256x oversampling
- Latency <3 ms, mic in to monitor out, including network and processor loop

## Frequency Response

- Any input to any output: +0.5 / -0.5 dB, 20 Hz to 20 kHz

## Dynamic Range

- Analog Input to Analog Output: 102 dB referenced to 0 dBFS, 105 dB "A" weighted to 0 dBFS
- Analog Input to Digital Output: 105 dB referenced to 0 dBFS
- Digital Input to Analog Output: 103 dB referenced to 0 dBFS, 106 dB "A" weighted
- Digital Input to Digital Output: 125 dB

## Equivalent Input Noise

- Microphone Preamp: -128 dBu, 150 ohm source, reference -50 dBu input level

## Total Harmonic Distortion + Noise

- Mic Pre Input to Analog Line Output: <0.005%, 1 kHz, -38 dBu input, +18 dBu output
- Analog Input to Analog Output: <0.008%, 1 kHz, +18 dBu input, +18 dBu output
- Digital Input to Digital Output: <0.0003%, 1 kHz, -20 dBFS
- Digital Input to Analog Output: <0.005%, 1 kHz, -6 dBFS input, +18 dBu output

## Crosstalk Isolation, Stereo Separation And CMRR

- Analog Line channel to channel isolation: 90 dB isolation minimum, 20 Hz to 20 kHz
- Microphone channel to channel isolation: 80 dB isolation minimum, 20 Hz to 20 kHz
- Analog Line Stereo separation: 85 dB isolation minimum, 20Hz to 20 kHz
- Analog Line Input CMRR: >50 dB, 20 Hz to 20 kHz
- Microphone Input CMRR: >50 dB, 20 Hz to 20 kHz

## Audio Processing

- Mic Equalizer (applicable to up to 6 faders)
- Frequency Bands: 20Hz to 320Hz, 125Hz to 2KHz, 1.25KHz to 20KHz.
- Cut/Boost range on each band: -25dB to +15dB.
- Q-factor: Automatic - bandwidth varies based on amount of cut or boost.

## Power Supply AC Input, QOR.16 With Radius Console

- Auto-sensing supply, 100VAC to 240VAC, 50 Hz to 60 Hz, IEC receptacle, internal fuse
- Power consumption: 100 Watts

## Operating Temperatures

- -10 degrees C to +40 degrees C, <90% humidity, no condensation

## Regulatory

**North America:** FCC and CE tested and compliant, power supply is UL approved.

**Europe:** Complies with the European Union Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), as amended by Commission Decisions 2005/618/EC, 2005/717/EC, 2005/747/EC (RoHS Directive), and WEEE.

# Axia® StudioEngine

## Bulletproof Power for 24/7 Operation.



## OVERVIEW



The networked Axia StudioEngine provides bulletproof mixing console signal processing for Fusion™ mixing consoles. Each StudioEngine is equipped with multiple simultaneous inputs, outputs, mix-minus feeds, monitor signals, etc. and can provide EQ for multiple channels, voice dynamics, studio headphone processing and multiple VMix (Virtual Mixer) channels.

The StudioEngine is fanless for cool, silent in-studio deployment, and is equipped with Gigabit Ethernet ports for network connection, and dual-redundant, field-replaceable internal power supplies with automatic switching for complete peace of mind.

In addition to providing mixing for physical console surfaces, StudioEngine can be used in conjunction with Axia SoftSurface Virtual Console software to create a powerful “virtual console” of up to 48 faders that’s controlled with a standard Windows-based laptop — perfect for places where space constraints do not permit a physical mixing device.

# FEATURES

- Fanless design with heavy machined heat-sinks is completely silent in-studio.
- Front-panel OLED display delivers monitors power status, operating temperature, and a fast manual setup option.
- Telecom grade dual-redundant power supplies are designed for maximum uptime under harsh conditions. Automatic, seamless switching.
- Field-replaceable, internally fused fault-protected power modules change out in under 1 minute.
- Dedicated Gigabit LAN interface for Livewire and System Administration
- Fusion 3.1 software update adds AES67 support
- AES67 Support.

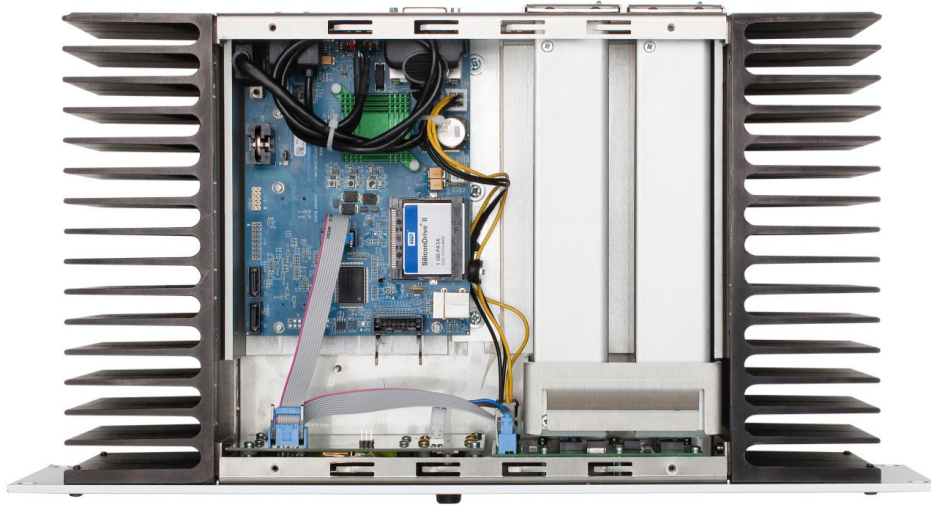


## IN DEPTH

### Mixing Power, a la carte.

Although Axia mixing consoles resemble traditional broadcast consoles, no audio is actually mixed by or even passes through their faders. Instead, think of Axia consoles as a "remote control" for Axia DSP-based mixing engines.

The rugged StudioEngine is a standalone mixing engine for use with Axia control surfaces; it has no audio I/O of its own, instead allowing you maximum flexibility in designing your audio network with a la carte I/O using Telos Alliance® xNode IP-Audio interfaces. In this way, you can construct bespoke systems to suit your specific needs.



The StudioEngine itself is an extremely powerful mixing device, based on a blazingly-fast Intel processor that can out-perform even the largest dedicated-DSP embedded designs. The StudioEngine accesses audio streams, modifies them, and then presents the resulting streams back to the network as program output (or monitor output, or mix-minus output, et cetera). This approach is ideally suited to a network-based audio architecture since all input and output streams are routed through a Gigabit Ethernet port.



To deliver the reliability and ultra-low latency required, we equipped the StudioEngine with a fast, robust version of the Linux real-time operating system. Then we optimized our engine processing program so that total input to output latency is just a few hundred microseconds.

In fact, each StudioEngine has so much CPU power, it can outperform the very largest digital or router-based consoles, with multiple simultaneous inputs, outputs, mix-minus feeds, monitor signals, etc. for consoles as large as 40 faders. It can even provide EQ for and voice dynamics for multiple audio channels, as well as multiple VMix (virtual mixer) channels that allow combination of multiple audio channels on “virtual faders” that can then be mapped to a single physical fader. One StudioEngine supplies mixing power for even the largest Fusion.

Additionally, StudioEngine can be paired with Axia SoftSurface software to create a “virtual console” controlled by any computer with the Windows operating system — an ideal way of putting big mixing power into very small spaces.

# SPECIFICATIONS

## Power Supply AC Input

- Auto-sensing supply, 90VAC to 240VAC, 50 Hz to 60 Hz, IEC receptacle, internal fuse
- Power consumption: 100 Watts

## Operating Temperatures

- -10 degrees C to +40 degrees C, <90% humidity, no condensation

## Dimensions (HxWxD) and Weight

- 3.5 x 19 x 15 inches, 15 pounds

## Network Interface

- 1x 1000BASE-T ports, standard RJ-45 connectors

## Audio Processing

### Equalizer

- Frequency Bands: 20Hz to 320Hz, 125Hz to 2KHz, 1.25KHz to 20KHz
- Cut/Boost range on each band: -25dB to +15dB
- Q-factor: Automatic - bandwidth varies based on amount of cut or boost

### Compressor

- Threshold: -30dB to 0dB Ratio: 1:1 to 16:1
- Post-processor Trim Level: Adjustable from -20dB to +20dB

### Expander/Noise Gate

- Threshold: -50dB to 0dB Ratio: -30dB to 0dB

### De-esser

- Threshold: -20dB to 0dB Ratio: 1:1 to 8:1

## Regulatory

**North America:** FCC and CE tested and compliant, power supply is UL approved.

**Europe:** Complies with the European Union Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), as amended by Commission Decisions 2005/618/EC, 2005/717/EC, 2005/747/EC (RoHS Directive), and WEEE.

# Telos Alliance® xNode2

## IP-Audio Interfaces

The Next Generation of the Industry's  
Most Trusted AoIP Interface.



## OVERVIEW



The xNode2 is a lightweight, half-rack, high-performance IP-Audio interface from Telos Alliance that is loaded with advanced features and capabilities. They're fanless, which means they're noiseless too. Versatile mounting options let you deploy two xNode2s in just 1RU of rack space, or on ceilings, walls, and under counters with an available wall-mount kit. xNode2s have studio-grade audio performance specs. Redundant power options (using AC mains and Power-over-Ethernet plus) and dual 1000MB network interfaces are included. And xNode2s are fully AES67-compliant, so they work with all AES67 audio gear. Along with AES67 comes Livewire advertisement and Session Announcement Protocol (SAP).

xNode2s are available in Analog, AES/EBU, Microphone-level, Mixed-Signal, and GPIO versions to handle virtually any signal encountered in today's broadcast studio.

# FEATURES

- Fanless design with cast-aluminum heat-sinks is completely silent in-studio. Front-panel heat sinks are cooled by ambient air, not “rack air,” eliminating overheating worries.
- xNode2s are “universal translators” that support a huge installed base of Livewire+ hardware as well as audio streams from other AES67-compliant devices.
- High-resolution front-panel multi-function LCD color display meters inputs and outputs or GPIO status and gives software and other status information.
- Power-efficient: xNodes use just 16 Watts each.
- Exclusive redundant power plan uses AC and Power over Ethernet plus (IEEE 802.3at) supplied by compliant Ethernet switches. Two front-panel LED glow when AC mains power is used and when PoE+ is used.
- SMPTE 2022-7, Seamless Protection Switching of RTP Datagrams: Dual NICs allow you to stream to separate network branches for RTP audio redundancy. Automatic failover to the available RTP stream.
- Built-in Syslog server with configurable event filter and external logging.
- Synchronize your AES master clock to a designated xNode AES/EBU input to keep all of your AES streams synchronized to the house clock.
- xNode2s use premium components, including rugged cast aluminum faceplates and heat sinks, high-resolution LCD displays, bulletproof power supplies designed for high availability telecom applications, and studio-quality SRCs with recording-studio specs.
- I/O connections via industry-standard RJ-45 audio connectors or high-density DB-25 connections, both available prefabricated and ready to attach in seconds.
- Versatile mounting options: Use freestanding, rack singly or side-by-side in 1 RU, or wall-mount using an optional surface-mount kit.
- Analog xNode2 inputs can be configured to supply four stereo audio channels or eight true mono channels. Outputs support the same variety of selections, easily selectable in software via the built-in web interface.
- On the Analog, AES/EBU, Mixed Signal, and Microphone xNodes, a fully configurable mixing matrix allows for mixing of both physical and network inputs, stream conversion, and a multitude of other unique solutions.
- SAP Support

## IN DEPTH

### Compact. Powerful. And more advanced than ever.

One day, all audio equipment will be networked. Until then, there are xNode2s.

xNode2s give you an easy way to add non-networked audio devices to your studio network. They pack a lot of I/O into a very small space. And xNode2s are so simple to set up, they nearly configure themselves.

All xNode2s feature a high-resolution LCD color front panel display and two “soft” buttons to provide status information and assist with initial setup, and discrete LEDs that give at-a-glance information about the xNode2’s power configuration. To ensure ultra-reliable network operations and extremely low delay, xNode2s run Linux on an embedded processor, and a built-in web server in each xNode2 gives you remote configuration and control—in an intuitive, easy-to-understand manner—using any standard web browser.

xNode2s are loaded with features designed to ensure the uptime of your network. Dual Ethernet ports can provide redundant RTP streaming to separate network segments. Redundant power capability with automatic switchover enables xNode2s to run on house mains or PoE+ (Power over Ethernet Plus), letting the network switch itself supply power, and enabling easy single-cable setup in places where AC power isn’t practical. Built-in Syslog servers with a configurable event filter are provided.

The xNode2 custom Matrix view or Wire view feature is one of the most flexible and capable virtual mixers available. It lets users mix physical inputs (like mics and playback devices) with digital network sources (like stream inputs) to a single output. With the xNode2 custom feature, broadcasters can bypass the studio console during automated dayparts and send on-air mixes straight to the transmitter thus simplifying audio workflows. This one-of-a-kind solution offers the power and flexibility of a big studio mixer switching system in a compact ½ RU device!

xNode2s are convenient, too. For example, a Microphone xNode2 placed in a studio can take audio from microphones and also provide outputs to associated studio monitors and headphones. An xNode2 in the rack room can collect audio from network feeds, codecs and other shared sources for system-wide use while providing handy outputs for audio processors and other terminal-room gear.

xNode2s are versatile and cost-efficient. Since they’re half the size of other AoIP interfaces, they cost less. And you can mix-and-match I/O as needed: Choose between analog, AES/EBU, or Mic-level inputs, without paying for ports you won’t use. High-density GPIO xNode2s let you easily provide logic and control for your audio source devices.

xNode2s are also fanless, so you can tuck one anywhere you need I/O without worrying about cooling fans or heat—they consume only 16 Watts of power! Two xNode2s fit side-by-side in a single rack space using the included rack-mount kit. Or, mount them to walls, ceilings, or under countertops, with an optional surface-mount kit.

Five different xNode2s provide analog and AES ins and outs, microphone inputs and GPIO logic ports, wherever you need them. No need for “home runs” to a central rack—one CAT-5 cable connection is all an xNode2 needs to interface multiple channels of bi-directional audio to your network.

## Analog xNode2



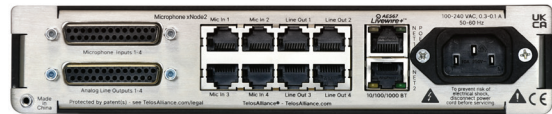
The Analog xNode2 has 8 mono or 4 stereo balanced line-level inputs and 8 mono or 4 stereo balanced line-level outputs, on RJ-45 and DB-25 connectors. The short-circuit protected outputs can deliver up to +24dBu before clipping. Telos Alliance uses only studio-grade A/D/A converters and low-noise components, so that each Analog node provides superior audio performance for high-end studio use.

## AES/EBU xNode2



Our AES/EBU xNode2 has 4 AES/EBU inputs and 4 AES/EBU outputs. Left and right input signals may be split and routed independently as mono signals. Stunning performance specs include 48 kHz sampling rate, 126dB of dynamic range, and <0.0003% THD. Sample rate conversion is available on all inputs; the unit can also be synchronized to a house clock to provide sync to your entire Axia network.

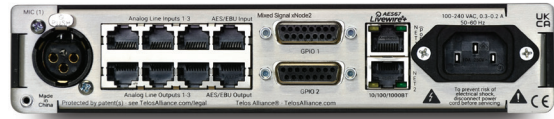
## Microphone xNode2



The Microphone xNode2 has four professional-grade microphone preamps with selectable Phantom power and Line input options. Software-adjustable gain adjusts the Microphone preamp. There are also four balanced analog line outputs to conveniently deliver headphone and studio monitor feeds back to your talent. Inputs and outputs are presented both on easy-to-install RJ-45s and high-density DB-25s, both of which connect to easily available 3rd-party breakout cables, to suit your connection preference.



## Mixed-Signal xNode2



The Mixed-Signal xNode2 is your utility player; perfect for places that require a mix of different audio I/O types. It provides 1 mic input, 3 analog line inputs, 3 analog line outputs, 1 digital AES3 input, 1 digital AES3 output, and 2 GPIO ports – truly a “jack of all trades.”

## GPIO xNode2



GPIO xNode2 provides 6 general-purpose logic ports for machine control of studio peripherals – audio devices, loudspeaker muting relays, signal lamps, etc. – each with 5 opto-isolated inputs and 5 outputs. A logic port can be associated with any audio input or output and routes control data transparently along with the audio.

## SPECIFICATIONS

### Microphone Preamplifiers

- Source Impedance: 150 Ohms
- Input Impedance: 4k Ohms minimum, balanced
- Input type: Line or Microphone
- Microphone PreAmp Gain: Adjustable, 14 dB to 68 dB
- Phantom power: +48VDC, switchable

### Analog Line Inputs

- Input Impedance: >40k Ohms, balanced
- Nominal Input Range: +4 dBu
- Input Headroom: 20 dB above nominal input



## Analog Line Outputs

- Output Source Impedance: <50 Ohms balanced
- Output Load Impedance: 600 Ohms, minimum
- Nominal Output Level: +4 dBu
- Maximum Output Level: +24 dBu

## Digital Audio Inputs and Outputs

- Reference Level: +4 dBu (-20 dB FSD)
- Impedance: 110 Ohm, balanced
- Signal Format: AES3 (AES/EBU)
- AES3 Input Compliance: 24-bit with sample rate conversion
- AES3 Output Compliance: 24-bit
- Digital Reference: Internal (network timebase) or external reference 48 kHz, +/- 2 ppm
- Internal Sampling Rate: 48 kHz
- Input Sample Rate: 32 kHz to 192kHz
- Output Sample Rate: 44.1 kHz or 48kHz
- A/D Conversions: 24-bit, Delta-Sigma, 256x oversampling
- D/A Conversions: 24-bit, Delta-Sigma, 256x oversampling

## Frequency Response

- Any Input to Any Output: +/- 0.5 dB, 20 Hz to 20 kHz

## Latency

- Analog Input to Analog Output, 4.5ms including network, converters, and mixing process
- Digital Input to Digital Output, 3.5ms including network mixing engine (ASRC off)

## Dynamic Range

- Analog Inputs to Analog Outputs 104dB referenced to 0dBFs, 111dB A-weighted
- Analog Inputs to Digital Outputs 110dB referenced to 0dBFs, 113dB A-weighted
- Digital Inputs to Analog Outputs 110dB referenced to 0dBFs, 115dB A-weighted
- Digital Inputs to Digital Outputs 126dB

## Equivalent Input Noise

Microphone Preamp: -130 dBu, 150 Ohm source, reference -50 dBu input level

## Total Harmonic Distortion + Noise

- Mic Pre Input to Analog Output: < 0.005%, 1 kHz, -36dBu input, +18dBu output
- Analog Input to Analog Output: < 0.005%, 1 kHz, +18dBu input, +18dBu output
- Analog Input to Digital Output: < 0.004%, 1 kHz, +18dBu input, -6dBFS output
- Digital Input to Analog Output: < 0.004%, 1 kHz, -6dBFS input, +18dBu output
- Digital Input to Digital Output: < 0.0003%, 1 kHz, 0dBFS

## Crosstalk Isolation, Stereo Separation and CMRR

- Analog Line Stereo Separation: < -90dB, 20Hz to 20kHz
- Analog Line Input CMRR: < -85dB, 20Hz to 20kHz
- Microphone Input CMRR: < -70 dB, 20 Hz to 20 kHz

## Power Supply AC Input

- Auto-Ranging Supply, 95VAC to 260 VAC, 50Hz to 60Hz, IEC Receptacle, Power Consumption: 16 Watts

## Operating Temperatures

- 0 degree C to +40 degree C, <90% humidity, no condensation

## Dimensions

- 8.5" (22 cm) wide; two may be mounted side-by-side in a standard 1RU rack space; 1.72" (4.4 cm) height, 11.75" (30 cm) depth

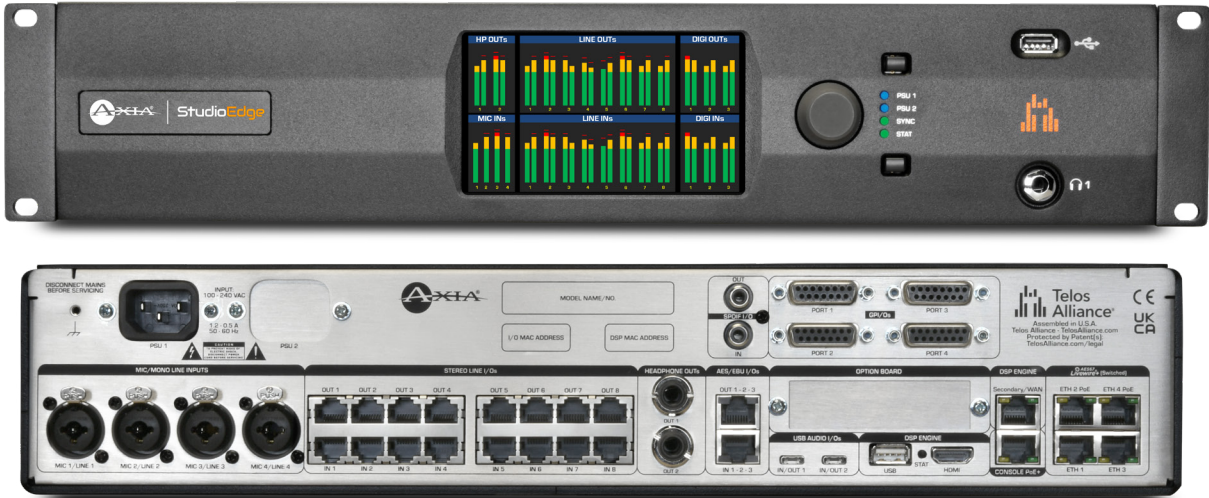
## Regulatory

**North America:** FCC and CE tested and compliant, power supply is UL approved.

**Europe:** Complies with the European Union Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), as amended by Commission Decisions 2005/618/EC, 2005/717/ EC, 2005/747/EC (RoHS Directive), and WEEE.

# Axia® StudioEdge™

## High-Density I/O Edge Platform



**AES67**  
**Livewire+**

## OVERVIEW

StudioEdge is a high-density endpoint device combining an abundance of audio I/O with a dedicated five-port AoIP network switch with PoE in a single fanless 2RU rack-mounted package.

StudioEdge provides four selectable mic/line inputs, eight dedicated line inputs and outputs, and three digital inputs and outputs that are user-configurable as AES/EBU, S/PDIF, and USB Audio, which eliminates the need for an IP driver for stereo applications. It also includes two headphone outputs with independent DACs and built-in amplifiers, a built-in audio file player via USB data port, and four GPI/O ports.

A second redundant internal power supply is optionally available.

## FEATURES

- Fanless design for silent in-studio use.
- 5" color IPS LCD touchscreen display
- Front panel UI for local control of routing, I/O, and audio levels
- Single internal power supply (second internal PSU optional)
- Dedicated 5-port AoIP network switch with PoE
- 4 selectable mic/line inputs
- 8 dedicated line inputs/line outputs
- 3 digital inputs/outputs (user-configurable combinations of AES/EBU, USB Audio, and S/PDIF)
- USB Audio I/O eliminates the need for an IP driver for stereo applications
- 2 headphone outputs with independent DACs and built-in amplifiers
- 4 GPI/O ports
- Built-in audio file player via USB data port
- 8 output monitor matrix system
- Livewire+ AES67 stream capacity of 32 inputs and 32 outputs

## IN DEPTH

StudioEdge is a high-density endpoint device. Designed as an all-in-one "super node" with a comprehensive and versatile array of inputs and outputs, it perfectly compliments the Telos Alliance xNode family of products. In addition to its generous I/O, StudioEdge includes a dedicated five-port AoIP network switch with PoE, all in a single, 2RU rack-mounted package.

StudioEdge is at home in control rooms of any size, as a compact endpoint in Quasar SR- and XR-equipped studios, or as an ingest station or routing and monitoring solution in TOCs and machine rooms. There are four selectable mic/line inputs, eight dedicated line inputs and outputs, three digital inputs and outputs that are user-configurable as AES/EBU, S/PDIF, and USB Audio, which eliminates the need for an IP driver for stereo applications. Its generous Livewire+ AES67 stream capacity offers thirty-two inputs and thirty-two outputs. An eight-output monitor matrix system provides for flexible monitoring. StudioCore also includes a built-in audio file player via its USB data port and four GPI/O ports.

Its front panel boasts a 5" color IPS LCD touchscreen display that is viewable from any angle. Its UI provides complete local control of routing, I/O, and audio levels. Two dedicated headphone outputs with independent DACs and built-in amplifiers easily and cleanly drive low- and high-impedance headphones. Its fanless design ensures studio-friendly silent operation.

StudioEdge's easy-to-configure built-in 5-port Ethernet switch with PoE makes connecting to other compatible devices on the AoIP network simple and straightforward.

# GENERAL SPECIFICATIONS

## Power Supply

- Universal AC Input Range (90 – 264VAC)
- Operating Mains Frequency 47-63Hz
- -10 to +40 degrees Celsius, <70% humidity, no condensation
- IEC receptacle. Internal fuse.
- Mains Outlet rating: 100W minimum (for each PSU module)
- Standard Operating Power consumption: 25W (each PSU module)

## Mechanical Data

- Standard Rack-Mounted chassis, 2RU (Rack Units)
- Overall External Depth: 307mm, Rack depth: 272mm, Height: 89mm
- Unit Weight: 4.8kg
- Shipping Weight: 6.0kg

# EDGE I/O SPECIFICATIONS

## Microphone Inputs 1 - 4

- Input Type: MIC/LINE selectable, electronically balanced
- Input Impedance: 2k ohms minimum, balanced
- Preamp Gain Range: Adjustable, 0dB (Line), 8dB .. 63dB in 1dB steps (Mic)
- Digital Gain Range: Adjustable, -100dB to +27dB on all Line Inputs
- A/D Conversion: 32-Bit Delta-Sigma, 256x oversampling
- Maximum Input Level: +18dBu
- Frequency Response: +/-0.25dB @ 20Hz to 22kHz on all Mic/Line Inputs
- THD: < 0.0012% (-98dB) @ 1kHz, -1dBFS (+17dBu)
- Dynamic Range: -112dB A-Weighted, -110dB unweighted
- Equivalent Input Noise: -128dBu, 150-ohm source, -50dBu input level
- Phantom Power: 48V switchable, 14mA per channel

## Analog Line Inputs 1 - 8

- Input Type: Electronically Balanced
- Input Impedance: 12k Ohms
- A/D Conversion: 32-Bit Delta-Sigma, 256x oversampling
- Digital Gain Range: Adjustable, -100dB to +27dB on all Line Inputs
- Maximum Input Level: +24dBu
- Frequency Response: +/-0.25dB, 20Hz to 22kHz, on all Line Inputs
- THD: < 0.0017% (-95dB) @ 1kHz, -1dBFS (+23dBu)
- Dynamic Range: -112.5 dB (A-Weighted), -109.5dB (Unweighted)
- S/N Ratio: 112dB (Unweighted)
- Idle Noise: -112.5 dB (A-Weighted), -109.5dB (Unweighted)

## Digital Audio Inputs 1 - 3

- Signal Format: Switchable AES/EBU (AES3), S/PDIF, USB Audio (Class 1.0), 24-bit
- ADC Type: 32-bit, Delta-Sigma, 256x oversampling
- Reference Level: +4dBu (-20dBFS)
- Impedance: 110 Ohm balanced (AES3), 75 Ohm (S/PDIF)
- SRC Type: 24-bit switchable on all inputs
- Digital Reference: Internal (network timebase) or external reference 48 kHz, +/- 2 ppm
- Internal Sampling Rate: 48 kHz
- SRC THD+N: -125dB, 22Hz to 24kHz @ -1dBFS

## Analog Line Outputs 1 - 8

- Output Type: Electronically Balanced
- D/A Conversion: 32-bit, Delta-Sigma, 256x oversampling
- Digital Gain Range: Adjustable, -127.5dB to 0dB, 1dB step on all Line Outputs
- Maximum Output Level: +24dBu
- Frequency Response: +/-0.1dB, 10Hz to 22kHz on all Line Outputs
- THD: < 0.013% (-77.5dB) @ 1kHz, -1dBFS (+23dBu)
- Dynamic Range: -114dB (A-Weighted), -111.5dB (Unweighted)
- S/N Ratio: -111dB (Unweighted)
- Output Type: Electronically Balanced

## Headphone Outputs 1-2

- Output Type: Stereo unbalanced, with headphone plug detection
- D/A Conversion: 32-bit Delta-Sigma, 256x oversampling
- S/N Ratio: 128dB A-Weighted.
- THD+N: 108dB @ 1kHz, -1dBFS (+23dBu)
- Continuous output power, 32- $\Omega$  stereo load: 2 W
- Minimum load impedance 8  $\Omega$
- CMRR: 100dB

## Network Switch

- 1x 1000BASE-T with PoE+, RJ-45 port
- 2x 1000BASE-T with PoE, RJ-45 ports
- 2x 1000BASE-T, RJ-45 ports

## CAN Option Board

- Console Frame Connections: 3x, 6-pin Molex ports, "latch and lock" style

## Latency

- Mic/Line IN to Line/HP OUT: 1.4ms (ADC + Internal AoIP Loopback Routing + DAC)
- Usage scenario: Analog Monitor Matrix
- Mic/Line IN to Network to Line/HP OUT: 2.28ms (ADC + External AoIP Network + DAC)
- Usage scenario: 2x StudioEdge units interconnected via external Network switch
- Mic IN to Monitor OUT: 3.9ms (ADC + Internal AoIP Net + Core DSP + Internal AoIP Net + DAC)
- Usage scenario: Console Mic to Headphone monitoring in a StudioCore
- Digital IN to Digital OUT: 4.0ms (A-SRC input + Internal AoIP Loopback Routing + Digital output)
- Usage scenario: Digital Monitor Matrix

## I/O Endpoint Audio Buffering

- Live Streams: 1ms
- AES67 Streams: 20ms
- Standard Streams: 20ms
- AES67 Streams with pTime>5ms : 100ms

# Axia® xSelector Router Panel

## The Network Switch Built for IP-Audio



## OVERVIEW

The Axia® xSelector combines the routing functions of an XY router control panel with the audio outputs of an Telos Alliance® xNode. In addition to analog, AES3 and headphone outputs, the Router Selector Node also features an analog and an AES3 input — ideal for production or news studios where operators both create and play audio streams. Six convenient “radio buttons” can be quickly programmed for instant access to favorite sources.



# FEATURES

- Fanless design for silent in-studio operation.
- High-resolution front-panel multi-function OLED display meters inputs and outputs and provides audio source selection controls.
- Local I/O connections via industry-standard RJ-45 or XLR audio connectors,.
- In addition to being able to select audio streams from the Livewire® network for use locally, the xSelector features one stereo input and one stereo output, allowing fast network distribution of locally created streams from audio workstations or portable audio devices. Each xSelector can create 1 stereo Livewire stream, which becomes available to other devices on the Livewire network.
- Local I/O is presented on both AES digital and analog balanced inputs and outputs. The user can feed audio into either a balanced analog input or an AES input.
- Both the AES and analog outputs are active simultaneously; both outputs have the same audio present.
- Includes two GPIO closures presented on standard DB-15 connectors for machine control of associated devices.
- xSelector's stereo outputs can be assigned to output either the locally-created audio stream, or a single stereo Livewire stream acquired from the network and easily selected from a list of available streams using the front panel OLED display.
- Six frequently-used streams can be assigned to the front panel "radio buttons" for instant access. Filmcap buttons can be labeled with names of assigned channels if desired.
- Dual Livewire 100BASE-T Ethernet ports for redundant connection to your Livewire audio network.
- Front panel headphone jack and volume control make xSelector a valuable addition to dubbing and ingest stations where minimal infrastructure is desired.
- Built-in HTTP server for easy remote control using any PC with a Web browser.

## IN DEPTH

### The production-room powerhouse.

The Axia xSelector looks a lot like a traditional XY router control panel, but it's much, much more. So much more, in fact, that you'll make xSelector a staple in your TOC, production rooms, news stations — anywhere your talent needs to both create and consume networked audio streams.

xSelector lets talent select from all available audio streams on the Livewire network, and route them to its local output (conveniently presented in both balanced analog and AES/EBU format). xSelector is easy to use: The front-panel LCD screen lists available network sources; talent uses the adjacent selector knob to browse sources and then pushes the knob to "take" the selected source, instantly routing that source to the local outputs for use with an audio workstation, a specific console input, recording device, etc.

Also on the front panel, six film-cap "radio buttons" provide instant access to frequently-used sources. There's also a stereo ¼" TRS jack with a volume control which supplies an internally-amplified audio output directly to talent headphones, making xSelector a perfect choice for small workstation environments by eliminating the need for an external headphone amp.



Around back, you'll find separate left and right balanced XLR and RJ-45 connections for the analog input and output, another set of XLR and RJ-45 connectors for the AES/EBU input and output, DB-15 connectors for the two GPIO machine-logic controls, and RJ-45s for the two redundant Livewire 100BASE-T Ethernet connections.

All this functionality makes xSelector the perfect choice for news booths or dubbing stations where only one active feed is required, or for intake stations that allow non-technical folks to easily move audio from external sources (like field recorders) into the Axia network.

# SPECIFICATIONS

## Connections:

### AES/EBU

- 1x Stereo Input, presented on one XLR-F connection and one RJ-45 connection
- 1x Stereo Output, presented on one XLR-M connection and one RJ-45 connection

### Analog

- 1x Stereo, presented on two XLR-F connections and one RJ-45 connection
- 1x Stereo, presented on two XLR-M connections and one RJ-45 connection

### GPIO

- 2x DB-15, each with 5 opto-isolated inputs and 5 outputs

### Network

- 2x 100BASE-T connections, presented on RJ-45

## Audio:

### Analog Line Inputs:

- Input Impedance: >40 k Ohms, balanced
- Nominal Input Range: Selectable, +4 dBu or -10dBv
- Input Headroom: 20 dB above nominal input

### Analog Line Outputs:

- Output Source Impedance: <50 Ohms balanced
- Output Load Impedance: 600 Ohms, minimum
- Nominal Output Level: +4 dBu
- Maximum Output Level: +24 dBu

## Digital Audio Inputs And Outputs

- Reference Level: +4 dBu (-20 dB FSD)
- Impedance: 110 Ohm, balanced
- Signal Format: AES3 (AES/EBU)
- AES3 Input Compliance: 24-bit with sample rate conversion
- AES3 Output Compliance: 24-bit
- Digital Reference: Internal (network timebase) or external reference 48 kHz, +/- 2 ppm
- Internal Sampling Rate: 48 kHz
- Input Sample Rate: 32 kHz to 192 kHz
- Output Sample Rate: 44.1 kHz or 48 kHz
- A/D Conversions: 24-bit, Delta-Sigma, 256x oversampling
- D/A Conversions: 24-bit, Delta-Sigma, 256x oversampling

## Frequency Response

- Any input to any output: +/- 0.5 dB, 20 Hz to 20 kHz

## Dynamic Range

- Analog Inputs to Analog Outputs 108dB referenced to 0dBFs, 111dB A-weighted
- Analog Inputs to Digital Outputs 110dB referenced to 0dBFs, 113dB A-weighted
- Digital Inputs to Analog Outputs 112dB referenced to 0dBFs, 115dB A-weighted
- Digital Inputs to Digital Outputs 126dB

## Total Harmonic Distortion + Noise

- Analog Input to Analog Output: < 0.005%, 1 kHz, +18dBu input, +18dBu output
- Analog Input to Digital Output: < 0.004%, 1 kHz, +18dBu input, -6dBFs output
- Digital Input to Analog Output: < 0.004%, 1 kHz, -6dBFs input, +18dBu output
- Digital Input to Digital Output: < 0.0003%, 1 kHz, -20dBFs

## Crosstalk Isolation, Stereo Separation And Cmrr

- Analog Line channel to channel isolation: 90dB minimum, 20Hz to 20kHz
- Analog Line stereo separation: 85dB minimum, 20Hz to 20kHz
- Analog Line Input CMRR: 80dB minimum, 20Hz to 20kHz

## Power Supply Ac Input

- Auto-ranging supply, 90VAC to 240VAC, 30 Hz to 60 Hz, IEC receptacle, internal fuse
- Power consumption: 35 Watts

## Operating Temperatures

- 0 degree C to +40 degree C, <90% humidity, no condensation

## Regulatory

**North America:** FCC and CE tested and compliant, power supply is UL approved.

**Europe:** Complies with the European Union Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), as amended by Commission Decisions 2005/618/EC, 2005/717/EC, 2005/747/EC (RoHS Directive), and WEEE.

# Axia® Studio Control Panels

## Fingertip Control, Just Where You Need It.



## OVERVIEW

Axia makes it easy to build large, IP-based routing networks of up to 10,000 audio streams. We also make hardware tools to help your operators control all that networking power. Along with PathfinderPC and PathfinderPRO routing control software, Axia Routing Control Panels put fingertip control of inputs, outputs and routing scene changes anywhere you've got a rack space.

## FEATURES

- Six accessory control panels for convenient talent / guest control of a variety of studio operations: routing scene changes, GPIO closures, XY control of inputs and outputs, etc.
- Slim panel design mounts in any 1RU rack space.
- Fanless, convection-cooled.

# IN DEPTH

## Take Control.

Axia control panels let you place routing power anywhere — in a studio turret, a TOC control panel or an equipment rack. These accessory control panels work with Axia's PathfinderPC and PathfinderPRO routing control hardware, allowing you to map routing commands — from simple contact closures to complex logic-driven events — to any button for fast execution.

Film-cap controllers with LED-backlit keys can be illuminated with a choice of colors; keycaps are film-legendable for quick function identification. SmartSwitch panels have dynamic, backlit LCD buttons that can change color and text with user activation. And the rack-mount 8-button SoftSwitch panel has high-resolution OLED buttons that can be loaded with user-created bitmaps for instant function identification. And the XY Routing Control Panel allows convenient on-the-fly routing of networked sources from anywhere in your facility; route any source to any output of your choosing with just a couple of knob twists.

### 17-Button LCD SmartSwitch Panel



The 17-button SmartSwitch Router Control Panel features backlit LCD buttons with dynamic text and color to provide 1-touch remote access to often-used machine-control or software functions. Multiple pages of button assignments can be programmed and recalled with just a touch; use PathfinderPC's Stacking Events Editor to map single commands or complex routing salvos to any button. Easy-to-use Web-based configuration pages can be accessed from any PC on the Livewire® network.

### Film-Cap Switch Panels



Use these Film-Cap Router Control Panels when dynamic-text capabilities are not required; lighted aircraft-grade switches provide fast execution of router salvos, machine-control or software functions programmed using PathfinderPC Router Control software. 5-, 10- and 15-button rackmount models are perfect for use in a studio turret, TOC control panel or equipment rack. Place film labels under the clear button caps; set the LED backlights to any of 8 different colors.

## XY Router Control Panel



XY Router Control Panel lets you route any source to any destination (any-to-any routing) with the click of a button. Choose your desired audio stream, select your network output and press “Take” to route audio. Perfect for TOC program stream selection, ingest stations where a multitude of incoming feeds need routing to air, or production rooms — anywhere you need many-to-one control of networked audio streams.

## SPECIFICATIONS

### General

- Rackmount package requires 1RU of free rack space.
- XY Router Control Panel and 17-Button LCD Smartswitch panel require 1 free 100BASE-T POE enabled Ethernet port on a network switch for connection and power to the Axia network.
- 17-button SmartSwitch Panel requires PathfinderPC or PathfinderPRO software to program and execute conditional routing commands.
- FilmCap Button Panels require 1 free Axia GPIO port per each 5 buttons. PathfinderPC or PathfinderPRO software is not required for GPIO command of networked devices, but is required to program and execute routing commands.
- 8-Button OLED SoftSwitch requires PathfinderPC or PathfinderPRO software to program and execute conditional routing commands.

### Regulatory

**North America:** FCC and CE tested and compliant, power supply is UL approved.

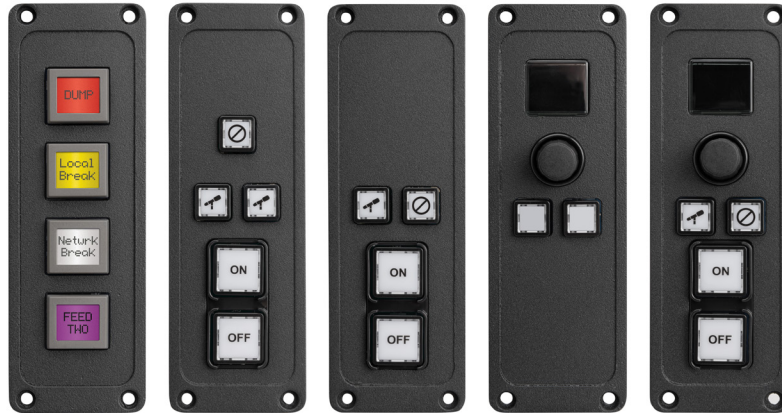
**Europe:** Complies with the European Union Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), as amended by Commission Decisions 2005/618/EC, 2005/717/EC, 2005/747/EC (RoHS Directive), and WEEE.



# Axia® Studio Control Panels

## Give Your Talent The Power

Fusion Panels



## OVERVIEW

Axia Studio Control Panels are a family of options panels designed for flush-mounting in desktop or turret cabinetry. They allow you to place control of headphone source selection, mic off/on control and even GPIO machine control at talent and guest desk positions, where they're most convenient.

## FEATURES

- Six accessory control panels for convenient talent / guest control of frequently-changed options, including headphone and mic control, GPIO closures, routing scene changes tied to Axia PathfinderPC software, Talkback to CR board op or Guest positions.
- Easy RJ-45 connection to console CANBus control network.
- May be flush-mounted in any flat or vertical solid surface.
- All panels measure 6" x 2"; require 2" mounting depth.

## IN DEPTH

### Options are just a touch away.

Axia consoles are nearly synonymous with "flexibility." You can save show settings and recall them in an instant... customize backfeeds and routing salvos... share audio sources and control throughout your facility... and that's just the beginning. Axia helps you customize your studio too, with accessory control panels that work seamlessly with your consoles to give talent fast access to headphone, mic and select switching controls.

#### Mic Control Panel



The Mic Control panel gives talent or guests remote control of their mic channel. Press the Talkback key, and you open a comm channel to the board operator. There's a handy Mute key for those "frog-in-the-throat" moments, too. Works with all Axia consoles.

## Producer's Mic Control Panel



Designed especially to suit the needs of busy talk show producers, the Producer's Mic Control panel provides control of microphone On/Off/Mute functions, and includes two special Talkback keys so producers can easily converse with studio remote talent. Works with all Axia consoles.

## Headphone Selector Panel



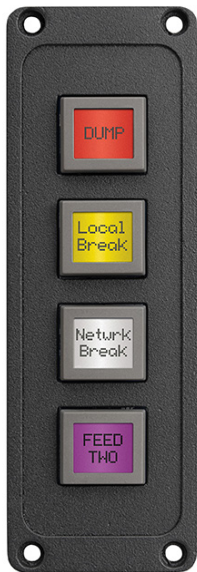
The Headphone Selector panel lets talent control their own headphone feeds. Turn the knob and control the volume. Push the knob, scroll through the list of available sources, and push again to "take." Preset buttons are provided for instant access to two programmed sources. Works with Fusion™ consoles.

### Mic Control / Headphone Selector Panel



Why choose when you can have it all? Combination Mic Control/Headphone Selector panel gives talent remote control of headphone source and volume, mic channel on/off, and includes Mute and Talkback functions. Works with Fusion consoles.

### Four-Key SmartSwitch Button Panel



Four-key SmartSwitch has illuminated, dynamic LCD keys that can change text and backlight color based on conditional logic macros you construct in Pathfinder routing control software, using simple drop-down tools. Works with Fusion consoles.

# SPECIFICATIONS

## General

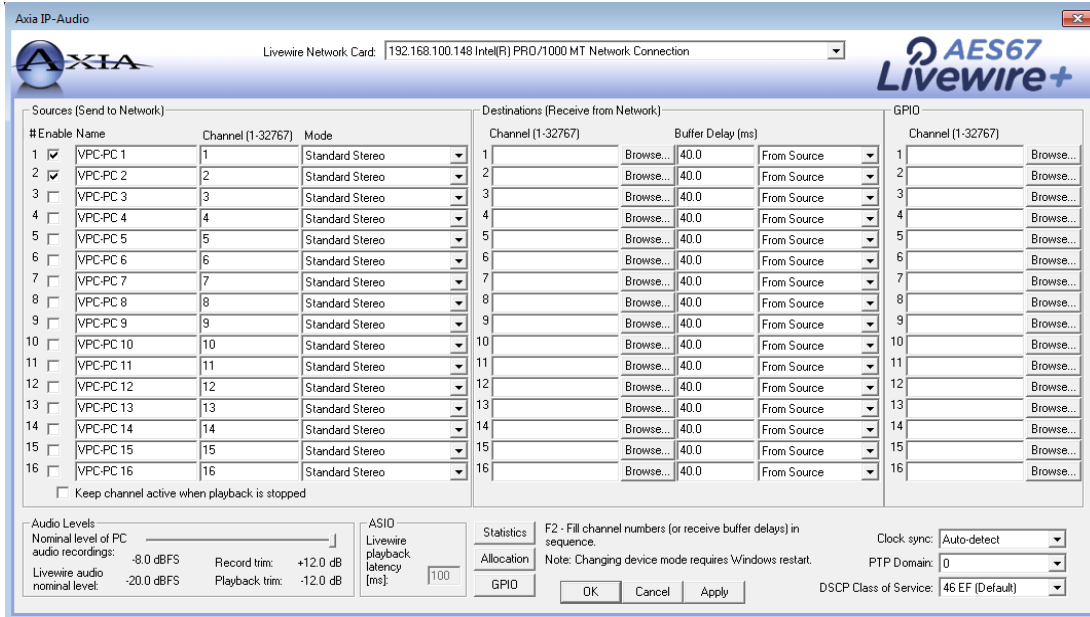
- Desktop panels require access to Axia CANBus control network via CAT-5 connection.
- Flush-desktop mounting style requires routed 6" x 2" cutout in countertop or work surface. 2" of space required behind each panel for adequate connector/cable clearance.
- Not all panels work with all Axia consoles. Consult Axia or your Axia representative for specific applications.

## Regulatory

**North America:** FCC and CE tested and compliant, power supply is UL approved.

**Europe:** Complies with the European Union Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), as amended by Commission Decisions 2005/618/EC, 2005/717/EC, 2005/747/EC (RoHS Directive), and WEEE.

# Axia® Livewire+™ AES67 IP-Audio Driver Pure Digital Audio from Networked PCs



## OVERVIEW

The Axia Livewire+ AES67 IP-Audio Driver is one of the first AES67-Compliant\* IP Drivers. It lets you send and record single or multiple channels of stereo PC audio directly to and from Axia networks via Ethernet — no sound cards needed. Up to 24 channels of stereo audio can be sent simultaneously over a single CAT-5 Ethernet connection.

## FEATURES

- AES67-compliant IP-audio driver.
- Sends audio sources to the Livewire® / Livewire+ AES67 network from PC/Windows audio applications such as multichannel delivery systems and other audio players.
- Receives audio from the Livewire / Livewire+ AES67 network to destinations on the PC/Windows system, such as audio recording applications.
- GPIO function conveys “button-press” data from the Livewire /Livewire+ AES67 network to destination applications; i.e., a console fader start button can command a PC/Windows-based audio player to start playback.
- The Axia Livewire+ AES67 IP-Audio Driver single-stream version emulates a standard sound card, with one stereo audio output device and one stereo audio input device. This version is suitable for typical two-channel (stereo) playback or recording applications.
- Axia Livewire+ AES67 IP-Audio Multichannel OEM versions emulate 4, 8 or 24 stereo channel sound cards (depending upon installed version), with one stereo audio output device and one stereo audio input device per “sound card.” These versions are intended for more complex professional applications.
- Supports 5.1 surround audio streams as well as stereo, configurable on a per-stream basis.
- Windows version includes WDM and ASIO versions for maximum system flexibility.

## IN DEPTH

### Pristine PC Audio: No Sound Card Required

Way back when enormous cart machines still roamed the earth freely, we used XLR connectors to get recorded audio into the console. But when PCs replaced the cart machine, we continued to connect to their sound cards with plain-Jane XLRs and a thick bundle of discrete wires that can't carry logic, PAD or any of the useful information that PC playout systems provide. Why? With the Axia Livewire+ AES67 IP-Audio Driver, there's a better way, and it's now AES67-compliant. We've added the ability to sync to PTP, support to define multicast address outside of the Livewire range, and added SIP/Unicast support for RTP streaming.

The PC is the heart of the modern radio studio. And Axia makes it easy to connect and exchange pristine digital audio with it. The Axia IP-Audio Driver for Windows is a special Windows driver that feeds your digital audio directly from your PC's Ethernet port to the Livewire / Livewire+ AES67 network. Up to 24 stereo playback channels and 24 stereo record channels can be accessed using our multi-stream driver that's provided by your favorite digital delivery system provider; a single-play/single-record version is available for audio workstations.

The IP-Audio Driver also provides GPIO-like start/stop and other control functions over the same network. It's available with the latest versions of high-end Windows audio delivery and editing software applications such as those from BSI, Burl, DAVID Systems, Dalet, ENCO, iMediaTouch, Netia, RCS, WideOrbit, and Zenon Media (to name just a few) and for Linux-based Rivendell through Paravel Systems—more than 50 systems and counting.

The Windows version of the IP-Audio Driver is available to broadcasters directly from Axia in 1-Stream and 4-Stream versions, and from Axia Delivery System Partners in 8-Stream and 24-Stream versions. Linux versions are available from our partner, Paravel Systems. For a full listing of Axia Delivery System Partners, visit [www.TelosAlliance.com/Partners](http://www.TelosAlliance.com/Partners).



# SPECIFICATIONS

## Microsoft Windows™ Operating System Requirements

- Windows 7 and Windows 7 Pro (32- and 64-bit editions)
- Windows 8
- Windows 10 (32- and 64-bit editions)
- Minimum hardware requirements specified for your Windows operating system are sufficient to run the Axia IP-Audio Driver.

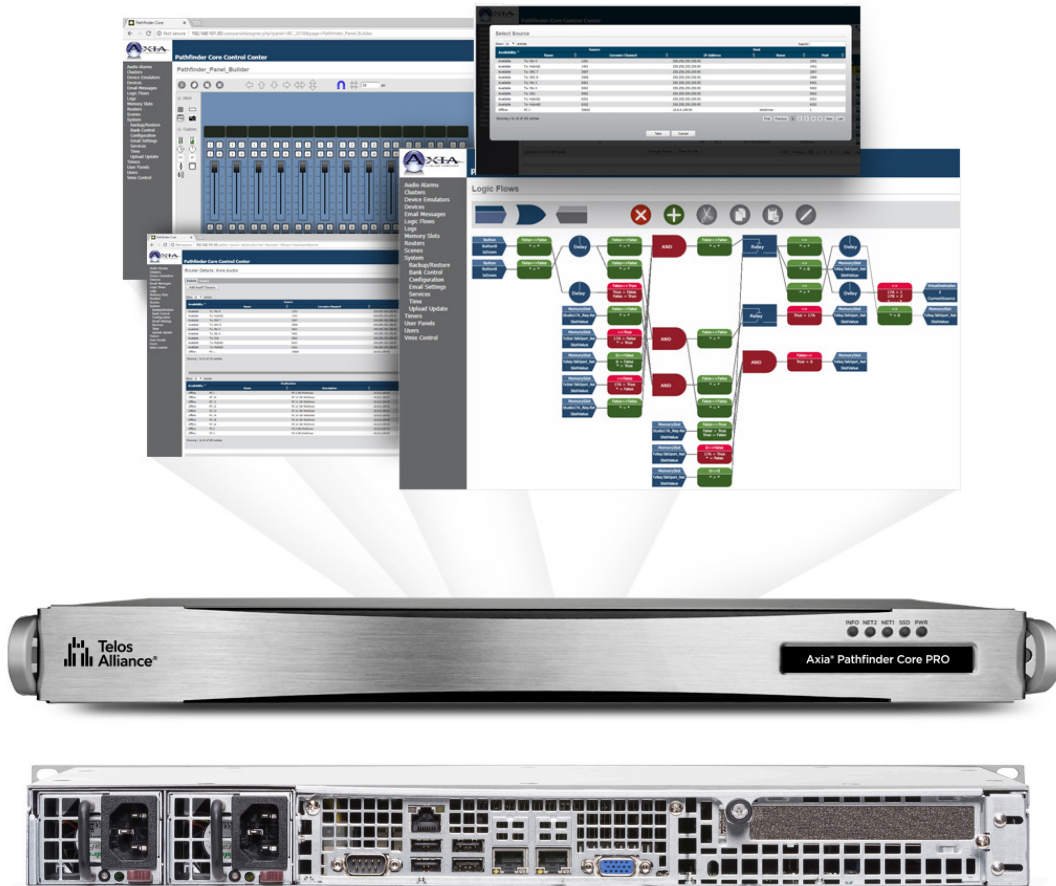
## Linux Operating System Requirements

- The Axia IP-Audio Driver for Linux is sold exclusively through Paravel Systems. Please contact them at [ParavelSystems.com/contact-us/](http://ParavelSystems.com/contact-us/)

\* One of our goals at the Telos Alliance is to further the adoption of AES67, the standard for Audio over IP designed to allow interoperability between various IP-based audio networking systems. And while these two words may sound the same, the differences between AES67 *compliance* and *compatibility* is huge. AES67, like all standards, can be minimally implemented. And when standards are minimally implemented, they minimally get the job done. Simply put, compliance means that every single aspect of the AES67 standard—like Unicast mode, for example—is met. Livewire+ AES67 is fully AES67-compliant.

# Axia® Pathfinder Core™ PRO

## Broadcast Controller & VM



## Tap Into the Power of the Livewire® AoIP Ecosystem

Livewire+™ AES67 is an AoIP protocol that not only enables high-reliability, low-latency uncompressed digital audio over Ethernet, but crucially, it incorporates logic, control, and program associated data (PAD) abilities.

Since no signal routing solution is useful unless you can control and manage the system effectively, Axia Pathfinder Core PRO Broadcast Controller + VM is the key to unlocking the true potential of a Livewire+ AES67 ecosystem.

By discovering and identifying all compatible devices connected to the system, Pathfinder identifies each available AoIP source and destination. Acting as a middleware layer using its onboard protocol translator to connect with many commonly used third-party controllers, it effectively serves as an AoIP router, an ideal core infrastructure component for a host of diverse radio and TV audio applications.

Pathfinder can schedule and trigger events, detect audio silence, issue alarms, and instruct failover routing. It even allows the user to create custom screen-based control and monitoring panels.

Throughout Telos Alliance® brochures, web page, and other materials, you'll find the designations "Control with Pathfinder" and "Route & Manage with Pathfinder," indicating those products are part of the Livewire+ AES67 ecosystem and can interface easily and efficiently with Pathfinder.

## See More. Do More. Control More.

With the third generation of Axia Pathfinder, the Pathfinder Core PRO Broadcast Controller and Pathfinder Core PRO VM, routing control has never been this simple...or this sophisticated.

Pathfinder Core PRO—either Appliance or VM—is a toolbox with powerful features that create efficient workflows and facility management. For one, it unifies your Axia device monitoring and control, letting you make system-wide changes from one central place—the Pathfinder Core PRO web interface. Pathfinder Core PRO simplifies routing in complex facilities, even those with thousands of audio sources and destinations, by giving the user easier, more intuitive control over audio workflows. This third generation of Pathfinder routing control lets you customize and command your Axia network with streamlined functionality, including Logic Flows—a flow-chart-style events system that makes events easier to create, adjust, and monitor in real-time. An efficient, intuitive web interface means easy configuration and monitoring from any device, and customizable user interfaces provide streamlined control over your entire Telos Alliance® system. Finally, this Linux-based appliance or VM makes full use of the processor while freeing you from a Windows-based server.

## Pathfinder Core PRO Broadcast Controller

Pathfinder Core PRO is a powerful and reliable 1RU appliance, proven in years of on-air service. It brings enterprise server-class redundancy and multi-processor, multi-threading architecture to real-time broadcast operations. Faster response, deeper event logging, and ultra-reliable monitoring and control are available in the Pathfinder Core PRO Broadcast Controller. Access to the Pathfinder Core PRO is browser-based using HTML-5, so it's PC platform-independent.

## Pathfinder Core PRO VM

Broadcasters worldwide are migrating key infrastructure and processes to virtualized platforms. Whether in company data centers or third-party server farms, broadcasters in radio, television, and other digital media are finding significant benefits in equipment and process virtualization.

Axia Pathfinder Core PRO VM is the virtualized monitoring and control solution for Axia Livewire+™ AES67 facilities. Many IT departments have standardized on one or two server hardware platforms, and perhaps a single hypervisor solution. This standardization is good business practice with benefits for operations, maintenance, upgrades, and redundancy.

Now, Pathfinder Core PRO VM allows broadcasters to deploy Pathfinder monitoring and control on familiar, approved hardware. Moreover, thanks to Pathfinder's network-optimized monitoring and control protocols, Pathfinder Core PRO VM can be deployed locally or at an off-site data center. Indeed, just one instance of this VM-installable solution can monitor and control dozens of Axia broadcast facilities—over a small region or around the globe.

Today's broadcast IT and operations teams appreciate standardization, functionality, and redundancy. Pathfinder Core PRO VM may be installed in a selection of hypervisor environments, including VMware, Hyper-V, VirtualBox, Proxmox, and Stratus.

Thanks to installation and deployment options, the VM version of Pathfinder Core PRO lends itself to centralized deployment, allowing monitoring and control of routing and Axia equipment for a network of studios and remote Axia locations.

## Pathfinder Core PRO VML

Joining the Axia Pathfinder Core PRO family is Pathfinder Core Pro VML. The VML delivers all the same features as VM, but has a lower starting price point as it comes with 300 connections (as opposed to VM's 1000 connections), making it perfect for a smaller system with just a studio or two. If the workflow expands, no problem. Simply apply add on license points to the server and expand system control.

## Broadcast Controller & VM

- Reliable, redundant, system-wide routing control
- With HTML-5, you can use any modern browser on any platform to configure, monitor, and control
- Linux-based with a web user interface
- Provides route control and customized logic events
- Graphical interface with real-time state reporting
- Graphical logic gates for creation of complex logic flows
- Control protocol for third-party integration, including Device Emulators
- Automatic router table generation
- Hardware version offers dual Gigabit Ethernet ports and dual-redundant power supplies
- Virtual routing for customized views of key audio flows
- Customizable user panels
- Includes 1000 points for use as crosspoint or Logic Flow endpoints
- Add-on licenses for additional 500 points for use as crosspoints or Logic Flow endpoints available
- Add-on licenses for additional 100 points for use as crosspoints or Logic Flow endpoints also available
- VML comes with 300 points for use as crosspoints or Logic Flow endpoints

## Access from Any Device with HTML-5

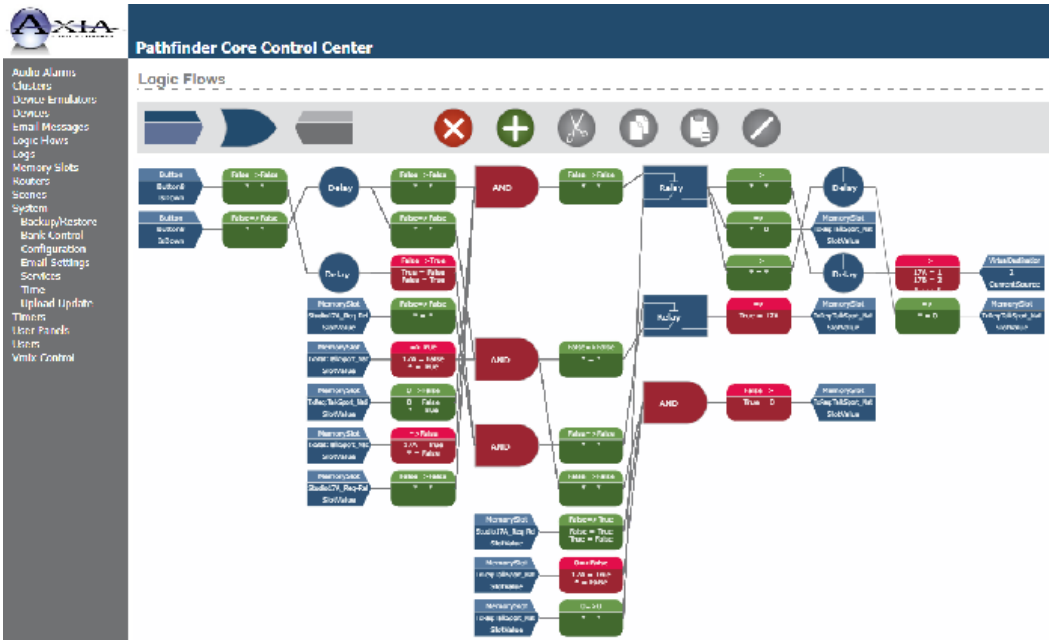
The Axia Pathfinder Core PRO is ideal for stations that want reliable, redundant, system-wide routing control that is purpose-built. The Linux-based network-attached appliance for routing control includes a web user interface to provide route control and customize logic events. Because it uses a web interface, Pathfinder Core PRO becomes platform-independent; users can use almost any personal computing device to interface with the appliance for reliable, 24/7 unattended operation. Customizable function panels are based on HTML5 and can be accessed from almost any computing device with access to the network.

## Telos Infinity IP Intercom Integration

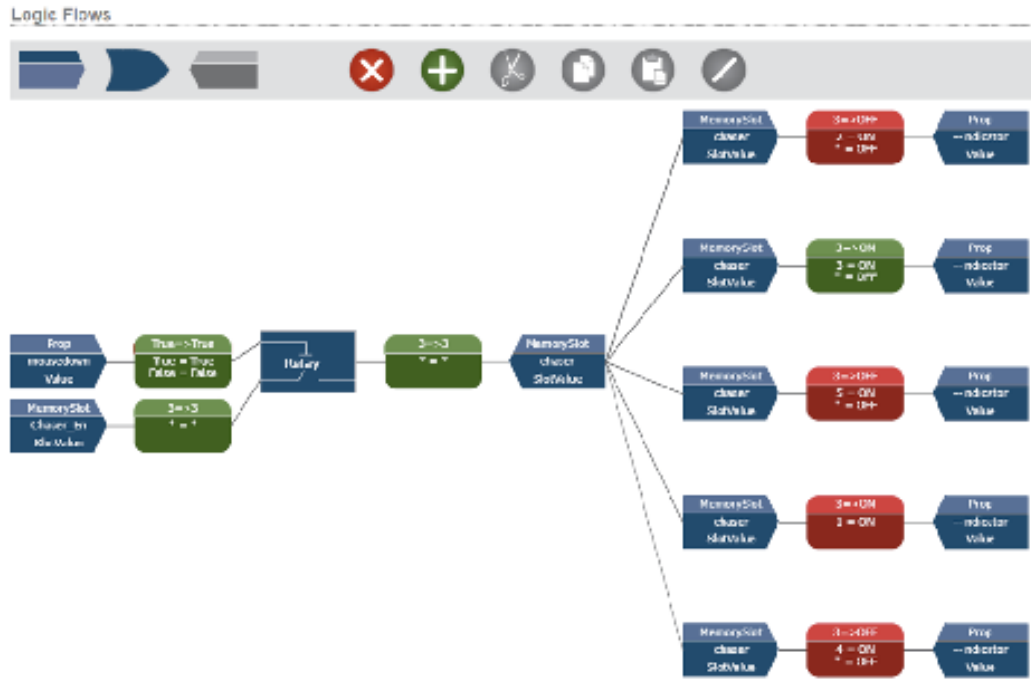
When coupled with an [Infinity IP Intercom System](#), Pathfinder users have direct access to, and control of, their intercom system's audio. With access to GPIO and external microphone functions, Pathfinder virtual panels can be used to remotely control Infinity intercom panels, giving users full remote functionality of their panel keys.

# Logic Flows

Pathfinder Core PRO features Logic Flows, an all-new events system that uses logic gates for the creation of complex logic and dramatically simplifies route changes. The Logic Flows event system features a graphical flow-chart style that allows you to see the connections and manipulate them easier, as well as see state changes in real-time via the web interface. For example, if an endpoint changes, you will see those changes live via color and/or textual change on the Logic Flow graphic. Logic Flows are intelligent enough to sense the connections between different flows and present those connections graphically with a much larger array of properties that are available for use. Finally, we have added the ability to clone entire groups of object settings with one simple flow, which becomes invaluable when creating redundant logical paths. These are dramatic improvements over previous versions.



Examples of PDM Logic Flows



Example of airchain switcher

## Device Emulators Control Protocol for Third-Party Integration

Because there are a variety of automation systems that don't understand the Axia language, Pathfinder Core PRO Device Emulators allow the unit to "look like" another protocol, emulating third-party protocols and translating them into the Axia language. When Pathfinder Core PRO receives commands in a non-Axia protocol language, it then makes the requested changes to the Axia equipment, emulating a different kind of device by speaking that language. Additionally, the Device Emulators allow the user to define their commands to send and receive, so Pathfinder Core PRO can be used to control and receive commands from third-party equipment in that way as well. The user simply has to define the textual commands to watch for or send in the Device Emulator.

## Easy Setup

Pathfinder Core PRO is fast, efficient, and simple to use: Just attach to your network, give it an IP address, and it automatically detects your Axia audio sources/destinations and GPIO ports. Pathfinder Core PRO searches for and finds all of the Axia equipment on the network, then automatically creates both an audio router and a GPIO router with all of the audio or GPIO sources and destinations that are discovered within that equipment, simplifying the initial configuration.

Pathfinder Core PRO also gives you peace of mind by providing distributed redundancy within your network. Multiple Pathfinder Core PRO units can be “clustered” for automatic redundant backup, and each unit has field-replaceable dual-redundant power supplies as well. As a dedicated hardware appliance, Pathfinder Core PRO gives you freedom from concerns about software compatibility, automatic OS patches, and computer hardware limitations.

## Customizable User Panels

In addition to advanced routing control, Pathfinder Core PRO lets users create their user panels, giving them a unique and customized look and design for features like meters and buttons. This powerful drag-and-drop tool integrates routing, logic, and device control to create a user interface that intuitively matches your facility’s unique workflow.

## Virtual Routing

Aside from routing physical inputs and outputs, Pathfinder Core PRO lets you create virtual routers. For example, if a specific room in a facility doesn’t need to see the entire network of inputs and outputs, but only the ones relevant to that room, then a Pathfinder administrator can create a virtual router that only includes the sources and destinations required by that room. In addition, virtual routers can be used to marry multiple sources and destinations together into routable packages. For example, you can create a virtual source that has both an actual audio source and an actual GPIO source as part of its package. Then when you create a route with the virtual router, the audio and GPIO get routed together with one route change. This capability extends even further by allowing any property known to the system to become a source or destination in a router.

## Memory Slots

Memory Slots allow you to store—and make changes based on—custom pieces of information. Memory Slots have been expanded in Pathfinder Core PRO to provide easy latching capability of any property in the system, to follow the state of any property in the system, and to build custom text by combining values from multiple slots together. This makes the use of Memory Slots more powerful than ever.

## Scene Changes

Scene changes are traditionally used for making a group of route changes at once. Pathfinder Core PRO extends this functionality by allowing any change over any device Pathfinder knows about to be included in a scene. Need to route a studio to air while turning on certain console channels, dialing a Z/IP ONE codec, and sending a start message to your automation system all at the same time? A scene can do that for you.



## Crosspoints

With Pathfinder Core PRO, you get 1000 points used towards sources and endpoint change blocks (within Logic Flows). Need more? You can simply buy an extension license to add more logic or more crosspoints.

**Note:** There are a variety of crosspoints that don't count against the license, including GPIO and virtual-only ones. Only Axia audio sources whose streams are enabled count against the point license. Also, logic flows built within the panel designer do not count against the logic licenses.

## FAQs

### Is Pathfinder required to run my Axia network?

No, Axia networks are self-contained routing and mixing systems that don't require any external control. However, if you want to automate your routing switcher, with preset scene changes, conditional routing changes, or scheduled route changes, Pathfinder will satisfy your needs.

### Why would I need routing automation?

Pathfinder Core PRO lets you consolidate control of your network operations, bringing all of your equipment together under one simple interface to create the most flexible workflows imaginable. It takes all of your Axia nodes and equipment and presents them as if they were a traditional single router, so you don't need to jump from place to place to see and manipulate your facility's routing infrastructure.

### Can I trigger routing changes from studio consoles?

Yes. There are a variety of drop-in modules for our popular Axia Fusion consoles that you can use to change single routes or execute predefined salvos based on time-of-day or GPIO. Rack-mount panels make it convenient to map Pathfinder routing commands to hardware buttons located elsewhere, too—like your TOC, engineering office, or communications room.

### Can Pathfinder sense dead air?

Yes, there's a Silence Detect function, including Silence, Audio Presence, and Clipping on Axia sources and destinations. With it, you can pick any audio stream in your network—say, your Program-1 output—and monitor it for signal loss. Once your "silence" condition is met, Pathfinder can take action by switching to a different audio input, flashing an alert to talent, or sending you an e-mail.

### Can Pathfinder react to a system command? I'm thinking about EAS activation...

Sure. You can define Logic Flows, in which Pathfinder Core PRO monitors GPI channels for external commands and takes action when predefined conditions are met. So you could use a logic flow to watch the GPIO output of your EAS decoder, and switch your main program output, along with your HD channels, to be fed by the output of your EAS gear until the GPI is released—upon which audio inputs are returned to their normal sources.

Additionally, Pathfinder Core PRO provides generic Device Emulators that allow you to define custom commands to send and watch for on a tcp port. So your automation system can send any command you desire, and Pathfinder Core PRO can detect that command, act upon it with any action you see fit via a Logic Flow and reply with another custom command.

Finally, Pathfinder Core PRO provides an advanced control protocol that exposes everything you might want an outside system to control.

### **Does Pathfinder Core PRO support clustering, like PathfinderPRO software?**

Yes. You can attach two Pathfinder Core PRO devices to your network for complete routing automation redundancy.

### **Does Pathfinder Core PRO support SNMP, AES70, or other protocols?**

Pathfinder Core PRO supports Axia and other protocols to allow you to create highly customized workflows. As the industry is learning the importance of common tools, open protocols are becoming hot topics. Pathfinder Core PRO was designed with an open architecture to easily incorporate other protocols. Pathfinder Core PRO includes Device Emulators (protocol translators) with multi-protocol support that can be used to send and receive *any* data.

## Power Supply AC Input

- 100VAC to 240VAC, 50Hz to 60Hz, IEC receptacle, internal fuse
- Power consumption: 100 Watts, auto-ranging

## Operating Temperatures

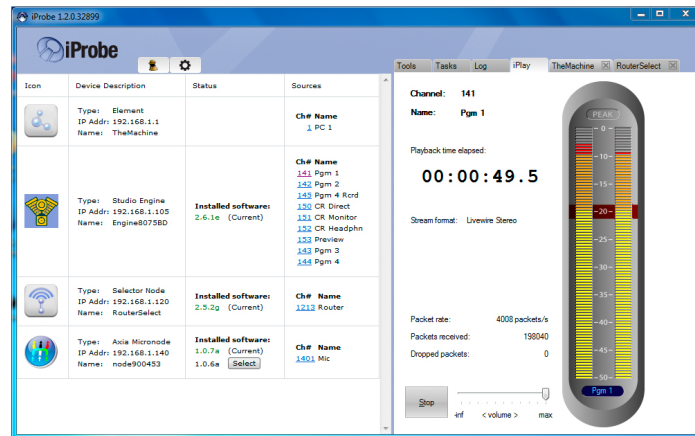
- 0 degrees C to +50 degrees C, <90% humidity, no condensation

## Dimensions

- W 19.00 in (48.0 cm), H 1.75 in (4.40 cm), D 19.50 in (49.53 cm)
- \*\*Depth is measured from the furthest edge to edge point (server handle to power supply handle)
- 1RU
- 18lbs

# Axia® iProbe

## IP-Audio Network Management Software



## OVERVIEW

iProbe software helps with management, updating, and remote control of any Axia system. It has a powerful auto-documentation feature that generates configuration docs for every device, an Organizer that allows grouping networked audio devices into logical groups for easy management, facilitates uploading software to single or multiple devices, makes device configuration backups and more.

## FEATURES

- **Discovery:** the ability to scan your Axia Livewire® network for Control Surfaces, Nodes (AES, Analog, GPIO), and Mixing Engines, as well as any Livewire devices from Axia Hardware Partners.
- Displays current firmware versions running on the all connected devices and gives you the ability to update firmware remotely, one device at a time or in logical groups of similar devices.
- Displays all the devices in your Livewire system and allows you to browse directly to a selected device's Web-based remote control interface. There is no need to type the device IP address into your browser.
- Complete configuration backup capabilities of individual devices, or all devices within your Livewire system.
- Integrated Syslog server for automated event logging.
- Auto-Documentation feature exports complete system data to a format of your choice for secure backup.
- Built-in iPlay module allows you to listen instantly to any channel on your network, and verify the levels of a given source.

## IN DEPTH

### Easy Network-Wide Backup, Update and Documentation

Axia iProbe is an intelligent network maintenance and diagnostics suite that consolidates managing, updating, and remotely-controlling your Axia system into one easy-to-use software application.

Axia networked audio devices are managed using a standard Web browser to view, configure, and administer each device. iProbe helps simplify this process by scanning and collecting all the information and presenting it a graphical interface. Along with this convenient central point of control, iProbe gives you powerful system tools like the Organizer, which performs advanced tasks such as gathering Livewire-enabled devices into logical groups for easy management and single-point administration of group settings. iProbe also helps with software version control, making it simple to upload software to single or multiple devices, back up device configuration, and more.

There's a powerful Auto-Documentation feature that queries and documents configuration settings for every networked Axia device — essential for administering large networks. Auto-Doc gives you the ability to export your Axia system data into an HTML format or text for printing a hard copy of your system configuration, or constructing a web page for future reference. You can also export to a tab-delimited text format for importing into other documents or spreadsheets. Exporting in XML format to other applications is also available.

And of course, there's a System Backup / Restore function that generates full-system backups which can be used to restore your Axia network from bare metal, should the need arise.

Even with all this power, iProbe is simple to use. An intuitive graphical interface lets you browse a list of similar devices, or click one-at-a-time on individual devices to make inspections or adjustments. You can even listen to individual sources with the integrated iPlay functions, and check on audio levels of any audio source.

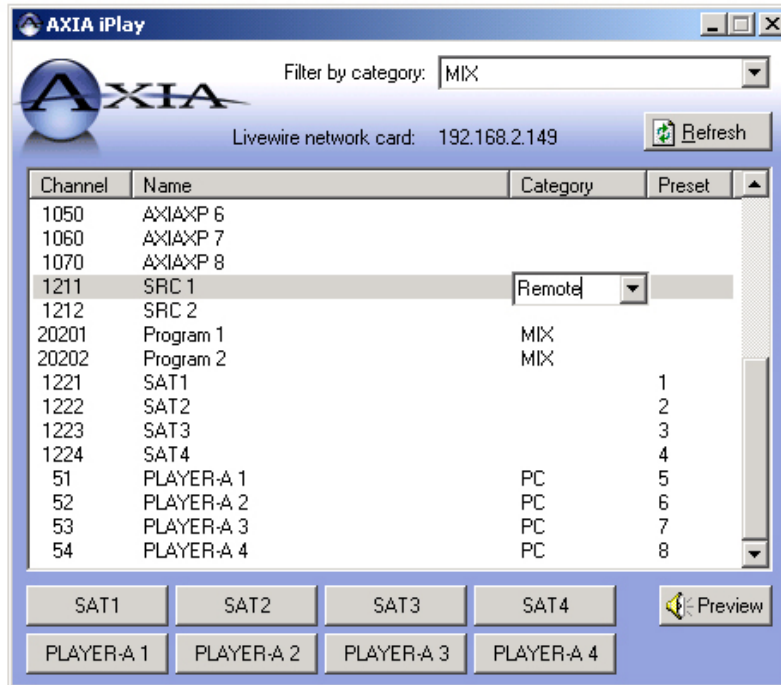
## SPECIFICATIONS

### System Requirements

- Windows 2000 Professional, Windows XP Professional, Windows Vista (32- and 64-bit editions), Windows 7 and Windows 7 Pro (32- and 64-bit editions), or Windows 8 operating system.
- 100BASE-T or higher wired network adapter.
- Internet access to enable device firmware downloads.

# Axia® iPlay

## Network Stream Player for Windows



## OVERVIEW

Software-based IP-Audio monitoring program lets Windows PC users select and listen to any audio source available to their Axia network. Choose from a complete list of available streams; eight user-programmable preset buttons provide quick access to frequently-accessed channels. On-screen level display meters auditioned audio.

## FEATURES

- Allows listening to any Axia network audio stream using standard PC sound card/speaker combo or headphones.
- Automatic detection of Livewire® audio sources from connected PCs.
- User friendly interface allows filtering and sorting Livewire channels, making it easy to navigate in big systems containing hundreds or thousands of Livewire channels.
- Preset buttons that allow quick access to eight pre-selected channels.
- Administrator can restrict access to a set list of audio channels using built-in Access Control Lists.

## IN DEPTH

### Turn Any PC Into a Listening Station.

Remember the days when giving your Sales Manager a listening station meant running cable through the ceiling, installing a selector panel in the office wall, and mounting speakers in the drop tiles? And then, he could only hear a limited number of the audio channels your plant produced.

Axia iPlay PC software does away with old-fashioned speaker wire and rotary selectors. It allows any Windows PC to listen to streamed audio directly from your Axia network — any streamed audio. Not just Program feeds, but satellite downlinks, remote hosts, news production studios, interview rooms, etc. iPlay lets you give PC monitoring capabilities to PDs, GMs and sales staff using their existing computers, with no special wiring required. Just connect their PC's NIC to your Axia network, install iPlay, and presto! Every PC is a listening station. There's even an on-screen level display that meters the audio you're listening to — great for use as confidence meters for PDs or production personnel.

Users can choose from a list of all available audio, but in big plants that can be a lot to sift through. Not to worry: they can pre-set their favorite channels on the eight user-programmable preset buttons to get quick access to the streams they listen to most. And of course, you can filter out raw mic channels or other selected audio streams to prevent unauthorized listening.

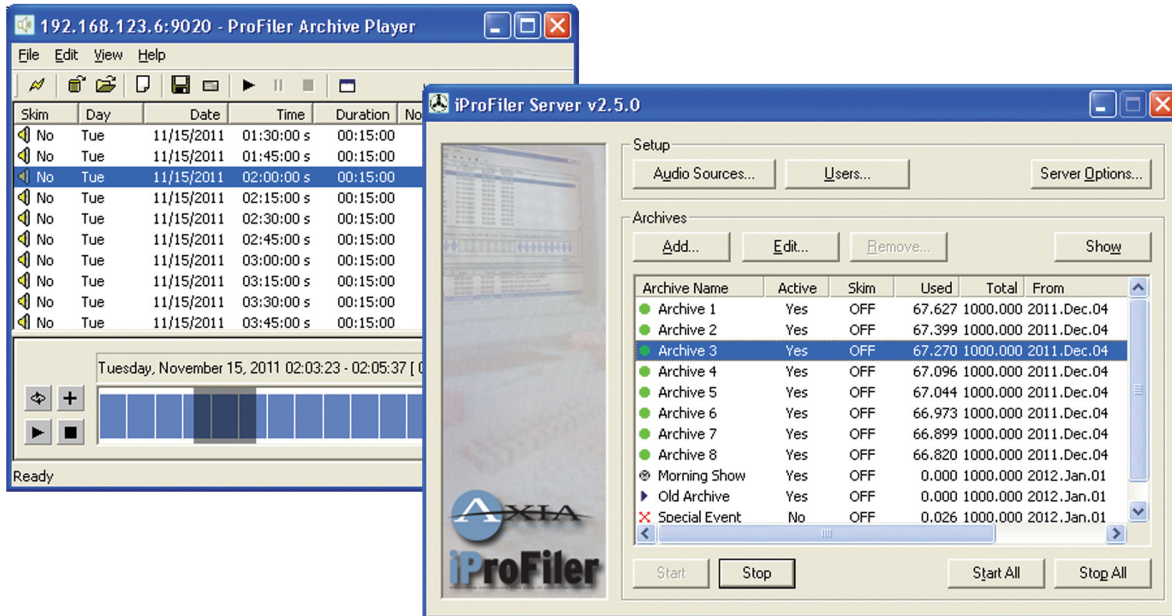
## SPECIFICATIONS

### System Requirements

- Windows 2000 Professional, Windows XP Professional, Windows Vista (32- and 64-bit editions), Windows 7 and Windows 7 Pro (32- and 64-bit editions), or Windows 8 operating system.
- 100BASE-T or higher wired network adapter.

# Axia® iProFiler

## Automated Program Archiving



## OVERVIEW

Axia's popular iProFiler logging software lets you simultaneously capture up to 24 stereo audio channels to time-stamped MP3 audio logs directly from your Axia IP-Audio network — no audio cards required. Included software records, manages and plays back archived audio files. Recording software runs under Windows XP and later; playback software runs under Windows NT, Windows 2000, Windows 98 or Windows XP and later. Record mode can be set for logging, skimming, or combination of both. Logged audio may be auditioned remotely via LAN, WAN, or Internet.

# FEATURES

- Simultaneously captures up to 24 channels of stereo audio.
- Directly records Axia digital audio streams — no sound card needed.
- Archived audio can be auditioned remotely via LAN, WAN or the Internet.
- iProFiler Live Player streams audio over any IP connection as it's being encoded. Great for consultants or group PDs listening remotely.
- NTP Time Sync synchronizes log file timestamps with your house NTP server (if equipped).
- Choose your skimming mode: Logging (continuous archival storage of program material), Skimming (records only when talent mic is open), or SmartSkimming (low-bitrate logging switches to a user-specified higher bitrate for quality captures when talent is on-mic).
- No "spool-up" time: iProFiler buffers incoming audio so that you never lose a word - no matter how late talent opens the mic.
- Recorded audio is time-stamped and stored in easy-to-search 15 minute blocks for fast retrieval.
- Standard MP3 file format allows logged audio to be played back on any media player application. Play files in iProFiler Archive Player to view detailed time-of-day data and user annotations.
- Easily select & export audio segments to WAV files for external editing.
- Choose any standard MP3 bit rate - from 16kbps - 320kbps - for the quality/disk space ratio that best suits your needs.
- Encoded program segments can also be set to upload automatically to an external drive, network share or FTP site.
- Remote monitoring application lets you "check up" on iProFiler remotely using a LAN or Internet connection; monitors disk space & audio presence.



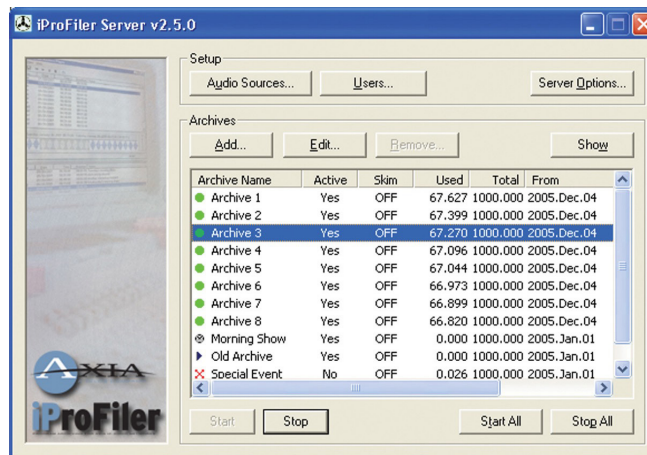
## IN DEPTH

### Multi-channel, Multi-stream audio archiving for Axia Audio networks.

Sooner or later, someone's going to ask for a hard copy of a specific broadcast. Whether it's a client looking for proof of play, a Group PD that wants airchecks, or a listener claiming your morning show did something naughty, you'll need a record of your broadcast programming.

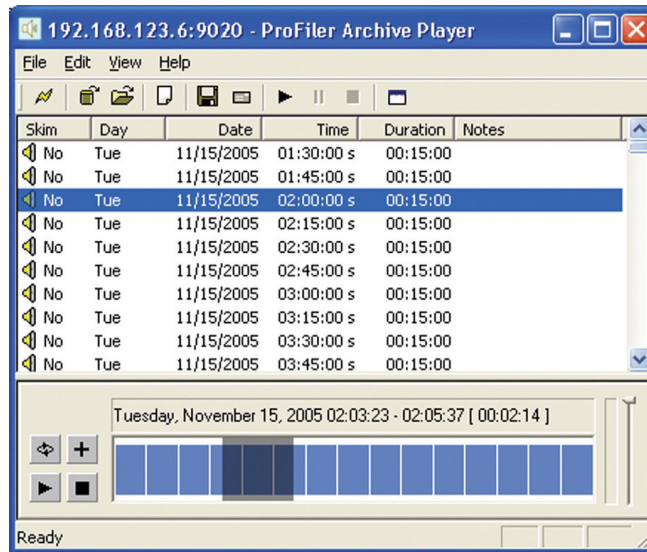
Be prepared with Axia iProFiler, the award-winning audio archiving software that integrates with Axia IP-Audio networks to capture up to 24 simultaneous channels of Livewire® Standard-stream stereo audio without sound cards. iProFiler uses the Axia IP-Audio Driver to exchange audio directly with Axia networks; just install iProFiler on a PC, connect the computer's NIC to the network with CAT-5, select the program streams you want to capture. It's as simple as that.

iProFiler's networked connectivity makes it the easiest logger to set up and operate, bar none. Just browse the audio streams available on your Axia network, select the ones you want to record, choose a bit rate for storage and off it goes.



And iProFiler is extremely flexible; you can continuously log program audio, automatically record telescoped talent airchecks, or record only what's broadcast when the mic isn't open. And iProFiler has "listen line" capability that lets you hear audio over your network (or the Internet) as it's being encoded - perfect for group PDs or consultants.

iProFiler's stored audio is networked, too. Any workstation or computer connected to your IP-Audio network can find and listen to time-stamped audio using a simple web-browser interface.



iProFiler gives you a choice of operating modes for each archived audio stream:

- Choose “Logging” for continuous archival storage of program material, indefinitely (dependent upon storage space) or on a timed-record basis.
- Choose “Skimming” to record audio only when talent’s mic is open, to capture live shows, call-in segments, talk shows or DJ bits. Program audio is pre-buffered so that there are no “up-cuts” upon record activation.
- Choose “SmartSkim” for a unique combination of skimming and logging. When talent mics are closed, ProFiler records audio in a low-bit rate logging mode, then switches to a higher bit rate for quality captures when talent is on-mic. All bit rates are user-selectable.

iProFiler is ideal for stations required by law to log program content, and since you can also listen to “live” audio over IP as it’s being logged, it’s great for Production Directors and morning show producers, program consultants or group PDs. Perfect for competitive monitoring, too — log other stations along with your own to fine-tune your formatics. An integrated audio browser lets your production crew tag segments and export them as WAV files for further editing, and logged shows can be automatically uploaded to FTP servers for storage or distribution.

# SPECIFICATIONS

## PC Hardware Minimum Requirements

- Pentium-IV, 2.4GHz processor or better with 512Mb RAM, 300 Gb free hard drive space, 100BASE-T NIC.

## Operating System

- iProFiler Server: requires Windows XP or later. WAN/Internet connection required for remote monitoring.
- iProFiler Client: Requires Windows XP, Windows Vista, or Windows 7 or later.

## Operating modes:

- Logging (continuous archival storage of program material)
- Skimming (records only when talent mic is open)
- SmartSkimming (low-bitrate logging switches to a user-specified higher bitrate for quality captures when talent is on-mic)
- Scheduled recording (date and time + length of program)

## Audio Interface

- 100BASE-T or better Ethernet NIC with connection to Axia IP-Audio Network.
- Supports up to 24 stereo streams simultaneously.

## Audio Specifications

- Storage Format: MP3.
- Compression Algorithm: Genuine Fraunhofer IIS
- Bit Rates Available: 8 kbps to 320 kbps, in standard increments
- Pre-roll and Post-roll Skim delay: up to 10 seconds, user-definable

# 25-Seven® Voltair®

## Ratings. Confidence.



## OVERVIEW

It's all about your listeners. Your people, your programming, your gear... they're all focused on building and retaining your audience.

We don't have to tell you about the direct link between the size and composition of your audience—as measured and reported by your ratings—and your advertising revenue. That's why it's vital to you that every panelist in your market is accurately measured and that every station is playing on a level field.

Introducing Voltair, designed to give you greater confidence that every listener is counted when it counts the most.

## Ratings, Programming & Technical Operations

Radio ratings have been called “a game of inches,” where winners and losers are sometimes decided by the thinnest of margins. Station management teams have always carefully monitored their markets’ listener data and taken action to maximize ratings and revenue.

With changes in rating survey methodologies in recent years, many program directors report making more dramatic changes than ever before. For example, dayparts have been moved, local breaks have been reduced, and programming clocks have become more rigid in response to the hard, quarter-hour boundaries of ratings credit. Likewise, the industry has seen changes in audio processing practices, airchain device order and other station engineering procedures—all in service to optimal performance of watermark-based ratings technologies.

Because ratings performance data is provided on a delayed basis, stations lack the means to conduct real-time analysis of audience response. Programmers have had limited insight into what efforts are of benefit and why. Hence, most station efforts to optimize their performance in ratings have been trial and error, with little insight into what may or may not be effective.

### Understanding The Current Ratings Ecosystem

25-Seven® has been following the deployment of watermark-based rating methodologies since they were introduced. We’ve spoken with many program directors and engineers, getting their perspectives on the overall system architecture and the results of their optimization efforts.

After researching the publicly available data on the technology, our team of broadcast and audio experts uncovered the variables that contribute to watermark integrity. More importantly, we developed Voltair to provide you with the tools you need to monitor and analyze these variables, providing you with data to inform your technical and programming decisions.

### What did we find?

- **Audio Content**—The spectral characteristics of your audio content—music, announcer voices, etc.—may negatively impact the robustness of your watermark encoding. Simply put, some audio content encodes well while other content does not.
- **Listener Environment**—A listener’s device may not detect particular content because of their current acoustic environment. A song or voice may not, for example, decode as well in a car as it does in a bedroom.

To address these issues, we needed to account for the highly complex set of interactions among the encoding and decoding processes, the audio properties of content, and listeners’ acoustic environments. We developed a totally new set of easy-to-use tools for Voltair to analyze and help you manage the consequences of these interactions.

## How Voltair Can Benefit You

### Operating transparently in your airchain, Voltair:

- Monitors and analyzes the robustness of watermark encoding across all program content.
- Offers visibility into how listening environments may influence watermark decoding, using models of acoustic spaces where listeners are wearing or carrying their devices.
- Includes advanced audio signal processing to enhance the detectability of the watermark codes within the context of your programming objectives.
- Empowers programmers to make informed decisions to address potential weaknesses in either encoding or decoding.

### For example:

- You can compensate for changes in program material and listening environments during different dayparts and program types.
- You may choose to balance strong and weak program segments within each quarter-hour time segment to produce successful decoding and get the earned credit for the full segment.

Voltair also serves as an off-line tool to identify produced and live content with low encoding confidence. New programming elements—liners, promotions, etc.—may be created with greater confidence of strong encoding.

## Voltair and Your Ratings

Your revenue relies on your ratings. The overriding purpose of Voltair is to increase your confidence that those ratings accurately reflect the habits of your listeners.

As you work to get credit for all the ratings you've earned, keep the following in mind:

- Even one listener device worth of data can make a measurable difference in your ratings.
- Insights into how your audio content is handled during the watermarking process can show you ways to improve the robustness of your encoding.
- Consideration of listening environments can guide changes that may improve the reliability of watermark decoding on listener devices.
- When you have confidence in the end-to-end watermark system performance of your stations' signals, you also have more confidence in the relationship between ratings and your programming decisions.

Voltair won't increase your actual listenership, but it will help you be more confident that listeners to your station participating in the watermark-based ratings process are correctly measured.

## Regulatory

**North America:** FCC and CE tested and compliant, power supply is UL approved.

**Europe:** Complies with the European Union Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), as amended by Commission Decisions 2005/618/EC, 2005/717/EC, 2005/747/EC (RoHS Directive), and WEEE.

# 25-Seven® Program Delay Manager II

## Profanity Delay, Perfected



## OVERVIEW

- PD Alert™ instantly emails time-stamped audio files whenever Dump is pressed
- Files capture what took place both on-air and off-air
- Seamlessly builds and exits delay, with configurable delay time, build and dump options
- Delays IP data, serial streams, and GPIO, maintains sync to audio
- Dual Network ports, redundant power, fanless design
- Analog, AES3 digital and Livewire+AES67 AoIP



# FEATURES

## It's About Time, Again!

Program Delay Manager II (PDM II) brings the legendary features of the original PDM broadcast delay to a freshly designed platform built for the AoIP world of today. Ease of use, transparent audio quality, and program director-friendly features converge in PDM II to take air chain management to a new level.

## The AirCheck is in Your Email

Program Directors have more on their plates today than ever before. There's no way anyone can monitor every broadcast hour of every day, but PDs need to be the first to know what happened when that "dump" button gets pressed.

With PDM II's patented PD-Alert™ feature, two time-stamped audio files capturing what took place both on-air and off-air get internally archived and emailed to the PD (or GM, or CE, or the legal team) every time questionable material is "dumped".

For broadcasters serious about protecting their license, PDM II provides an instant log record establishing your company's action and intent to keep the airwaves clean.

## 99 Seconds Of Delay Your Way

PDM II comes standard with 99 seconds of stereo audio delay, and a dump function that can be set to remove any number of seconds you choose.

Build a delay through pre-rolling, time expansion, or audio file playout capabilities built right into PDM II. Exit a delay through time compression or use the Cough button to simply wait and exit.

Dump audio through the standard "cut and rebuild" method, or use PDM II's Overkill™ feature to play a "fill" file. Overkill allows you to select a show-specific file from a list and play it over the dump buffer instead of collapsing the delay.

## How PDM Does It

### Superior Algorithm Design for Flawless Time Expansion/Compression

PDM II utilizes the industry's most transparent time compression and expansion algorithms. Your listeners probably won't appreciate our superior, artifact-free audio because they won't perceive it's in use!

Our algorithms serve up smooth, crisp, stutter-free audio, even on stereo music. Unlike other products, we never splice at level thresholds or alter pitch. Clean audio is what we do best, but now you can be sure the content is "clean" as well! Better algorithms mean delays can be rebuilt faster, so you can safely get back to callers. Build or Exit rates can be adjusted in real-time, so you can be more or less aggressive, depending on audio content.



## Audio, RDS, Data Streams and GPI/O Stay Synced

PAD or “now playing” serial data streams are delayed in precise synchronization with the audio as it grows, shrinks or whenever the dump button is pressed. PDM II’s data-follow-audio capabilities allow flexible synchronization from data input to data output. For example, serial data over IP can be routed to an IP output while remaining synchronized to the audio. Two independent data delays are supported, and GPI/O closures stay in sync, too.

## Future-Proof Audio Quality

Superior balanced analog and AES3 digital with 24 bit ADC’s and DAC’s. 85dB s/n, response 25Hz-18kHz (+0/-0.2dB) and 0.02% THD+N... even during compression/expansion. Audio is always linear, so no lossy data reduction enters your signal path.

## AES Digital, Balanced Analog or Livewire®+AES67 AoIP

Audio can be input on analog, AES3 digital, or Livewire+AES67 AoIP. All output types are active, regardless of the input type used. Analog and AES3 paths feature relay bypass circuits so audio will pass even if power fails. Whether you already have a Livewire network or you plan to build an AoIP facility, PDM II has you covered with Livewire+AES67 connectivity.

## Superior Remote Control

Choices, choices! PDM II presents you with easy-to-use front panel controls, designed for the rigors of the live studio. Contact closure commands can be synced to the audio delay by the smart, programmable 5x5 GP I/O on a DB15 connector, with 20 additional Livewire GPIOs available. Full bi-directional serial control over IP includes advanced real-time status monitoring of parameters such as current delay depth and audio levels.

## HTML5 Web Configuration and Control

A comprehensive, password protected HTML5 web interface lets you manage your PDM II from nearly anywhere by any device with a modern web browser. Our Multi-View web feature permits network operation centers and large facilities to monitor and manage up to 20 units from a single browser screen.

Navigating through “set and forget” parameters is a breeze with our built-in HTML5 web server. Change your settings, upload audio files and manage PDM’s dump archives remotely using simple, clear browser screens. Dual network support allows you to control and manage your PDM II from your admin network while running AoIP audio on an air-gapped LAN.

## Pathfinder Control and Support

With full support of the LWRP protocol, Telos Alliance’s Pathfinder broadcast controller can monitor, control, and change AoIP input/output routing of PDM II.

# IN DEPTH

## Front Panel

An HTML5 interface replicates PDM II's front panel on your web browser, so every button and display is present and functions just like the real front panel. Through careful client-server communications management, round-trip latency is almost imperceptible, creating a seamless user experience. You can even control PDM from multiple devices at the same time. Just open a web browser interface, and anything you do on one device will be reflected on others, including PDM II's physical front panel.

**PDM II "PDMII"**
Logout

FRONT PANEL
CONFIGURATION
PD-ALERTS™
DUMP ARCHIVE
AUDIO FILES
UTILITIES
INFORMATION

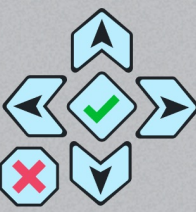
**Front panel page**

● PDM II is Ready

● 4:58:21P

● Delay 0.0s

● Menu✓



**Build**

**Exit**

**Cough**

**Dump**

**Bypass**

Click [here](#) to open a mini front panel window.

Click [here](#) to open multiple front panel windows.

---

Model: PDM II

Serial number: 0530ARD100

Firmware version: 1.0.0-rc2-5-ga0d2ffb-dirty

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## Configuration

Navigating through “set and forget” parameters is a breeze from PDM II’s Configuration page. You’ll find obvious control with all your settings on one simple screen.

PDM II "PDMII"Logout

FRONT PANELCONFIGURATIONPD-ALERTS™DUMP ARCHIVEAUDIO FILESTILITIESINFORMATION

Configuration page

Identification

PDM namePDMII

Control

Build modeExpand

Boot modeReal-time

Build file namepdm\_demo\_insert.wav

Dump modeDump

Overkill file namepdm\_demo\_insert.wav

Exit modeCompress

Delay size8seconds

Maximum delay size90seconds

Dump size4seconds

Initial build/exit speed7%

## PD Alerts™

A dedicated page lists all of the PD Alert emails the unit has sent to your chosen staff.

PDM II "PDMII"Logout

FRONT PANELCONFIGURATIONPD-ALERTS™DUMP ARCHIVEAUDIO FILESTILITIESINFORMATION

PD-Alert™ email log

This is a list of the notifications sent for the most recent dumps.

Date	To	Type	Size (bytes)
06Jan2022 09:09:52	gm@example.com	Text	1110
28Dec2021 09:52:39	pd@example.com	Audio	3971751
28Dec2021 09:49:26	gm@example.com	Text	1110
28Dec2021 09:49:26	pd@example.com	Audio	3879464
27Dec2021 12:50:22	gm@example.com	Text	1110
27Dec2021 12:50:22	pd@example.com	Audio	4056040

## Dump Archive

A Dump Archive displays before/after audio file pairs created whenever Dump gets pressed. Easily download and review what took place both on and off air.

PDM II "PDMII"

Logout

FRONT PANEL

CONFIGURATION

PD-ALERTS™

DUMP ARCHIVE

AUDIO FILES

UTILITIES

INFORMATION

Dumped Audio Clip Archive

This is a list of the most recently dumped **PD-Alert™** audio clips.

File name	File size	Date
<a href="#">PDMII_06Jan2022_09:09:52_OffAir.wav</a>	3.38 MB	06Jan2022 09:09:52
<a href="#">PDMII_06Jan2022_09:09:52_OnAir.wav</a>	2.58 MB	06Jan2022 09:09:52
<a href="#">PDMII_04Jan2022_09:22:50_OffAir.wav</a>	3.32 MB	04Jan2022 09:22:50
<a href="#">PDMII_04Jan2022_09:22:50_OnAir.wav</a>	2.57 MB	04Jan2022 09:22:50
<a href="#">PDMII_28Dec2021_09:52:39_OffAir.wav</a>	1.89 MB	28Dec2021 09:52:39

## Audio Files, Utilities & Information

- Easy management of audio files you can use for quickly building your buffer at the beginning of your show, or for our exclusive Overkill™ feature.
- Firmware uploads and bank switching
- Utilities such as system log files and Telos Connect support sessions
- System information display of status, setup and version information

## SPECIFICATIONS

### Power Input

PDM II features fully redundant power through a combination of an IEC C14 power connector, and PoE (Power over Ethernet) on the Primary network port.

### Network

PDM II features two 1000BT network adapters, supporting separate gateways for Admin and AoIP networks).

### Analog Inputs and Outputs

Stereo inputs are balanced with a load of 20kΩ on RJ45 (Studio Hub) connectors. Outputs are electronically balanced, also on RJ45 connectors, designed to feed a load of 600Ω or greater. Input and output sensitivity default levels can be set from the front panel, and can range between +20dBu and -10dBu. Hardware relay bypass allows signal to pass in the event of power loss.

## Digital Inputs and Outputs

Digital output is always active, regardless of whether you are using analog, AES3 or Livewire+AES67 AoIP inputs. PDM will lock to any valid 32 kHz, 44.1 kHz, or 48 kHz signal at the digital input connector, even if you have selected analog for the input. In that case, the digital input can be set to control PDM's AES3 output sample rate. If PDM is not connected to a digital input, it uses its own high-reliability 48 kHz sample clock. Hardware relay bypass allows analog and AES3 signals to pass in the event of power loss.

## Livewire+ AES67 Compliant AoIP

AoIP interface is fully AES67 compliant. Synchronizes to either local clock, Livewire or PTP / IEEE 1588 clocks.

## GPIO

Five parallel control inputs and five parallel control outputs appear on a DB-15 connector, with the same wiring scheme as Telos Alliance xNodes. Input and output functions are assigned through a configuration menu on the front panel or GUI. Inputs and outputs are opto-isolated for easy interface to other equipment. A +5v supply and ground are also brought out to the DB-15 for simple remote controls using pushbuttons and LED status readouts. The +5v supply can carry 200 mA, more than adequate for 5 LEDs and 5 logic inputs. It is protected by an internal, self-resetting thermal circuit breaker. Additionally supports 20 Livewire GPIOs (configurable from the GUI).

## Detailed Specifications

### Audio

- S/N  $\geq$  85 dBA with 10 dB headroom ( $\geq$ 94 dB dynamic range); THD @1 kHz < .01%; IMD (IHF) < .01%; Frequency response  $\pm$  0.5 dB, 20 Hz – 20 kHz, measured analog input to analog output.

### Dimensions

1RU (rack unit); 19" W (with rack ears) x 9.25" D x 1.75" H (483 x 235 x 44mm)

### Power

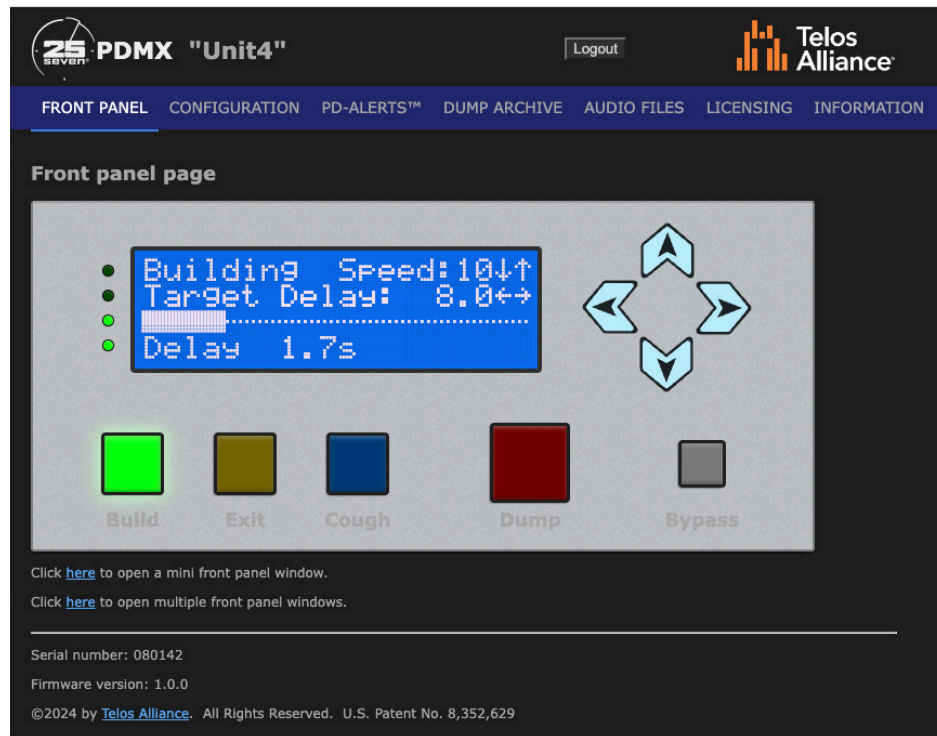
- 100-240 VAC, 50/60 Hz; typical consumption 32 VA.
- Class 3 PoE (max 13w)

## Regulatory

**North America:** FCC compliant, power supply is UL approved

**Europe:** Complies with the European Union Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), as amended by Commission Decisions 2005/618/EC, 2005/717/EC, 2005/747/EC (RoHS Directive), and WEEE.

# 25-Seven® PDMX Program Delay Software Audio Program Delay For Virtual Workflows



## OVERVIEW

- PDMX delivers all the functions of the renowned PDM II delay in a pure software embodiment
- Container-based instances enable high-density, server-based deployment
- Livewire+AES67 I/O powers a purely AoIP-based workflow, including Livewire GPIO
- PD Alert™ instantly emails time-stamped audio files whenever the Dump button is pressed
- "Dump" file captures what took place both on-air and off-air
- Seamlessly builds and exits delay, with configurable delay time, build, and dump options
- Delays IP metadata streams and GPIO, maintaining audio sync

# FEATURES

## Program Delay, Virtually!

PDMX brings the legendary features of the original PDM (Program Delay Manager) and PDM II broadcast delays into the virtual age. Ease of use, transparent audio quality, and program director-friendly features combine with AES67 AoIP, Livewire GPIO control, and reliable container architecture to take air chain management to the next level.

PDMX is purpose-built for server-based, scalable facilities with forward-thinking broadcasters in mind. It is delivered as a container and can be deployed on-premises on a COTS (commercial off-the-shelf) server, on a cloud-based platform such as AWS, or on the Telos Alliance AP-3000 hardware platform.

For those wanting the benefits of a virtualized software processor but with the simplicity of pre-configured hardware, up to four instances of PDMX can be pre-installed on the Telos Alliance® AP-3000 hardware platform.

## The AirCheck is in Your Email

Program Directors have more on their plates today than ever before. There's no way anyone can monitor every broadcast hour of every day, but PDs need to be the first to know what happened when that "dump" button gets pressed.

With PDMX's patented PD-Alert™ feature, two time-stamped audio files capturing what took place both on-air and off-air get internally archived and emailed to the PD (or GM, or CE, or the legal team) every time questionable material is "dumped".

For broadcasters who are serious about protecting their license, PDMX provides an instant log record establishing your company's action and intent to keep the airwaves clean.

## 99 Seconds Of Delay Your Way

PDMX comes standard with 99 seconds of stereo audio delay, and a dump function that can be set to remove any number of seconds you choose.

Build a delay through pre-rolling, time expansion, or audio file playout capabilities built right into PDMX. Exit a delay through time compression or use the Cough button to simply wait and exit.

Dump audio through the standard "cut and rebuild" method, or use PDMX's Overkill™ feature to play a show-specific fill file from a list and play it over the dump buffer instead of collapsing the delay.

## How PDMX Does It

### Superior Algorithm Design for Flawless Time Expansion/Compression

PDMX utilizes the industry's most transparent time compression and expansion algorithms from our PDM and PDM II hardware delays. Your listeners probably won't appreciate our superior, artifact-free audio - because they won't perceive it's in use!

Our algorithms serve up smooth, crisp, stutter-free audio, even on stereo music. Unlike other products, we never splice at level thresholds or alter pitch. Clean audio is what we do best, but now you can be sure the content is "clean" as well. Better algorithms mean delays can be rebuilt faster, so you can safely get back to your callers. Build or Exit rates can be adjusted in real-time, so you can be more or less aggressive, depending on the audio content.

### Audio, PAD Data, and GPI/O Stay Synced

PAD or "now playing" serial data streams are delayed in precise synchronization with the audio as it grows, shrinks, or whenever the dump button is pressed. PDMX's data-follow-audio capabilities allow flexible synchronization from data input to data output. For example, serial data over IP can be routed to an IP output while remaining synchronized to the audio. Two independent data delays are supported. Livewire GPI/O closures stay in sync, too.

### AoIP Native Livewire+AES67 Audio

PDMX is built for today's modern AoIP-based facility. Whether you already have a Livewire network or you plan to build an AoIP facility around the AES67 standard, PDMX has you covered with Livewire+AES67 connectivity.

### Livewire IP-Based Remote Control

20 Livewire GPIOs are available, with user-selected functions covering every switch and control state available. Full bi-directional serial control over IP includes advanced real-time status monitoring of parameters such as current delay depth and audio levels.

### HTML5 Web Configuration and Control

A comprehensive, password-protected HTML5 web interface lets you manage your PDMX instances from anywhere with any device using a modern web browser. Our Multi-View web feature permits network operation centers and large facilities to monitor and manage up to 20 units from a single browser screen.

Navigating through "set and forget" parameters is a breeze with our built-in HTML5 web server. Change your settings, upload audio files, and manage PDMX's dump archives remotely using simple, clear browser screens.

### Pathfinder Control and Support

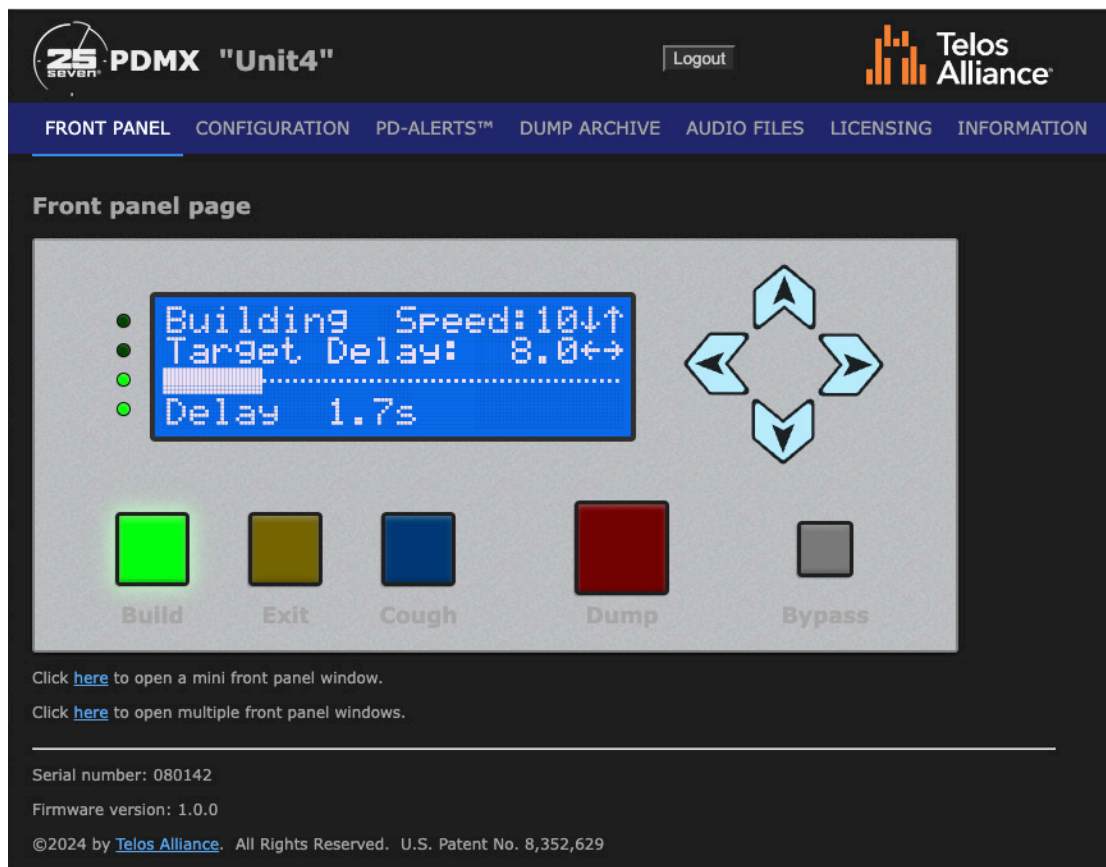
With full support of the LWRP protocol, Telos Alliance's Pathfinder broadcast controller can monitor, control, and change the AoIP input/output routing of any PDMX instance.



# IN DEPTH


## Virtual Front Panel

An HTML5 interface replicates the same familiar interface as our PDM II's front panel. Every button and display is present and functions just like its hardware counterpart. Through careful client-server communications management, round-trip latency is almost imperceptible, creating a seamless user experience. You can even control PDMX from multiple browsers at the same time. Just open a web browser interface, and anything you do on one device will be reflected on others.




## Configuration

Navigating through “set and forget” parameters is a breeze from PDMX’s Configuration page. You’ll find obvious control with all your settings on one simple screen.



Logout



FRONT PANEL
CONFIGURATION
PD-ALERTS™
DUMP ARCHIVE
AUDIO FILES
LICENSING
INFORMATION

### Configuration page

#### Identification

PDM name

Web password

Time zone

Time display

#### Audio

AoIP Input Type

Receive Channel

AoIP Output Type

Transmit Channel

#### Control

Build mode

Boot mode

Build file name

Dump mode

Overkill file name

Exit mode

Delay size  seconds

Maximum delay size  seconds

Dump size  seconds

Initial build/exit speed  %

Maximum build/exit speed  %

Control via net port 5443 ☐ Enabled

#### Livewire GPIO

Livewire GPIO ☐ Enabled

Port 1 Address

Inputs

1:   
2:   
3:   
4:   
5:

Outputs

1:   
2:   
3:   
4:   
5:

#### Delayed Data Streams

Data Stream A Input

(remote address )

remote port

Data Stream A Output

(remote address )

remote port

Data Stream B Input

(remote address )

remote port

Data Stream B Output

(remote address )

remote port

Detailed logging ☐ Enabled

#### PD-Alert

Mail server address

Mail server username

Mail server password

Use TLS encryption ☒ Enabled

Sender (email address)

PD-Alert context  seconds before and after dump

PD-Alert (attached audio) emails (space-separated list)

Attached audio file format

PD-Alert (text) emails (space-separated list)

Keep dump files  (or until storage runs out)

Set storage limit to  for dump files


Test PD-Alerts  (sends test email to every configured address)

#### AoIP Sync (must restart after change)

AoIP Synchronization


## PD Alerts™

A dedicated page lists all of the PD Alert emails the unit has sent to your chosen staff.



**PDMX "Unit4"**

Logout



FRONT PANELCONFIGURATION**PD-ALERTS™**DUMP ARCHIVEAUDIO FILESLICENSINGINFORMATION

**PD-Alert™ email log**

This is a list of the notifications sent for the most recent dumps.

Date	To	Type	Size (bytes)
23Feb2024 08:14:19	dan.griscom@telosalliance.com	Audio	3911682
18May2023_13:56:47	Error: status 74 (msmtplib: /var/tmp/pdalert2917msmtplib.conf: Permission denied)		
17May2023_14:36:03	Error: status 74 (msmtplib: /var/tmp/pdalert1116msmtplib.conf: Permission denied)		


Serial number: 080142

Firmware version: 1.0.0

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## Dump Archive

A Dump Archive displays before/after audio file pairs created whenever Dump gets pressed. Easily download and review what took place both on and off air.



**PDMX "Unit4"**

Logout



FRONT PANELCONFIGURATION**PD-ALERTS™****DUMP ARCHIVE**AUDIO FILESLICENSINGINFORMATION

**Dumped Audio Clip Archive**

This is a list of the most recently dumped **PD-Alert™** audio clips.

File name	File size	Date
<a href="#">MyPDMX_23Feb2024_08:14:19_OnAir.wav</a>	1.86 MB	23Feb2024 08:14:19
<a href="#">MyPDMX_23Feb2024_08:14:19_OffAir.wav</a>	1.87 MB	23Feb2024 08:14:19
<a href="#">MyPDMX_18May2023_13:56:47_OnAir.wav</a>	1.87 MB	18May2023 13:56:47
<a href="#">MyPDMX_18May2023_13:56:47_OffAir.wav</a>	1.90 MB	18May2023 13:56:47
<a href="#">MyPDMX_17May2023_14:36:03_OnAir.wav</a>	2.34 MB	17May2023 14:36:03
<a href="#">MyPDMX_17May2023_14:36:03_OffAir.wav</a>	2.35 MB	17May2023 14:36:03
<a href="#">MyPDMX_12May2023_11:41:55_OnAir.wav</a>	2.26 MB	12May2023 11:41:55
<a href="#">MyPDMX_12May2023_11:41:55_OffAir.wav</a>	2.26 MB	12May2023 11:41:55
<a href="#">MyPDMX_12May2023_11:38:17_OnAir.wav</a>	3.57 MB	12May2023 11:38:17
<a href="#">MyPDMX_12May2023_11:38:17_OffAir.wav</a>	3.62 MB	12May2023 11:38:17
<a href="#">MyPDMX_12May2023_10:35:01_OnAir.wav</a>	2.03 MB	12May2023 10:35:01
<a href="#">MyPDMX_12May2023_10:35:01_OffAir.wav</a>	2.03 MB	12May2023 10:35:01

Total file size: 27.99 megabytes

Serial number: 080142

Firmware version: 1.0.0

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## Audio Files, Utilities & Information

- Easy management of audio files available for quickly building your buffer at the beginning of your show, or for our exclusive Overkill™ feature.
- Utilities such as system log files and Telos Connect support sessions
- System information display of status, setup, and version information

## PDMX REQUIREMENTS

### PDMX System Requirements

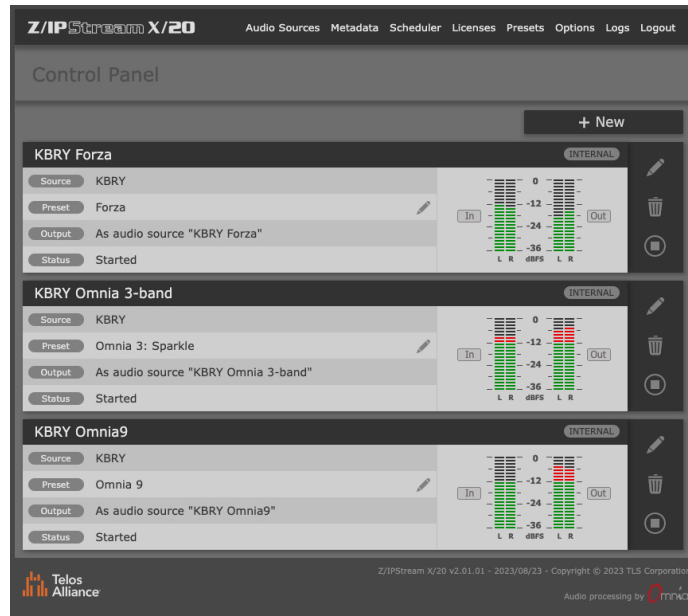
The information below is intended to provide general operational guidance for software container deployment on a Linux Server and is subject to change. When running multiple instances, assume a single core allocation for OS & overhead tasks.

#### **PDMX instance requirements:**

- Cores needed per instance: 1 core (x86-64 V3, 4th generation "Haswell" or preferably later Intel Core architecture, or Gen 1 Xeon server CPU)
- CPU speed requirement: 2 GHz
- Memory requirements: 256 MB RAM per instance
- Latency: 80ms typical; CPU speed, AoIP setup, and other factors will affect system latency
- Required Linux distribution: Ubuntu v20.04, or 22.04 (64-bit)

# Telos Alliance® Z/IPStream® X/20

## The Future is Streaming. The Future is Here.



## OVERVIEW

Z/IPStream X/20 represents the next-generation Telos Alliance® software streaming and processing platform. As the successor to the highly regarded Z/IPStream X/2, X/20 is designed for broadcasters who understand that streaming audio quality and reliability are just as important as terrestrial transmission. Z/IPStream X/20 gives you the power to fine-tune your streams for clear, clean, audio output — no matter the bitrate, codec, or delivery platform. It also paves the way for the introduction of more features and processing options now and in the future.

Z/IPStream X/20 stands above the rest with Adaptive Streaming technology. With Adaptive Streaming, the connection between the streaming server and the listener is automatically managed, dynamically adjusting bitrate and audio quality to maintain a solid connection with the best possible audio — regardless of Wi-Fi limitations or Internet behavior. Z/IPStream X/20 generates multiple streams to a server, simultaneously using different codecs and bitrates to support these adaptive streaming applications.

# FEATURES

- Genuine, high-quality audio codecs from Fraunhofer IIS (the inventors of MP3), including MP3, AAC-LC, HE-AAC v1, HE-AAC v2, and xHE-AAC
- Simultaneous MP3/AAC/aacPlus encoding, compatible with Shoutcast, Icecast, Wowza, and RTMP servers
- xHE-AAC works well at low bitrates and therefore has more encoding power. While codecs like AAC and MP3 sound much better for music than they do for speech, xHE-AAC sounds great for both speech and music, even at the lowest bitrates
- 3-band Omnia processing comes standard
- For more demanding requirements, Omnia Forza HDS and Omnia.9 processing are optionally available
- Optional Dèjà Vu upmixing from Omnia founder Frank Foti provides 5.1-channel surround sound via MPEG-Surround encoding
- Facilitates delivery of metadata to your streaming provider, enabling them to handle ad replacement programming blackouts, and metadata insertion.
- Flexible audio routing accepts input from any Windows sound source, including physical sound cards, or virtual (AoIP) sound cards such as the Axia Livewire driver.
- Unprecedented level of control: Use the built-in HTML5 web interface, or integrate with 3rd party applications using the REST API
- Cloud-Ready: Z/IPStream X/20 may be hosted and run using your cloud-based Windows server
- Built-in SNMP and email notification of system events
- Supports Kantar and Nielsen Watermarking

# IN DEPTH

## Adaptive Streaming

Adaptive Streaming is a stream-delivery method that allows media players to switch bitrates when network conditions change. Z/IPStream X/20 supports Microsoft's Smooth Streaming and Apple HLS adaptive streaming technologies, encoding the same stream at multiple bitrates and keeping audio packets sample-aligned. Adaptive Streaming ensures that your listeners are automatically receiving optimal quality and consistency based on the bandwidth of their connection.

## Audio Replacement/Blanking

For targeted advertising replacement, or when certain programming must be blacked out or contractually restricted from streaming online, Z/IPStream X/20 enables you to replace material with content from a separate audio source, or audio from files. You have full control over the switch points and the duration, and the switch points are sample-accurate when using timestamped RTP audio for input.

## Stream Synchronization

Stream synchronization is essential when implementing resilient streaming. Using Stream Synchronization, separate encoder instances (running on different PCs and even at different locations) are able to synchronize so that bitstreams generated by all instances are identical. This redundancy enables resilient streaming deployment. If one encoder goes down (or is taken down for maintenance), the other encoder(s) continue to generate the appropriate stream, with no interruptions to service. Timestamped RTP input and Smooth Streaming for output are required to use Stream Synchronization.

## Direct Livewire and RTP Audio Input

Z/IPStream X/20 works seamlessly with native Livewire audio sources, and can also accept RTP unicast sources.

## SNMP Support

Z/IPStream X/20 can be monitored via SNMP, a feature particularly important for large-scale deployments. SNMP monitoring gives you peace of mind that your stream is fully functional, and if anything does go wrong, SNMP alarms will alert and immediately inform you of any problems.

## REST API

In addition to an HTML5 web interface, Z/IPStream X/20 provides control over its functions through a REST API. REST is a web standard that can support integration with 3rd party applications such as on air playout systems, and can be used with the majority of scripting or programming languages from JavaScript to Python, Ruby, and others.

## Cloud-Ready

Z/IPStream X/20 is a software-only application that's cloud-ready. It is designed to run in the background as a Windows service, and its HTML5 web interface provides OS agnostic remote configuration from PCs, Macs, tablets, or even smartphones. Whether on premises or off-site, Z/IPStream X/20 gives you the flexibility to set up your stream however it best suits your needs.

## MINIMUM SYSTEM REQUIREMENTS

- Any supported Windows desktop or server OS (supports both 32-bit or 64-bit operating systems)
- 1 gigahertz (GHz) or faster 32-bit (x86) or 64-bit (x64) processor
- 1 gigabyte (GB) RAM (32-bit) or 2 GB RAM (64-bit)
- 200 MB free disk space required for installation
- Additional disk space is used for logging
- Internet access
- Administrative privileges required during installation
- HTML5 web browser required for configuration and management
- Supports multiple simultaneous Wave audio interfaces

(Actual bandwidth, CPU and memory loads are determined by the number of streams, encoders and processing types employed. For large scale installations, please consult with Telos or your dealer.)



# Telos Alliance® Z/IPStream® R/20 Stream Encoder/Processor

## The Best-Sounding Streams...from the Coolest Box.



## OVERVIEW

### Processing and Encoding of Multiple Programs

Z/IPStream® R/20 provides a multitude of streaming options for the broadcaster while maximizing audio quality for the listener. This latest-generation Z/IPStream processor and encoder is essentially the hardware appliance version of Z/IPStream X/20, allowing flexible, multi-format stream-encoding, audio processing and watermarking for up to eight audio programs, all in a single 1RU chassis.

Ideal for high-density processing and encoding applications, R/20 offers the simplicity and reliability of a single 1RU dedicated hardware appliance. R/20 is available with Omnia 3-band, Omnia Forza HDS, or Omnia.9 processing, all featuring the highest quality encoding from Fraunhofer IIS, the world leader in audio codecs.

# FEATURES

- Processing and stream encoding of up to eight audio programs in 1RU
- Available with Omnia 3-band, or optional Forza HDS or Omnia.9 processing
- Optional Dèjà Vu upmixing from Omnia founder Frank Foti provides 5.1-channel surround sound via MPEG-Surround encoding
- AES/EBU and Livewire® AoIP audio I/O
- Encode a program at multiple bitrates for adaptive streaming applications: Apple HLS and Microsoft Smooth Streaming formats are supported. Simultaneously send the encoded streams to multiple destinations
- AAC-LC, HE-AAC, HE-AAC v2, xHE-AAC and MP3 stream encoding from 16 kbps to 320 kbps depending on codec used
- xHE-AAC for low-bitrate streaming
- Processing, watermarking or encoding can be used independently if desired
- Supported server platforms include ICEcast, SHOUTcast, SHOUTcast v2, Adobe Media Server, Wowza, as well as Triton Digital, LimeLight, Akamai, and other popular streaming services
- Includes support for RTP and RTP multicast streams
- Stream Synchronization: separate encoder instances (running on different units and even at different locations) are able to synchronize so that bitstreams generated by all instances are identical. Enables redundant streaming deployment
- HTML5 web-based remote control for administration
- SNMP support allows direct monitoring from your SNMP management system
- Integrates into your workflow: REST API allows customized control by 3rd party applications to start/stop streams, switch audio sources or insert audio content from files
- When using optional Omnia.9 processing, you get dedicated IP remote control software with test instrumentation, including RTA, FFT, oscilloscopes and loudness metering
- Flexible Metadata ingest allows R/20 to accept metadata from multiple play-out systems and lets broadcasters tweak the fields they want to present to listeners
- Facilitates delivery of metadata to your streaming provider: sophisticated software routines enable them to handle ad replacement, metadata insertion and stream switching for programming blackouts.
- Supports Nielsen and Kantar Watermarking
- Dual power supplies and dual gigabit Ethernet ports for reliable, 24/7 operation

## IN DEPTH

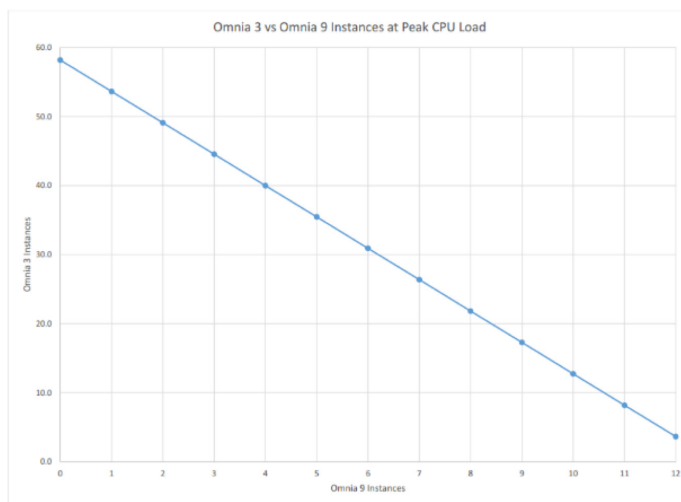
Z/IPStream R/20 is the latest generation of streaming audio processing and encoding hardware in the Z/IPStream family, handling the processing and encoding of multiple audio programs in a compact 1 RU chassis. Processing, watermarking and encoding of up to eight audio programs is supported, with Livewire+AES67 AoIP and AES/EBU I/O audio input.

The base unit includes processing and encoding of two audio programs using the standard 3-band Omnia audio processing. Multiple codecs and bitrates are supported simultaneously on each audio program. Supported streaming platforms include ICEcast, SHOUTcast, SHOUTcast v2, Adobe Media Server, RTMP, Triton Digital, LimeLight, Akamai, Cirrus and Wowza. Up to six additional audio program inputs, Omnia Forza HDS and Omnia.9 processing, as well as watermarking for Kantar and Nielsen are available as options.

## SPECIFICATIONS

### Processing

- Includes standard 3-band Omnia processing for each audio input. For more demanding applications, Omnia Forza and Omnia.9 processing are optional. Omnia Forza HDS and Omnia.9 processing are optional. As expected, Forza HDS and Omnia.9 are more resource-intensive than the 3-band Omnia processing. The chart below illustrates the number of instances that can be run under typical usage scenarios. It is provided as a general guide, the actual number may be different for your specific application.



## Stream Encoding

- Includes AAC-LC, HE-AAC, HE-AAC v2, xHE-AAC, and MP3 encoding at bitrates from 16 kbps up to 320 kbps (depending on encoder). A program may be encoded using multiple formats and bitrates simultaneously. A special multirate encoder supports encoding for Apple and Microsoft adaptive streaming applications. The multirate encoder properly generates the required Stream Access Points for adaptive streaming.

## Ethernet Remote Control

- Gigabit Ethernet supports an HTML5 web interface for administration and control, REST API for remote control, and SNMP monitoring. Also used with the dedicated remote control application for Omnia.9 audio processing, and metadata import and export.

## Audio I/O

- Livewire+AES67 AoIP and AES/EBU audio I/O
- Supports AES/EBU input at up to 24 bits, 192 kHz
- Supports direct input from RTP streams

## Power Requirements

- Dual power supplies, each rated at 100-264 VAC, 50/60Hz, auto-sensing, 100W max total

## Dimensions and Weight

- One rack unit— 1.75"H x 19"W x 15.5"D (44 x 483 x 394 mm)
- Net weight: 9 lbs (4 kg); shipping: 12 lbs (5.4 kg) approximate

## Environmental

- Fan cooled
- Operating: 0 to 50 degrees C
- Non-operating: –20 to 70 degrees C

## Regulatory

**North America:** FCC and CE tested and compliant. Power supply is UL approved.

**Europe:** Complies with the European Union Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), as amended by Commission Decisions 2005/618/EC, 2005/717/EC, 2005/747/EC (RoHS Directive), and WEEE.

## Warranty

For the latest Telos Alliance warranty, visit: [telosalliance.com/warranty](https://telosalliance.com/warranty)

# Telos Alliance® Z/IPStream® R/1

## The Professional, One-Box Streaming Appliance



## OVERVIEW

Z/IPStream® combines audio processing with MP3 and AAC encoding in one convenient, single-rack unit. The AAC encoder supports AAC-LC, HE-AAC and HE-AAC v2 formats, and is fully managed and configured remotely with any standard Web browser. Z/IPStream features a wideband AGC, 3-band compressor/limiter, EQ, low-pass filter and a precision look-ahead final limiter; processed audio can then be encoded directly to MP3 or AAC streams to feed a remote replication server at your ISP. Streams can be "tagged" with "now-playing" information received from automation systems. A full complement of I/O, including Livewire, analog, and AES/EBU, is standard.

## FEATURES

- Audio pre-processing, stream encoding and delivery to remote replication server, all in a professional 1RU appliance.
- Pro-grade 24-bit A/D converter for studio-reference quality audio.
- Choice of MP3 or AAC-LC, HE-AAC, HE-AAC v2 stream coding, with output bit rates from 16 kbps to 320 kbps (dependent upon active codec).
- Omnia audio processing includes wideband AGC, 3-band compressor/limiter, EQ, low-pass filter and precision look-ahead final limiter.
- Metadata support for all popular playout platforms allows streams to be dynamically tagged with “now-playing” information from automation systems.
- Studio-grade analog and Livewire IP-Audio I/O, with separate LAN & WAN Ethernet ports.
- Directly supports ICEcast, SHOUTcast, SHOUTcast v2, Adobe Flash Media Server as well as Adobe RTMP, RTP streams (including RTP multicast), as well as LimeLight, Akamai and other popular streaming servers.
- Dual encoder support can be used to provide high and low bitrate streams, or MP3 and AAC at the same time.
- Can accept metadata over TCP/IP, UDP, or RS-232 (using USB to RS232 adapter).
- HTML5 web user interface for remote configuration and management from computers and mobile devices.

## IN DEPTH

### Plug. Play. Stream.

For years, the way to stream audio to Internet listeners included unbalanced mini-jacks, poor-quality sound cards, one or more PCs to maintain, and a collection of software that didn't always play nicely together. Broadcasters asked for a professional, PC-free Web streaming solution — and Telos delivers.

Z/IPStream R/1 takes the hassle out of streaming. There's no PC needed; Z/IPStream R/1 takes just 1RU of rack space. Slide it in and it's ready to gostreaming. Just send audio to Z/IPStream R/1, make a few setup selections and, within minutes, you'll be streaming your programming to your favorite stream server or streaming service for worldwide distribution.

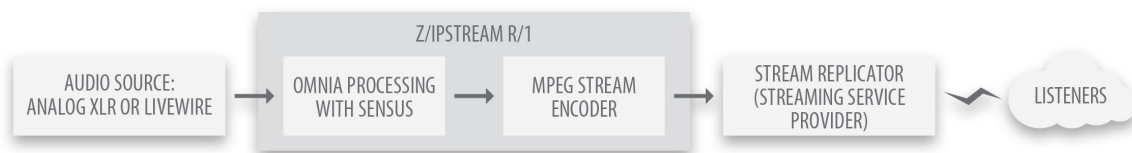
Broadcasters know that Telos is the codec expert, and Omnia is the processing authority. Z/IPStream R/1 puts all of our expertise into one integrated streaming appliance. First, incoming audio gets treated to pre-processing from Omnia, using algorithms that work hand-in-glove with Z/IPStream R/1's codecs to shape and optimize audio prior to encoding. Then, genuine MPEG encoding algorithms from FhG, the inventors of MP3, ensure the most artifact-free sound quality at whatever bit rate you choose. Encode directly to an MP3 or MPEG-AAC stream, then send it to a Shoutcast, Wowza, Icecast, LimeLight, Akamai, Adobe Flash Media server, or other popular streaming server for distribution to your waiting listeners.

Setup is a breeze. Log in with a laptop and Web browser for easy setup or remote control, or tweak the front-panel controls. This web interface is based on HTML5 so it's accessible from most modern browsers, including smart phones, tablets, and other devices. There's also a convenient built-in headphone amp with 1/4" jack and volume control for last minute in-the-rack fine tuning.



Z/IPStream R/1 comes with studio-grade analog inputs and outputs, plus Livewire Audio over IP. On the output side, Z/IPStream R/1 delivers fully processed, unencoded audio as well as encoded audio, providing your studio with another source for processed sound. Full network connectivity is provided via two Ethernet jacks, one for the LAN (including Livewire) and the other for the WAN and streaming.

## The Professional Choice for Streaming Audio.



Optimizing sound quality is as essential on the web as it is on traditional formats. Z/IPStream R/1 has a built-in processing section that works together with the streaming encoder, optimizing your audio for stunning sound — even after bit-reduction. This isn't just some cheap leveler — it's real processing by Omnia, complete with wideband AGC, a 3-band combined compressor/limiter, high-frequency EQ, an adjustable-bandwidth low-pass filter, and Omnia's famous anti-aliasing final Look-Ahead limiter. There are even a selection of presets, tailored to specific formats and bit rates, to help you get up and running quickly.

Of course, the foundation for high fidelity audio distribution rests on professional encoding technology. The quality of the encoder directly affects the quality of the output. Telos has a long history of partnership with Germany's Fraunhofer Gesellschaft Laboratory (FhG), the world leader in audio compression research and the inventors of MP3; Z/IPStream R/1 uses genuine MP3 and MPEG-AAC encoding algorithms to ensure the most artifact-free sound quality at any bit rate you choose, from 16 kbps all the way to 320 kbps. No other encoder has this pedigree, or achieves this level of quality and performance. Generic "mp3" encoders can't come close.

Z/IPStream R/1 gives you a wide choice of genuine Fraunhofer encoding algorithms, which include MP3, the Standard for digital audio. It's the safest codec choice for compatibility with the widest variety of listening devices. Or choose AAC-LC, a high performance codec for excellent audio quality at lower bitrates. AAC-LC is in widespread use, most notably in Apple's iTunes. And then there's High Efficiency Advanced Audio Coding, or HE-AAC, a newer AAC codec which incorporates Spectral Band Replication (SBR) bandwidth expansion to improve audio at very low bitrates. HE-AAC v2 applies a Parametric Stereo feature to HE-AAC codec allowing for even further reduction in bandwidth.

When you're done processing and encoding, select your metadata source and feed your stream to any SHOUTcast or SHOUTcast v2-compatible media server, or a Wowza server for streaming to Flash clients. Z/IPStream R/1 works with ICECast and Adobe Flash Media and Adobe RTMP servers too, as well as popular streaming services from LimeLight, Akamai, and other popular streaming service providers. You can feed directly to a streaming server on your LAN, to an Internet streaming relay service via the WAN port, or take processed audio from the rear-panel XLR outputs. No matter what your audio source or how you stream, Z/IPStream R/1 delivers flawlessly optimized audio that sounds terrific.



# SPECIFICATIONS

## Audio Coding

### Codec Choices:

- MP3: 16 to 320 kbps
- AAC-LC: 24 to 320 kbps
- HE-AAC: 24-96 kbps
- HE-AAC v2 (aacPlus): 24-96 kbps

### AAC Transport Modes:

- ADTS
- ADTS-CRC
- ADIF
- RAW

### Metadata Formats:

- Character Parser Sample
- Line Parser Sample
- Nexgen Audio Sense
- Simian Template 1
- XML Parser Sample
- XML-Jazler
- XML-Jazler2
- XML-MediaTouch
- XML-MediaTouch2
- XML-Sample2
- XML-Zetta
- User-definable

## Input

- Analog: Balanced XLR, +4 dBu
- Input Impedance: 6K Ohm differential
- Analog to Digital Converter: 24bits
- Digital: Livewire AoIP, via LAN port

## Output

- Analog: Balanced XLR
- Output Clipping: + 22dBu
- Output Impedance: 50 Ohm differential
- Digital to Analog Converter: 24bits
- Digital: Livewire AoIP, via LAN or WAN port

## Audio Performance

- THD+N: < 0.03% @ +12dBu, 1 kHz Sine
- Frequency Response: +/- 1dB 25– 20 kHz
- Headroom: 18dB
- Dynamic Range: > 87dB Unweighted > 90 dB "A" Weighted
- Crosstalk: > 80 db

## Remote Control

- HTML5 web interface via built-in webserver

## Power

- Internal supply, 85–250 VAC auto-switching, 50–60 Hz
- Power consumption: 14.2 Watts

## Regulatory

**North America:** FCC and CE tested and compliant, power supply is UL approved.

**Europe:** Complies with the European Union Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), as amended by Commission Decisions 2005/618/EC, 2005/717/ EC, 2005/747/EC (RoHS Directive), and WEEE.

# Linear Acoustic® AERO.20

## DTV Audio Processor



## OVERVIEW

### Cost-effective PCM loudness control without compromising quality.

AERO.20 hosts a single AEROMAX® processing instance in AMX5.1 (5.1+2+2), AMX2.0 (2+2+2), or AMX 5x2 (2+2+2+2+2) configurations (user-selectable) plus upmixing/downmixing via our UPMAX®-II algorithm.

I/O includes de-embedding and re-embedding of up to 16 pairs of 3G/HD/SD-SDI audio, four pairs of AES3 audio, along with AoIP via AES67 for SMPTE ST2110-30 support as well as Livewire+.

Support for SAP/DVS, EAS, local emergency audio, local voiceover, and optionally, Audio Description (warble tone) functionality is included.

ITU-R BS.1770 and selectable EBU R-128 or ATSC A/85 metering and logging (including True Peak) is provided for all program outputs. NfRemote software is included for remote configuration, control and metering over an Ethernet connection, while a built-in HTTP server enables control of I/O, presets, and individual processing parameters using simple IP commands. Compensating SDI video delay and dual redundant internal power supplies are standard.

## FEATURES

- Linear Acoustic AEROMAX loudness and dynamics control
- UPMAX-II automatic upmixing and downmixing
- Single processing instance AMX5.1 (5.1+2+2), AMX2.0 (2+2+2), or AMX 5x2 (2+2+2+2+2) configuration (user-selectable)
- 16 audio pairs via dual 3G/HD/SD-SDI I/O with included video delay
- 4 audio pairs of AES3 I/O with reference input
- AoIP via AES67 for SMPTE ST2110-30 support as well as Livewire+
- Dual auto-ranging power supplies
- Relay bypass of all I/O
- Comprehensive PC based GUI plus extensive TCP/IP and HTTP control
- Logging of loudness and True Peak data

## IN DEPTH

The highest quality industry standard television loudness control has never been more affordable. AERO.20 is a full-featured audio processor specifically for PCM (non-coded) audio that uses the same AEROMAX processing engine as our AERO.200, AERO.2400, and other products. Add upmixing, downmixing, and ITU- and EBU-compliant loudness metering and logging and it's easy to see why AERO.20 is such a powerful solution for nearly any application despite its low cost.

Comprehensive TCP/IP remote provides control over all system settings and processing parameters plus extensive loudness metering. It also offers reporting of physical I/O details, power supply status, and environmental health. The remote application also delivers remote audio, up to 5.1 channels, so the user can audition signal quality anywhere link bandwidth permits. An HTTP server is included for simple get/set control of all parameters and retrieval of status and logging information.

Constantly active logging captures 24 hour, 48 hour, and 7.5 day rolling weekly reports as well as specific time slots controlled by start/stop. Loudness measurements with multiple integration times as well as True Peak measurements are captured and available for download.

Failover bypass relays on AES and SDI I/O maintain signal continuity and dual auto-ranging power supplies enable redundancy and worldwide compatibility.

Designed and assembled in the USA, the lightweight and rugged single rack-unit AERO.20 is a solid investment in performance and flexibility.

# SPECIFICATIONS

## Processing

- AEROMAX processing for PCM audio in your choice of AMX5.1 (5.1+2+2), AMX2.0 (2+2+2), or AMX 5x2 (2+2+2+2+2) configurations (user-selectable)
- Dual UPMAX-II two-channel to 5.1 channel upmixers plus main channel downmixing and automatic bypass of discrete content

## Audio Processing Core

- Audio processing core supports workflows containing up to 34 input channels and 34 output channels

## Sample Rate/Resolution/Frequency Response

- 48kHz, 24-bit, 20Hz to 20kHz below threshold

## Reference

- 48kHz via AES3 DARS (or any AES3 signal applied to the Ref In connector), AES3 In 1, SDI, or from the internal 48kHz clock (standalone use only).

## AES3 I/O

- Four audio input pairs plus reference via 75-Ohm BNC female connectors, internally terminated; Four audio output pairs; Signal levels per SMPTE 276M/AES-3ID-2001

## SDI I/O

- Dual, auto-sensing, 3G/HD/SD-SDI (SMPTE ST 424/292M/259M) paths, supporting embedding and de-embedding of up to 16 I/O audio pairs, with video resolutions up to 1080p/60/59.94/50Hz

## AoIP I/O

- AES67 for SMPTE ST2110-30 (Level A) support plus Livewire+

## Parallel GPI/O Control Port

- 15-pin female D connector, 0-5V TTL levels for 5 inputs and 5 outputs; controls simple preset recalls, voiceover/EAS insertion, or customized scripts

## Remote Control

- Windows®-compatible TCP/IP remote control application for full setup and control is included. ITU-R BS.1770 metering for all programs, encoder statistics, and return audio for remote monitoring (network speed permitting). HTTP server allows get/set control from PC and downloading of loudness logs.

## Front Panel Controls and Indicators

- Graphical OLED display

## Loudness Logging

- Constantly active logging captures 24-hour, 48-hour, and 7.5 day rolling weekly reports as well as specific time slots controlled by start/stop. Loudness measurements with multiple integration times as well as True Peak measurements are captured and available for download.

## Power Requirements

- Dual power supplies, each rated at 100-264 VAC, 50/60Hz, auto-sensing, 100W max. total

## Dimensions and Weight

- One rack unit - 1.75"H x 19"W x 15.5"D (4.5 x 48.3 x 39.4 cm)
- Net weight: 10 lbs (4.6 kg), approximate.

## Shipping Dimensions and Weight

- 7"H x 22"W x 20"D (18 x 56 x 51 cm)
- Net weight: 15 lbs. (6.80 kg), approximate.

## Environmental

- Fan cooled. Operating: 0 to 50 degrees C, non-operating -20 to 70 degrees C.

## Regulatory

**North America:** FCC and CE tested and compliant with UL-approved power supplies.

**Europe:** Complies with European Union Directive 2011/65/EU + (EU) 2015/863 of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS). Compliant with the CE EN 62368-1:2020, EN 55032:2015 and EN 55035:2017 requirements

## Warranty

For the latest Telos Alliance warranty, visit: [telosalliance.com/warranty](https://telosalliance.com/warranty)

# Linear Acoustic® AERO.200

## Loudness Management Platform for DTV



## OVERVIEW

### High quality, compliant audio in a compact 1RU design.

AERO.200 hosts one or two AEROMAX® processing instances in your choice of AMX5.1 (5.1+2+2), AMX2.0 (2+2+2), or AMX 5x2 (2+2+2+2+2) configurations (a minimum of one is required) plus upmixing/downmixing via our UPMAX®-II algorithm.

Optional Dolby® Digital Plus transcoding provides for decoding of Dolby Digital/Dolby Digital Plus content to PCM audio for loudness processing and encoding to Dolby Digital/Dolby Digital Plus for transmission.

I/O includes de-embedding and re-embedding of up to 16 pairs of 3G/HD/SD-SDI audio, four pairs of AES3 audio, along with along with AoIP via AES67 for SMPTE ST2110-30 support as well as Livewire+.

Support for SAP/DVS, EAS, local emergency audio, local voiceover, and optionally, Audio Description (warble tone) functionality is included. CrowdControl™ is standard for increased dialogue intelligibility.

ITU-R BS.1770 and selectable EBU R-128 or ATSC A/85 metering and logging (including True Peak) is provided for all program outputs. NfRemote software is included for remote configuration, control and metering over an Ethernet connection while a built-in HTTP server enables control of I/O, presets, and individual processing parameters using simple IP commands. Compensating SDI video delay and dual redundant internal power supplies are standard.

## FEATURES

- Linear Acoustic AEROMAX loudness and dynamics control
- UPMAX-II automatic upmixing and downmixing
- One or two processing instances in AMX5.1 (5.1+2+2), AMX2.0 (2+2+2), or AMX 5x2 (2+2+2+2+2) configuration
- CrowdControl for increased dialog intelligibility
- Support for SAP/DVS
- Available Dolby® Digital Plus transcoding, including Dolby Digital/Dolby Digital Plus decoding to PCM and encoding to Dolby Digital/Dolby Digital Plus for transmission
- Available Nielsen watermark encoding
- Available Verance® Aspect® watermark encoding
- 16 audio pairs via dual 3G/HD/SD-SDI I/O with included compensating video delay
- 4 audio pairs of AES3 I/O with reference input
- AoIP via AES67 for SMPTE ST2110-30 support as well as Livewire+
- Dual auto-ranging power supplies
- Relay bypass of all I/O
- Extensive TCP/IP remote control and HTTP control
- Logging of loudness and True Peak data

## IN DEPTH

AERO.200 brings our industry standard, no-compromise AEROMAX television loudness control and UPMAX-II upmixing/downmixing algorithm to a space-saving 1RU design. Add ITU- and EBU-compliant loudness metering and logging to the package along with the ability to host two processing instances and it's clear that preserving valuable rack space doesn't require giving up features or performance.

Ideal for situations where a full front panel display and controls are not required, AERO.200 includes a comprehensive TCP/IP remote to provide control over all system settings and processing parameters plus extensive loudness metering. It also offers reporting of physical I/O details, power supply status, and environmental health. The remote application also delivers remote audio, up to 5.1 channels, so the user can audition signal quality anywhere link bandwidth permits. An HTTP server is included for simple get/set control of all parameters and retrieval of status and logging information.

Constantly active logging captures 24-hour, 48-hour, and 7.5-day rolling weekly reports as well as specific time slots controlled by start/stop. Loudness measurements with multiple integration times as well as True Peak measurements are captured and available for download.



Failover bypass relays on all I/O maintain signal continuity and dual auto-ranging power supplies enable redundancy and worldwide compatibility.

Designed and assembled in the USA, the lightweight and rugged single rack-unit AERO.200 is a solid investment in performance and flexibility today and in the future.

## SPECIFICATIONS

### Processing

- Can host one or two instances of AEROMAX processing in your choice of AMX5.1 (5.1+2+2), AMX2.0 (2+2+2), or AMX 5x2 (2+2+2+2+2) configurations
- Dual UPMAX-II two-channel to 5.1 channel upmixers per instance plus main channel downmixing and automatic bypass of discrete content

### Audio Encoding/Decoding

- Available Dolby® Digital Plus transcoding in stereo and 5.1-channel configurations, including Dolby Digital/Dolby Digital Plus decoding to PCM and encoding to
- Dolby Digital/Dolby Digital Plus for transmission
- Optional Nielsen watermark encoding, including N2, N6, and CBET
- Optional Verance® Aspect® Aspect watermark encoding

### Audio Processing Core

- Audio processing core supports workflows containing up to 34 input channels and 34 output channels

### Sample Rate/Resolution/Frequency Response

- 48kHz, 24-bit, 20Hz to 20kHz below threshold

### Reference

- 48kHz via AES3 DARS (or any AES3 signal applied to the Ref In connector), AES3 In 1, SDI, or from the internal 48kHz clock (standalone use only).

### AES3 I/O

- Four audio input pairs plus reference via 75-Ohm BNC female connectors. Four audio output pairs outputs plus encoder output. All digital inputs are 75 Ohm internally terminated, unbalanced. Signal levels per SMPTE 276M/AES-31D-2001

## SDI I/O

- Dual, auto-sensing, 3G/HD/SD-SDI (SMPTE ST 424/292M/259M) inputs, up to 1080p/60/59.94/50Hz. De-embed up to 16 audio pairs from applied SDI signals, process and/or encode, and re-embed up to 16 audio pairs. Supports SMPTE 2020 A and B VANC metadata

## AoIP I/O

- AES67 for SMPTE ST2110-30 (Level A) support plus Livewire+

## Parallel GPI/O Control Port

- 5-pin female D connector, 0-5V TTL levels for 5 inputs and 5 outputs; controls simple preset recalls, voiceover/EAS insertion, or customized scripts

## Ethernet

- Gigabit Ethernet via RJ45 supports included TCP/IP remote control application; HTTP server included for get/set control of all parameters

## Remote Control

- Windows®-compatible TCP/IP remote control application for full setup and control is included. ITU-R BS.1770 metering for all programs, encoder statistics, and return audio for remote monitoring (network speed permitting). HTTP server allows get/set control from PC and downloading of loudness logs.

## Front Panel Controls and Indicators

- Graphical OLED display

## Loudness Logging

- Constantly active logging captures 24-hour, 48-hour, and 7.5 day rolling weekly reports as well as specific time slots controlled by start/stop. Loudness measurements with multiple integration times as well as True Peak measurements are captured and available for download.

## Power Requirements

- Dual power supplies, each rated at 100-264 VAC, 50/60Hz, auto-sensing,
- 100W max. total

## Dimensions and Weight

- One rack unit - 1.75"H x 19"W x 15.5"D (4.5 x 48.3 x 39.4 cm)
- Net weight: 10 lbs (4.6 kg), approximate.

## Shipping Dimensions and Weight

- 7"H x 22"W x 20"D (18 x 56 x 51 cm)
- Net weight: 15 lbs. (6.80 kg), approximate.

## Environmental

- Fan cooled. Operating: 0 to 50 degrees C, non-operating -20 to 70 degrees C

## Regulatory

**North America:** FCC and CE tested and compliant with UL-approved power supplies.

**Europe:** Complies with European Union Directive 2011/65/EU + (EU) 2015/863 of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS). Compliant with the CE EN 62368-1:2020, EN 55032:2015 and EN 55035:2017 requirements

## Warranty

For the latest Telos Alliance warranty, visit: [telosalliance.com/warranty](https://telosalliance.com/warranty)

# Linear Acoustic® AERO.2400™

## DTV Audio Processor



## OVERVIEW

### High quality, compliant audio with a front panel GUI.

Like AERO.200, AERO.2400 hosts one or two AEROMAX® processing instances in your choice of AMX5.1 (5.1+2+2), AMX2.0 (2+2+2), or AMX 5x2 (2+2+2+2+2) configurations (a minimum of one is required) plus upmixing/downmixing via our UPMAX®-II algorithm - but adds the flexibility and convenience of a full color display, menu navigation controls, and a headphone output to the front panel.

Optional Dolby® Digital Plus transcoding provides for decoding of Dolby Digital/Dolby Digital Plus content to PCM audio for loudness processing and encoding to Dolby Digital/Dolby Digital Plus for transmission.

I/O includes de-embedding and re-embedding of up to 16 pairs of 3G/HD/SD-SDI audio, eight pairs of AES3 audio, along with AoIP via AES67 for SMPTE ST2110-30 support as well as Livewire+.

Support for SAP/DVS, EAS, local emergency audio, local voiceover, and optionally, Audio Description (warble tone) functionality is included. CrowdControl™ is standard for increased dialogue intelligibility.

ITU-R BS.1770 and selectable EBU R-128 or ATSC A/85 metering and logging (including True Peak) is provided for all program outputs. NfRemote software is included for remote configuration, control and metering over an Ethernet connection while a built-in HTTP server enables control of I/O, presets, and individual processing parameters using simple IP commands. Compensating SDI video delay and dual redundant internal power supplies are standard.

## FEATURES

- Linear Acoustic AEROMAX loudness and dynamics control
- UPMAX-II automatic upmixing and downmixing
- One or two processing instances in AMX5.1 (5.1+2+2), AMX2.0 (2+2+2), or
- AMX 5x2 (2+2+2+2+2) configuration
- CrowdControl for increased dialog intelligibility
- Support for SAP/DVS
- Optional Dolby® Digital Plus transcoding provides for decoding of Dolby Digital/Dolby Digital Plus content to PCM audio for loudness processing and encoding to Dolby Digital/Dolby Digital Plus for transmission
- Available Nielsen watermark encoding
- Available Verance® Aspect® watermark encoding
- 16 audio pairs via dual 3G/HD/SD-SDI I/O with included compensating video delay
- 8 audio pairs of AES3 I/O with reference input
- AES67 for SMPTE ST2110-30 (Level A) support plus Livewire+
- Dual auto-ranging power supplies
- Relay bypass of all I/O
- Extensive TCP/IP remote control and HTTP control
- Front panel color display, menu navigation controls, and headphone output
- Logging of loudness and True Peak data

## IN DEPTH

AERO.2400 offers our industry standard, no-compromise AEROMAX television loudness control and UPMAX-II upmixing/downmixing algorithm in a 2RU package.

The extra 1RU of height compared to AERO.200 makes room for an additional four audio pairs of AES3 I/O. It also allows us to include a full color front panel display, menu navigation controls, and a headphone output to adjust or monitor processing locally, though our NfRemote TCP/IP remote control software can also be used to provide control over all system settings and processing parameters remotely.

AERO.2400 can host two processing instances, both with ITU- and EBU-compliant loudness metering and logging.

It also offers reporting of physical I/O details, power supply status, and environmental health. The remote application can deliver remote audio, up to 5.1 channels, so the user can audition signal quality anywhere link bandwidth permits. An HTTP server is also included for simple get/set control of all parameters and retrieval of status and logging information.

Constantly active logging captures 24-hour, 48-hour, and 7.5 day rolling weekly reports as well as specific time slots controlled by start/stop. Loudness measurements with multiple integration times as well as True Peak measurements are captured and available for download.

Failover bypass relays on all I/O maintain signal continuity and dual auto-ranging power supplies enable redundancy and worldwide compatibility.

Designed and assembled in the USA, AERO.2400 is a solid investment in performance and flexibility today and in the future.

## SPECIFICATIONS

### Processing

- Can host one or two instances of AEROMAX processing in your choice of AMX5.1 (5.1+2+2), AMX2.0 (2+2+2), or AMX 5x2 (2+2+2+2+2) configurations
- Dual UPMAX-II two-channel to 5.1 channel upmixers per instance plus main channel downmixing and automatic bypass of discrete content

### Audio Encoding/Decoding

- Optional Dolby® Digital Plus transcoding in stereo and 5.1-channel configurations provides for decoding of Dolby Digital/Dolby Digital Plus content to PCM audio for loudness processing and encoding to Dolby Digital/Dolby Digital Plus for transmission
- Nielsen watermark encoding, including N2, N6, and CBET
- Optional Verance® Aspect® watermark encoding

### Audio Processing Core

- Audio processing core supports workflows containing up to 34 input channels and 34 output channels.

### Sample Rate/Resolution/Frequency Response

- 48kHz, 24-bit, 20Hz to 20kHz below threshold

### Reference

- 48kHz via AES3 DARS (or any AES3 signal applied to the Ref In connector), AES3 In 1, SDI, or from the internal 48kHz clock (standalone use only).

## AES3 I/O

- Eight main inputs plus reference via 75-Ohm BNC female connectors. Eight main outputs plus encoder output. Eight additional channels of auxiliary digital I/O on

DB-25 female connector. All digital inputs are 75 Ohm internally terminated, unbalanced. Signal levels per SMPTE 276M/AES-31D-2001.

## HD/SD-SDI I/O

- Dual, auto-sensing, 3G/HD/SD-SDI (SMPTE ST 424/292M/259M) inputs up to 1080p/60/59.94/50Hz supported. De-embed up to 16 audio pairs from applied SDI signals, process and/or encode, re-embed up to 16 audio pairs. Supports SMPTE 2020A and B VANC metadata.

## AoIP I/O

- AES67 for SMPTE ST2110-30 (Level A) support plus Livewire+

## Headphone Output

- 1/4" (6.35mm) front panel connector with volume control.

## GPI/O

- Parallel GPI/O Parallel Control Port
- 15-pin female D connector, 0-5V TTL levels for 5 inputs and 5 outputs; controls simple preset recalls, voiceover/EAS insertion, or customized scripts

## Ethernet

- Gigabit Ethernet via RJ45 supports included TCP/IP remote control application; HTTP server included for get/set control of all parameters

## Remote Control

- Windows®-compatible TCP/IP remote control application for full setup and control is included. ITU-R BS.1770 metering for all programs, encoder statistics, and return audio for remote monitoring (network speed permitting). HTTP server allows get/set control from PC and downloading of loudness logs.

## Front Panel Controls

- Rotary encoder and control keys plus color display and headphone output.

## Loudness Logging

- Constantly active logging captures 24-hour, 48-hour, and 7.5 day rolling weekly reports as well as specific time slots controlled by start/stop. Loudness measurements with multiple integration times as well as True Peak measurements are captured and available for download.

## Power Requirements

- Dual redundant power supplies, each rated at 100-264 VAC, auto-sensing, 50/60 Hz,
- 100W each maximum

## Dimensions and Weight

- 2RU: 3.50"H x 19"W x 16"D (9 x 48.25 x 40.7 cm)
- Net weight: 13 lbs. (5.9 kg), approximate.

## Shipping Dimensions and Weight

- 9"H x 22"W x 20"D x 9"H (23 x 56 x 51 cm)
- Net weight: 17 lbs. (7.7 kg), approximate.

## Environmental

- Fan cooled. Operating: 0 to 50 degrees C, non-operating -20 to 70 degrees C

## Regulatory

**North America:** FCC and CE tested and compliant with UL-approved power supplies.

**Europe:** Complies with European Union Directive 2011/65/EU + (EU) 2015/863 of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS). Compliant with the CE EN 62368-1:2020, EN 55032:2015 and EN 55035:2017 requirements.

## Warranty

For the latest Telos Alliance warranty, visit: [telosalliance.com/warranty](https://telosalliance.com/warranty)



# Linear Acoustic® AERO.8000™

## Loudness Management Platform for DTV



## OVERVIEW

### The future of Audio over IP loudness control - today.

AERO.8000 is a 1RU high-density loudness management platform featuring Livewire+ AES67 AoIP I/O for enterprise-wide audio access.

It can host up to eight AEROMAX® processing instances (a minimum of one is required) in your choice of AMX5.1 (5.1+2+2), AMX2.0 (2+2+2), or AMX 5x2 (2+2+2+2+2) configurations.

Upmixing is provided by the Hollywood-approved UPMAX®-II algorithm which delivers engaging 5.1-channel audio from two-channel sources. AutoMAX™ detection and switching between 2.0 and 5.1 surround sources makes full time 5.1 surround output easy to achieve with viewer-pleasing results.

All processing instances support SAP/DVS, LoRo/LtRt downmix, local audio insertion, and optional Audio Description (warble tone) functionality. ITU-R BS.1770-3 or EBU R128 meters are present on each audio program output. Linear Acoustic Crowd Control™ is standard and eliminates viewer complaints about “missing” or “hard to hear” dialogue.

Dolby® Digital Plus transcoding is optionally available for each AMX instance and provides for decoding of Dolby Digital/Dolby Digital Plus content to PCM audio for loudness processing and encoding to Dolby Digital/Dolby Digital Plus for transmission. Nielsen® watermark encoding is also available as an option for each AMX5.1 and AMX2.0 instance.

An included comprehensive TCP/IP remote control application provides control over all system settings, processing and coding parameters, per-channel signal presence, and loudness metering from any Windows PC. Multiple logs of LKFS loudness values, True Peak, and Dolby dialnorm and acmod values are provided for each program output. The remote control application also delivers remote audio monitoring so the user can audition signal quality anywhere link bandwidth permits. An http server is included for log retrieval and provides control of all parameters and retrieval of status via network commands.

Audio over IP (AoIP) connectivity via Livewire+™ AES67 enables enterprise-wide audio access. Audio from any video source can be placed on the AoIP network using a wide variety of Livewire+™ AES67 compliant devices such as Telos Alliance xNodes.

## FEATURES

- Ideal for high density enterprise applications
- Up to eight processing instances
- I/O independence via Livewire+™ AES67 Audio over IP
- Linear Acoustic AEROMAX loudness/dynamics control
- UPMAX-II automatic upmixing and downmixing with AutoMAX 5.1 surround/2.0 detection and switching
- ITU-R BS.1770-3- and EBU R128-compliant metering
- Extensive remote GUI over IP control enables metering, control, and local audio monitoring (up to 5.1 channels)
- Internal logging of all program outputs in 24 hour, 48 hour, 7.5 day logs of 3s, 10s, 30s integration, TP and DN, and 1 hour/100ms logs
- Optional Dolby® Digital Plus transcoding provides for decoding of Dolby Digital/Dolby Digital Plus content to PCM audio for loudness processing and encoding to Dolby Digital/Dolby Digital Plus for transmission
- Nielsen watermark encoder option

## IN DEPTH

### Livewire®

Since 2003, broadcast facilities have been using Axia Livewire AoIP (audio over IP) technology to route hundreds of audio channels using standard Ethernet switches, cables, and other components. With thousands of devices on the air every day, reliability is proven.

Livewire is lightning fast, simple to implement, easy to manage, and now as Livewire+™ AES67, fully compliant with the AES67 standard and ready to incorporate new standards as they are developed. It significantly reduces the number of cables and wires needed to transport and share audio throughout the broadcast plant.

Nearly any audio source – analog, AES, or SDI, plus a wide variety of equipment from phone systems to codecs to satellite receivers – can be a part of the AoIP network.

## SPECIFICATIONS

### Processing

- Can host up to eight instances of AEROMAX processing in your choice of AMX5.1 (5.1+2+2), AMX2.0 (2+2+2), or AMX 5x2 (2+2+2+2+2) configurations
- Dual UPMAX-II two-channel to 5.1 channel upmixers per instance plus main channel downmixing and automatic bypass of discrete content.
- Includes extensive support for SAP/DVS, voiceover, downmix auto replacement of SAP/DVS and optional Audio Description (warble tone) functionality

### Remote Control

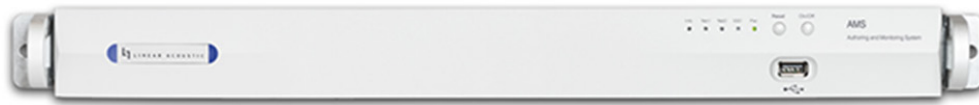
- Dedicated TCP/IP remote control application provides extensive metering, control, system management and remote monitoring of one or many instances; http server included for log access and also for control of all parameters using commands over the network

### Audio Encoding/Decoding

- Optional Dolby® Digital Plus transcoding provides for decoding of Dolby Digital/Dolby Digital Plus content to PCM audio for loudness processing and encoding to Dolby Digital/Dolby Digital Plus for transmission
- Nielsen watermark encoding

# Linear Acoustic® AMS

## Authoring and Monitoring System



## OVERVIEW

### Leading the way to ATSC 3.0 audio.

The Linear Acoustic AMS Authoring and Monitoring System is a comprehensive solution for real-time authoring, rendering, and monitoring of advanced audio programs for the ATSC 3.0 Digital Television System while simultaneously supporting 5.1- and 2-channel audio for ATSC 1.0 broadcasts.

## FEATURES

- Real-time authoring, rendering, and monitoring of ATSC 3.0 advanced audio programs
- Utilizes Next Generation Audio (NGA) technologies including MPEG-H
- Legacy support for 5.1- and 2-channel ATSC 1.0 broadcasts
- Features Linear Acoustic APTO loudness processing
- Full-featured web interface for configuration, status, I/O routing, loudness processing, audio mixing, object panning, authoring configuration, and monitoring

## IN DEPTH

The audio system in ATSC 3.0 provides listeners with a personalized, immersive audio experience but requires unique and specialized solutions to deliver on its potential. Using Next Generation Audio (NGA) technologies including MPEG-H, Linear Acoustic AMS simultaneously provides advanced audio for ATSC 3.0 broadcasts as well as 5.1- and 2-channel audio for ATSC 1.0 broadcasts.

AMS features Linear Acoustic APTO, the state-of-the-art loudness adaptation technology designed to carefully control audio levels in a way that preserves transients, sonic image, and the artistic intent of the source audio while ensuring loudness consistency and compliance for any target and regulatory standard.

Configuration, signal routing, loudness processing, mixing, object panning and authoring configuration are managed by an intuitive web interface. Individual audio elements can be combined with user-specified metadata to create immersive, personalized audio programs for the viewer which can all be monitored directly through the interface.

Customized loudness logs can be created, saved and retrieved for analysis and compliance purposes. Because engineers must be able to deal with a multitude of I/O configurations in the field, the Telos Alliance xNode family of Audio over IP devices allow Linear Acoustic AMS to handle analog, AES/EBU, and SDI I/O effortlessly with full Livewire+ AES67 AoIP support.

The Telos Alliance SDI xNode can de-embed 3G/HD/SD-SDI inputs and extract up to 16 channels of audio to the Livewire+ AES 67 port. This audio can be re-embedded into the SDI output stream with full video delay compensation for each SDI input to ensure A/V synchronization.

Up to 36 outputs can be configured including 16 channels of authored audio plus control channels, up to 12 channels for monitoring, and two additional sets of rendered broadcast outputs.

# SPECIFICATIONS

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## Processing

- Linear Acoustic APTO loudness processing

## Ethernet Remote Control

- Gigabit Ethernet supports included TCP/IP remote control application and HTTP server access

## Power Requirements

- Dual redundant internal 95-240 VAC 50/60 Hz power supplies

## Dimensions and Weight

- One rack unit - 1.75"H x 19"W x 18.5"D (44 x 483 x 470 mm) Net weight: 12 lbs (4 kg);

## Environmental

- Fan cooled. Operating: 0 to 50 degrees C, non-operating -20 to 70 degrees C.

## Regulatory

**North America:** FCC and CE tested and compliant, power supply is UL approved.

**Europe:** Complies with the European Union Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), as amended by Commission Decisions 2005/618/EC, 2005/717/EC, 2005/747/EC (RoHS Directive), and WEEE.

## Warranty

Standard 2-year limited parts and labor

# Linear Acoustic® LA-5291

## Audio Encoding, Transcoding, and Decoding for Live Dolby Atmos® Workflows



## OVERVIEW

The Linear Acoustic LA-5291 Professional Audio Encoder allows you to create an exciting and immersive Dolby Atmos® experience via a Dolby Digital Plus JOC bitstream for production workflows, platforms, and delivery streams that do not require Dolby AC-4. The LA-5291 offers decoding, encoding, and transcoding to and from PCM and select Dolby® coded formats for up to 16 audio channels.

## FEATURES

- Decoding from Dolby ED2 to PCM
- Transcoding from Dolby ED2 and Dolby E to Dolby Digital Plus and Dolby Digital Plus JOC
- Encoding PCM to Dolby Digital Plus, Dolby Digital Plus JOC, and Dolby ED2
- 3Gb/s HD/SD-SDI and AES-3 I/O
- AES67 I/O in support of SMPTE ST 2110-30 and -31 workflows
- Optional Quad-Link 3Gb/s SDI I/O for supporting 4K video workflows, or optional MADI I/O (mutually exclusive options)
- Dual internal redundant auto-ranging power supplies
- Browser-based remote control

## IN DEPTH

### Supporting Today's Dolby Atmos Workflows

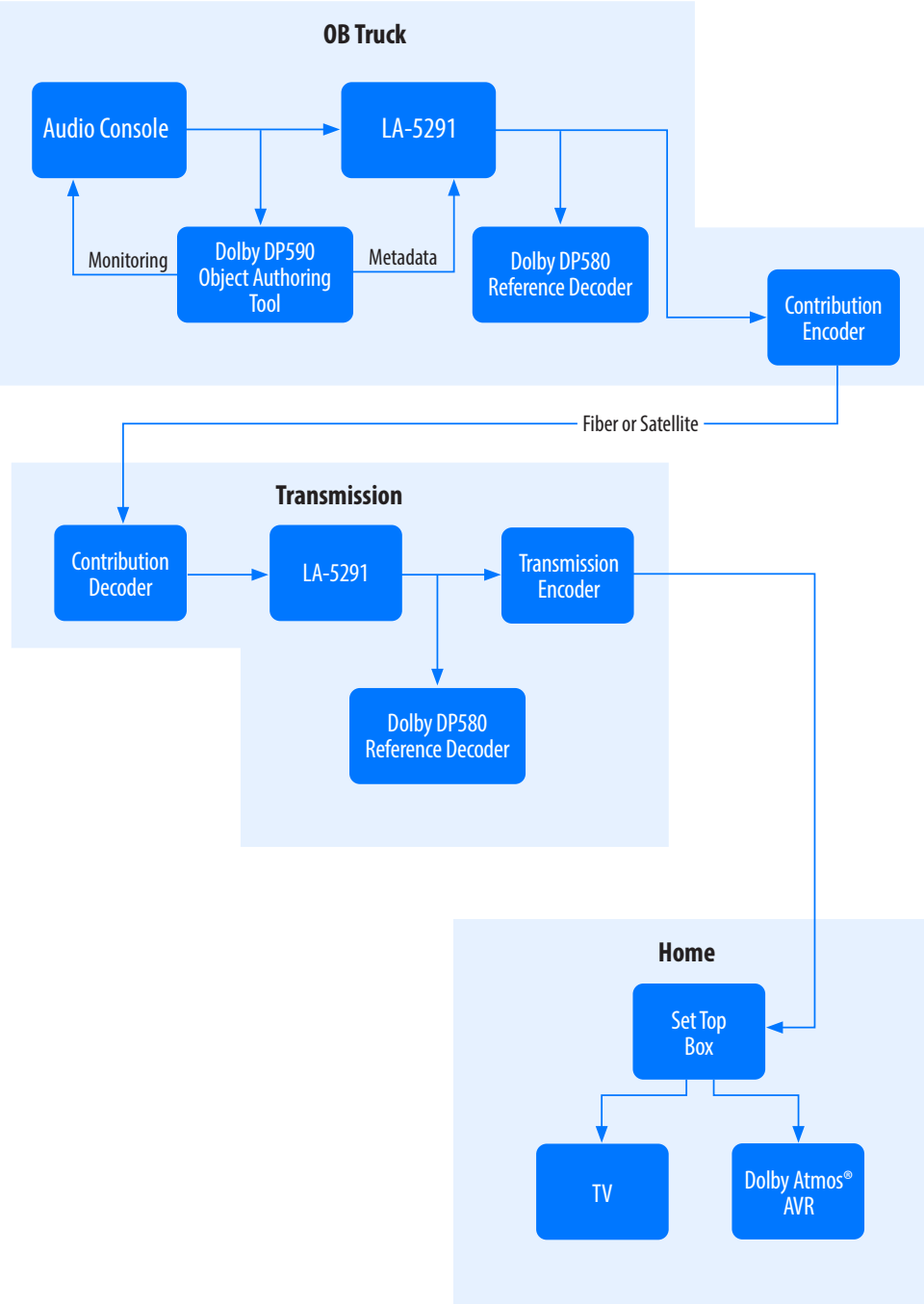
While emerging standards such as ATSC 3.0 continue to advance and provide improved immersive audio for OTA broadcast, the amount of cinematic and live content produced in Dolby Atmos continues to grow as well reaching consumers via Blu-ray Disc, satellite, cable, and streaming services. The workflow required to create, transport, and deliver that content to viewers at home can be complex, requiring the ability to work with PCM, Dolby ED2, Dolby E, Dolby Digital Plus, and Dolby Digital Plus JOC formats – tasks for which the LA-5291 was purpose-built.

### Equally at Home for Contribution and Distribution

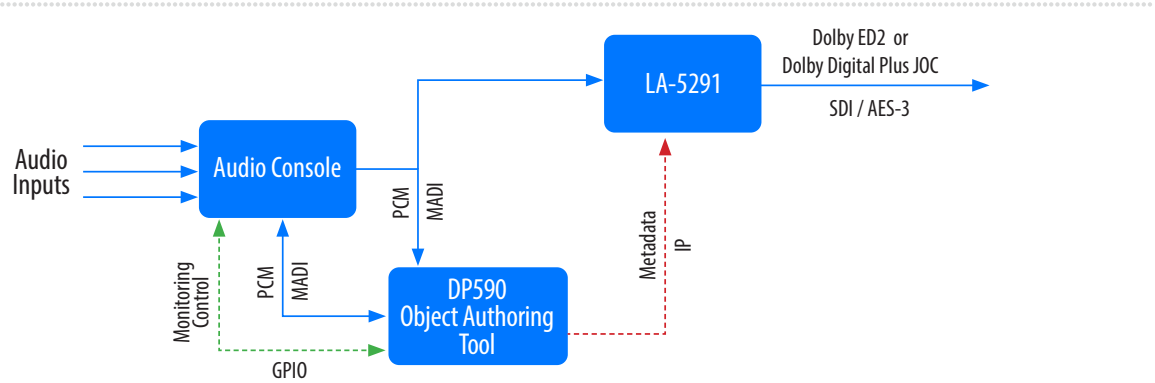
The LA-5291 integrates well into remote and OB trucks for encoding multi-channel PCM audio into Dolby Digital Plus, Dolby Digital Plus JOC, or Dolby ED2 for distribution. Further downstream, it can transcode Dolby ED2 and Dolby E directly to Dolby Digital Plus and Dolby Digital Plus JOC, and can encode PCM to Dolby Digital Plus and Dolby Digital Plus JOC for final distribution.



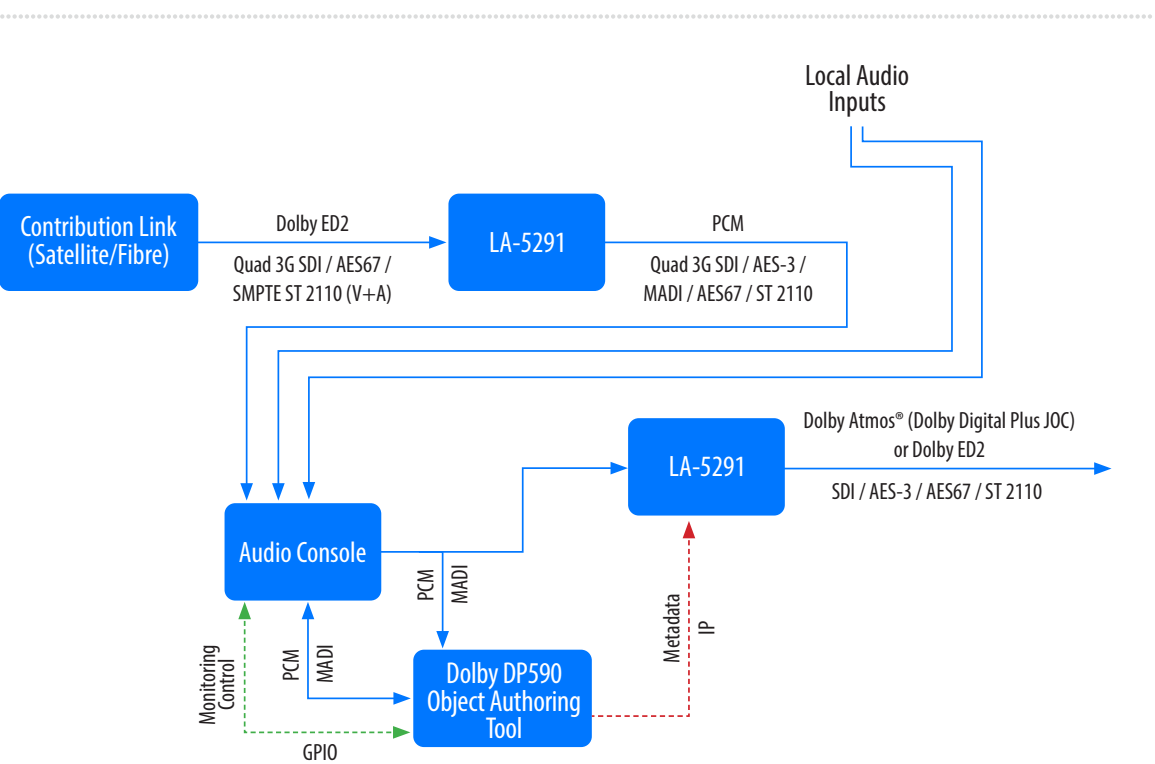
# End-to-End Workflow



OB Truck/Production Workflow



Broadcast Center Decode / Insert / Encode



# SPECIFICATIONS

## Decoding

- Decoding from Dolby ED2 to PCM

## Transcoding

- Transcodes Dolby ED2 and Dolby E to Dolby Digital Plus and Dolby Digital Plus JOC

## Encoding

- Encodes PCM to Dolby Digital Plus, Dolby Atmos (via Dolby Digital Plus JOC), and Dolby ED2

## 3G HD/SD-SDI I/O

- Two independent auto-sensing 3Gb/s HD/SD-SDI inputs (SMPTE ST 425-1, 292M, and 259M), up to 1080i/60/59.94/50Hz
- Optional Quad-Link 3Gb/s SDI for 4K workflows (mutually exclusive with MADI option)

## AES-3 I/O

- 5 stereo pairs via 75 Ohm BNC unbalanced female connectors, internally terminated; signal levels per SMPTE 276M/AES-3ID-2001

## AES67 I/O

- 16 channels of bi-directional AES67 I/O in support of SMPTE ST 2110-30 and -31 workflows

## MADI I/O

- Optional MADI I/O supports up to 16 channels for processing
- Passthrough and shuffling for up to 64 channels
- I/O via coax or optical SFP socket (SFP sold separately)
- MADI option mutually exclusive with Quad-Link SDI option

## Reference

- 48kHz reference via SDI, PTP, AES-3, internal clock (standalone use only), or MADI (when MADI option is installed)
- Vref

## Sample Rate/Resolution/Frequency Response

- 48kHz, 24-bit, 20Hz – 20kHz

## Ethernet

- Two Gigabit RJ-45 connections – one for AES67, one for networked remote control

## Parallel GPI/O Control Port

- 15-pin female D connector, 0-5V TTL levels, 5 GPI/O inputs, 5 GPI/O outputs

## Power

- Dual internal redundant auto-ranging power supplies
- 95-240 VAC, 50/60 Hz, 100W maximum total

## Dimensions and Weight

- 19" W x 15.5" D x 1.75" H (approximately 48.2 x 39.4 x 4.5 cm )
- Net weight: Approximately 9.0 lbs (4.08 kg)
- Approximate shipping weight 16 lbs (7.26 kg)

## Regulatory

- North America – FCC and CE tested and compliant with UL-approved power supplies
- Europe – Complies with European Union Directive 2002/95/EC on the restriction of use of certain hazardous substances in electrical and electronic equipment (RoHS), as amended by Commission Decisions 2005/618/EC, 2005/717/EC, 2005/747/EC (RoHS directive), and WEEE

## Warranty

- Standard Telos Alliance 2-year limited parts and labor

# Linear Acoustic® UPMAX® ISC

## Immersive Soundfield Controller



## OVERVIEW

UPMAX ISC builds upon the Hollywood-approved and industry-trusted line of upmixing products from Linear Acoustic, and carries it forward to meet the additional demands introduced by the immersive audio capabilities of Next Generation Audio systems.

Employing a completely new upmixing algorithm, UPMAX ISC can upmix 2-channel, 3-channel, 5.1-channel, and 7.1-channel audio to immersive audio formats including 5.1.4 and 7.1.4. Upmixing to legacy formats including 5.1-channel and 7.1-channel audio is also supported, while content presented in native immersive formats is automatically recognized and passed through without processing. Compensating video delay is included to ensure perfect A/V sync regardless of input format or operating mode.

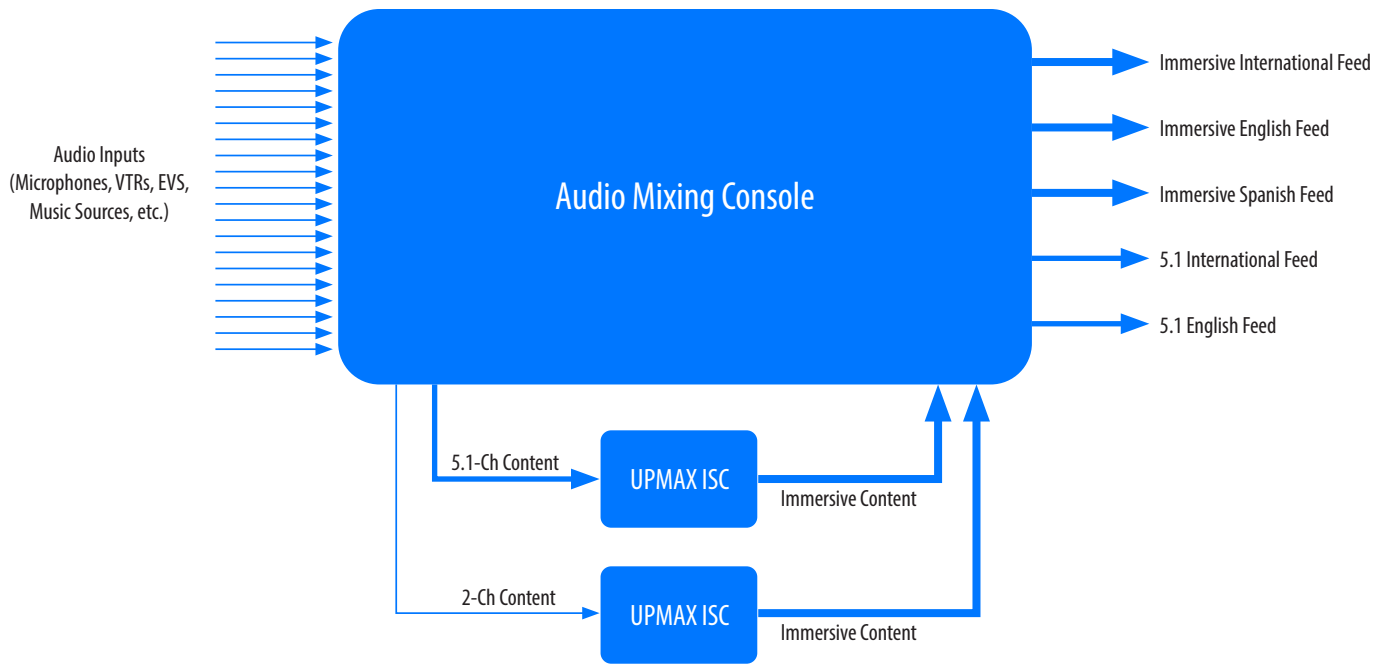
For live events and broadcasts, UPMAX ISC can be inserted on a mix bus or placed at the output of the mixing console in the OB truck at the venue for upmixing sources including music, effects, and legacy content not natively presented in an immersive format.

UPMAX ISC is equally at home in the airchain at the Network Operations Center to ensure all programming - including commercial and interstitial content - is delivered to the viewer as a consistent immersive experience.

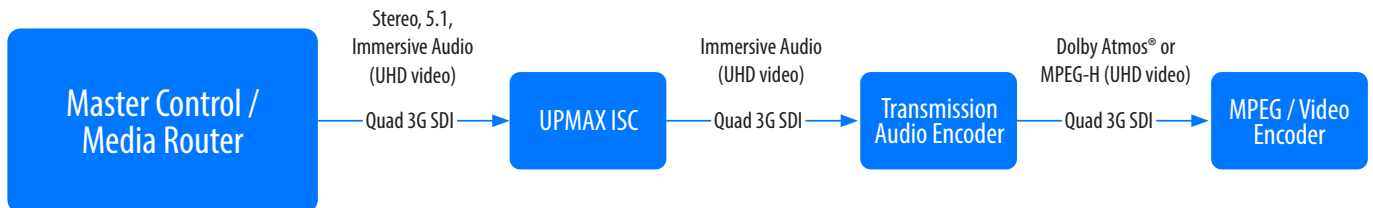
I/O includes auto-sensing 3Gb/s HD/SD-SDI, AES-3, and AES67 to natively support SMPTE ST 2110-30 workflows.

UPMAX ISC includes a 5-button front panel navigation cluster and color LCD display for basic setup and control, plus the convenience of a web-based GUI for full control and monitoring capabilities. Dual auto-ranging internal power supplies provide redundancy and worldwide compatibility.

## ISC Workflow 1



## ISC Workflow 2



## FEATURES

- Latest Linear Acoustic UPMAX algorithm
- Upmixing from 2-channel, 3-channel, 5.1-channel, and 7.1-channel to immersive 5.1.4 and 7.1.4 formats
- Upmixing to legacy formats including 5.1 and 7.1
- 3b/s HD/SD-SDI, AES-3, and AES67 I/O to support SMPTE ST 2110-30 workflows
- Optional Quad-Link SDI I/O for 4K video workflows or MADI I/O (mutually exclusive options)
- Dual internal redundant auto-ranging power supplies
- Browser-based remote control

# SPECIFICATIONS

## Processing

- Next-generation Linear Acoustic UPMAX algorithm; upmixing from 2-channel, 3-channel, 5.1-channel, and 7.1-channel to 5.1.4 and 7.1.4

## Reference

- 48kHz reference via SDI, PTP/AES67, AES-3, internal clock, or MADI (with optional MADI I/O)

## Sample Rate/Resolution/Frequency Response

- 48kHz, 24-bit, 20Hz – 20kHz (passthrough); PCM audio only

## AES-3 I/O

- Five two-channel inputs/outputs via 75 Ohm BNC unbalanced female connectors, internally terminated; signal levels per SMPTE 276M/AES-3ID-2001

## SDI I/O

- Two auto-sensing 3Gb/s HD/SD-SDI inputs (SMPTE ST425/292M/259M), up to 1080i/60/59.94/50Hz, with de-embedding for 8 audio pairs; re-embedding for 8 audio pairs via one SDI output
- Optional Quad-Link SDI for 4K workflows (mutually exclusive with MADI option)

## AES67 I/O

- 16 channels of bi-directional AES67 I/O in support of SMPTE ST 2110-30

## Parallel GPI/O Control Port

- 15-pin female D connector, 0-5V TTL levels, 5 GPI/O inputs, 5 GPI/O outputs

## MADI I/O

- Optional MADI I/O supports up to 16 channels for processing
- Passthrough and shuffling for up to 64 channels
- I/O via coax or optical SFP socket (SFP sold separately)
- MADI option mutually exclusive with Quad-Link SDI option

## Ethernet Connection

- Two independent Gigabit Ethernet ports allows web-based remote access/control and AES67 I/O

## Front Panel Display and Controls

- 5-button navigation cluster, color LCD display, LEDs for power supply, status, and sync

## Power

- Dual internal power supplies, each rated at 100-264VAC, 50/60Hz, auto-sensing, 100W maximum total

## Dimensions and Weight

- 1RU – 1.75"H x 19"W x 15.5"D (44 x 483 x 394 mm)
- Approximate net weight 9 lbs (4 kg)
- Approximate shipping weight 16 lbs (7.26 kg)

## Environmental

- Fan-cooled; operating temperature 32 to 122 degrees F (0 – 50 degrees C); non-operating temperature -4 to 158 degrees F (-20 – 70 degrees C)

## Regulatory

- North America – FCC and CE tested and compliant; power supplies are UL-approved
- Europe – Complies with European Union Directive 2002/95/ EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), as amended by Commission Decisions 2005/618/EC, 2005/717/ EC, 2005/747/EC (RoHS Directive), and WEEE

## Warranty

- Standard 2-year limited parts and warranty



# Linear Acoustic® LA-5300

## The Complete Audio Processor for ATSC 3.0 and 1.0



## OVERVIEW

Watching TV is a very different experience than a decade ago. Viewers can watch broadcast TV “off the air,” from a local cable provider, or via streaming. Media consumption continues to evolve rapidly to match the world’s on-demand lifestyle.

Broadcasters—traditionally restricted to the confines of the “TV set”—finally have the options they need to compete when adopting ATSC 3.0. By using a platform built on the same Internet Protocol backbone as today’s popular streaming media, they can now break free and push broadcast to mobile, cars, and gaming consoles and play by Internet rules, bringing together Over-the-Air (broadcast) with Over-the-Top (streaming) content. Viewers now have the same choices and overall enhanced experience that they have come to expect from competing media platforms like streaming.

The Linear Acoustic LA-5300 Broadcast Audio Processor provides everything broadcasters need to be ready for NEXTGEN TV/ATSC 3.0 audio, with the option of backward compatibility for ATSC 1.0 services and streaming or MVPD feeds. It simultaneously addresses the concerns of aging ATSC 1.0 infrastructure and future-proofs the way forward for those wishing to update to ATSC 3.0 today, all in a single, compact, integrated package that supports loudness control, upmixing, encoding, audience measurement, watermarking, and bitstream analysis for up to four simultaneous real-time audio programs, along with confidence decoding.

## FEATURES

- Linear Acoustic UPMAX® ISC upmixing
- Linear Acoustic APTO™ loudness control
- Optional Dolby® AC-4 encoding from PCM for stereo, 5.1, and Dolby Atmos® services
- Optional Dolby® Digital Plus / Dolby Digital\* encoding (stereo, 5.1, and Dolby Atmos configurations)
- Dolby® Real-Time Loudness Leveler when encoding to a Dolby format
- Confidence AC-4 / Dolby Digital / Dolby Digital Plus / Dolby Digital Plus with Atmos decoding
- Optional Verance® or Nielsen watermarking
- Dual 3Gb/s HD/SD-SDI, 5 pairs of AES-3 I/O, and AES67 I/O in support of SMPTE ST 2110-30 workflows
- Optional Quad-Link 3Gb/s SDI I/O for supporting 4K workflows or MADI I/O (mutually exclusive)
- Dual Gigabit Ethernet connections (Control and AES67 / ST 2110-30)
- SNMP alarm and status reporting
- Web-based user interface provides comprehensive setup, configuration, routing, control, and metering

## IN DEPTH

### A Complete ATSC 3.0/NEXTGEN TV and ATSC 1.0 Audio Solution

The rollout of ATSC 3.0—better known to consumers as NEXTGEN TV—offers myriad benefits for both the broadcaster and the viewer alike. New features such as personalization, dialog enhancement, and immersive audio all bring a more enriching experience to your audience. For the broadcaster, ATSC 3.0 helps generate revenue with watermarking. While ratings watermarking is not new, modern implementations of this proven approach yield ratings data that is consistent and reliable across all connections. ATSC 3.0 also brings with it a unique set of requirements, challenges, and opportunities for television broadcasters.

The Linear Acoustic LA-5300 provides a single solution for all of your audio processing needs for both ATSC 3.0 and 1.0 services, including loudness control, upmixing, optional audience measurement watermark insertion, and optional encoding into select Dolby emission formats. These include Dolby AC-4 or Dolby Digital (AC-3) for ATSC broadcasts and Dolby Digital Plus / Dolby Digital Plus with Atmos (Dolby Digital Plus with JOC) for streaming or MVPD distribution, plus bitstream analysis and monitoring of the final encode.

The ability to handle up to 4 audio programs means one LA-5300 can provide unique encoded streams for the main program audio, SAP, and video descriptive services—all in a single 1RU solution.

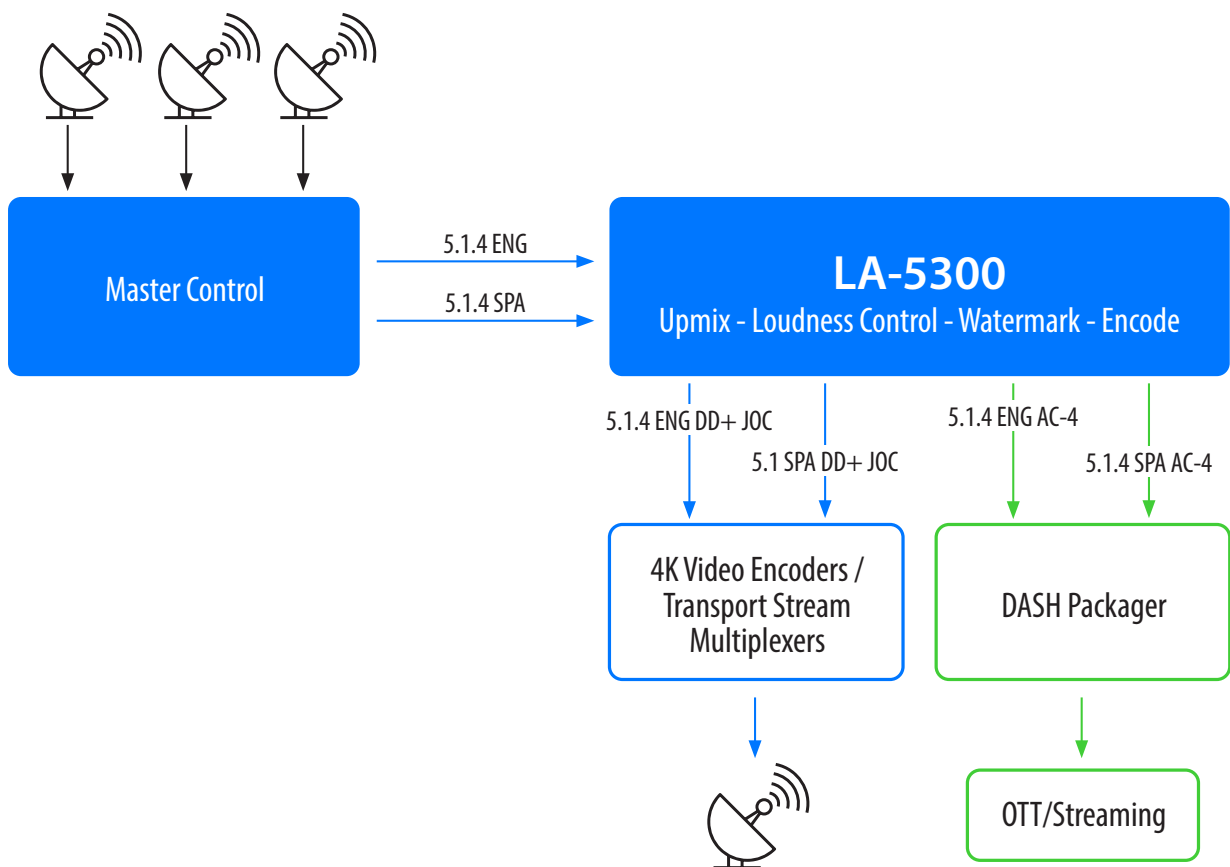
## I/O for Any Facility

The LA-5300 comes standard with 5 pairs of AES3 I/O, dual 3G SDI I/O, and AES67 I/O to support SMPTE ST 2110-30 workflows. Options include Quad-Link 3G SDI for facilities utilizing 4K workflows, or MADI I/O. Two Gigabit Ethernet ports are provided, one for AES67, and one for remote control via the web-based GUI.

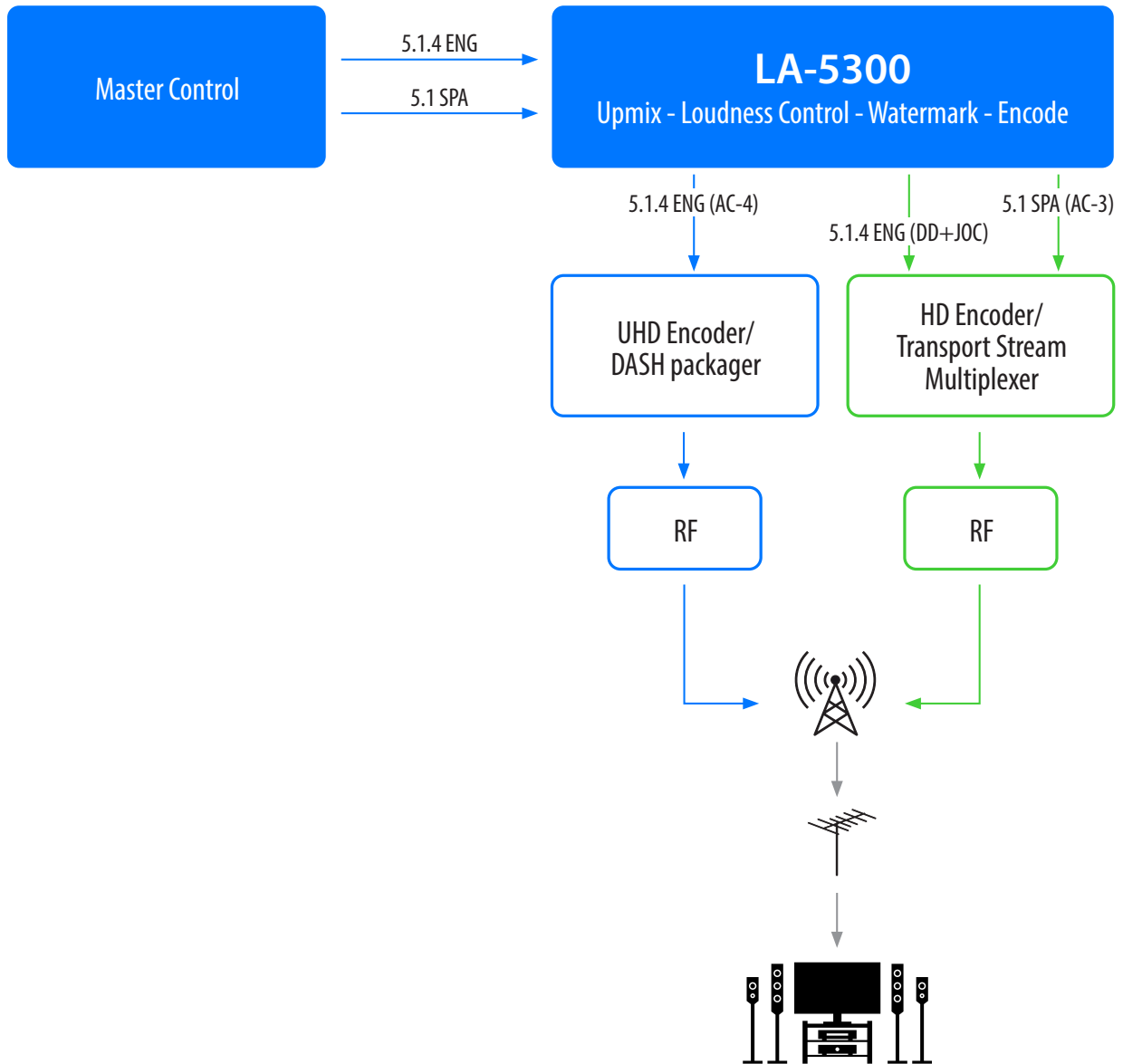
## Ready for Today, Ready for Tomorrow

The LA-5300 meets the immediate requirements for NEXTGEN TV/ATSC 3.0 audio right out of the box, with channel-based AC-4 encoding, loudness control, and upmixing to either 5.1 or immersive audio (Dolby Atmos) configurations for multiple programs. As ATSC 3.0 adoption grows, support for its additional features and benefits such as object-based audio, interactive consumer control, personalized audio, and multiple presentations within a single stream can be incorporated into the LA-5300 via software updates.

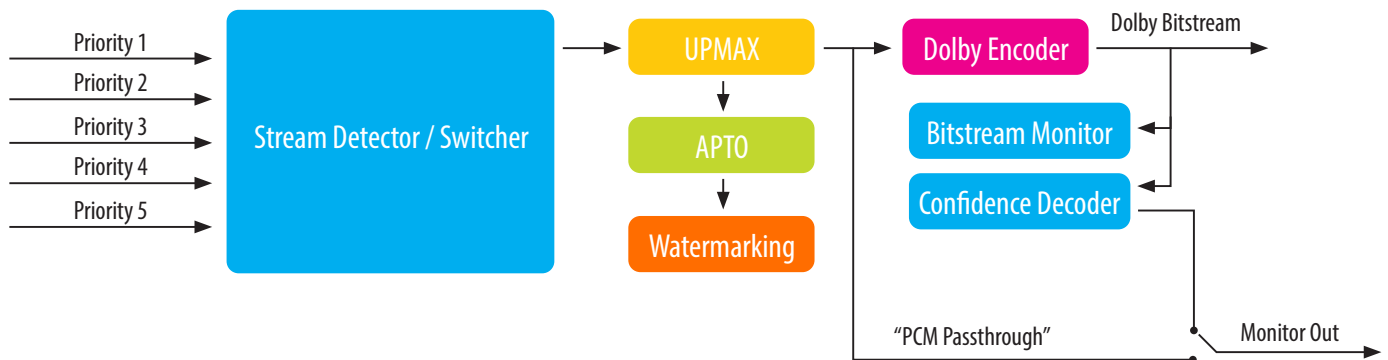
## MVPD Turn-Around Workflow



## ATSC 1.0 / 3.0 Simulcast



## AC-4 Encoder Block Diagram



# SPECIFICATIONS

## Processing

- Processing for up to 4 independent audio programs
- Linear Acoustic UPMAX ISC® upmixing to 5.1 or immersive configurations, and downmixing to 5.1 or stereo configurations
- Linear Acoustic APTO™ Loudness Control
- Dolby Real-Time Loudness Leveler (RTLL) when encoding to Dolby formats
- Input source priority switching
- Optional Nielsen and Verance® audience measurement watermarking

## Encoding

- Optional encoding to Dolby AC-4 (stereo, 5.1-ch, and Dolby Atmos configurations)
- Optional encoding to Dolby Digital (AC-3) / Dolby Digital Plus (E-AC-3) in stereo and 5.1-ch configurations, and encoding into Dolby Digital Plus with Atmos (Dolby Digital Plus w JOC)

## Decoding

- Confidence decode of all enabled Dolby encoder formats

## Bitstream Analysis and Monitoring

- Bitstream analysis of all streams simultaneously plus confidence decoding/monitoring
- Multichannel output of either the PCM processing path or Dolby confidence decoder

## Watermarking

- Optional Nielsen (N2, N6, CBET) audience measurement watermarking
- Optional Verance® Aspect® audience measurement watermarking

## Audio Core

- Thirty four channel audio core for processing and passthrough including compensating delay

## HD/SD-SDI I/O

- Two independent auto-sensing 3Gb/s HD/SD-SDI inputs (SMPTE ST 425-1, 292M, and 259M) up to 1080p/60/59.94/50Hz, each with de-embedding/re-embedding for up to 8 audio pairs
- Optional Quad-Link 3Gb/s SDI for 4k workflows (mutually exclusive with MADI option)

## AES3 I/O

- 5 inputs/outputs via 75 Ohm BNC unbalanced female connectors, internally terminated; signal levels per SMPTE 276M/AES-31D-2001

## AES67 I/O

- up to 32 channels of bi-directional AES67 I/O in support of SMPTE ST 2110-30 (Level A) workflows

## MADI I/O

- Optional MADI I/O supports up to 32 channels for processing (mutually exclusive with Quad-Link SDI option)
- Passthrough and shuffling for up to 64 channels
- I/O via coax or optical SFP socket (SFP sold separately)

## Clock Reference

- 48kHz reference via SDI, PTP, AES-3, internal clock (standalone use only)
- MADI (when MADI option is installed)
- Vref

## Sample Rate/Resolution/Frequency Response

- 48kHz, 24-bit, 20Hz – 20kHz

## Ethernet

- Two Gigabit RJ-45 connections – one for AES67 / SMPTE ST 2110-30, one for networked remote control

## Parallel GPI/O Control Port

- 15-pin female D connector, 0-5V TTL levels, 5 GPI/O inputs, 5 GPI/O outputs

## Power

- Dual internal redundant auto-ranging power supplies
- 95-240 VAC, 50/60 Hz, 100W maximum total

## Dimensions and Weight

- 19" W x 15.5" D x 1.75" H (approximately 48.2 x 39.4 x 4.5 cm )
- Net weight: Approximately 9.0 lbs (4.08 kg)
- Approximate shipping weight 16 lbs (7.26 kg)

## Regulatory

**North America** – FCC and CE tested and compliant with UL-approved power supplies

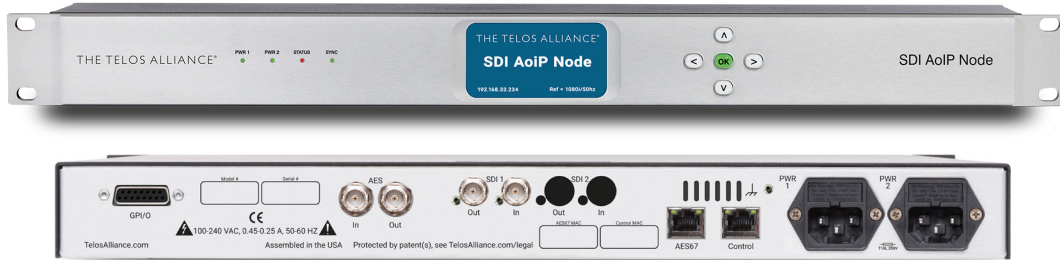
**Europe** – Complies with European Union Directive 2011/65/EU + (EU) 2015/863 of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)  
Compliant with the CE EN 62368-1:2020, EN 55032:2015 and EN 55035:2017 requirements



Dolby, Dolby Atmos, Dolby Audio, and the double-D symbol are trademarks of Dolby Laboratories. The NEXTGEN TV logo is an unregistered trademark of the Consumer Technology Association and is used by permission.

# Telos Alliance® SDI AoIP Node

## Bridging the Present and Future of TV Technology



## OVERVIEW

As the successor to the SDI xNode, the Telos Alliance SDI AoIP Node continues our commitment to bring the power and flexibility of Audio over IP to broadcast television by de-embedding and converting up to 8 pairs of audio from two SDI inputs to AES67. Audio can then be shared on the network, processed for loudness compliance, and ultimately re-embedded into two SDI output streams.

## FEATURES

- Provides de-embedding, routing, and re-embedding of up to 8 audio pairs through two SDI inputs and outputs
- 3Gb/s HD/SD-SDI supports UHD applications
- AES67 supports SMPTE ST 2110-30 workflows
- Compensating video delay maintains proper A/V sync
- Provides SRCs for all SDI output channels
- Full-width 1RU hardware with dual internal redundant auto-ranging power supplies



## IN DEPTH



### Bringing the Power of IP to Television

Radio discovered the myriad benefits of AoIP nearly two decades ago, and hasn't looked back since. Television broadcasters are now realizing the benefits of networked audio and interoperability between manufacturers and products.

### Flexible Routing for Two SDI Signals

The SDI AoIP Node offers two independent 3Gb/s HD/SD-SDI inputs and outputs. Up to 8 audio pairs from either or both SDI inputs can be de-embedded and converted to AES67 and become available anywhere on the network for monitoring, distribution, or loudness control via a Linear Acoustic® AERO.8000 Processing Engine. Up to 8 audio pairs can then be re-embedded (and pair shuffled if desired) to two independent SDI outputs.

### Ready Today, Ready for the Future

The SDI AoIP Node supports 3G video standards to seamlessly integrate into UHD facilities. Installations built using SMPTE ST 2110 workflows will appreciate its AES67 I/O which provides native support for SMPTE ST 2110-30.

### User-Friendly Setup and Configuration

Despite its powerful features and signal routing capabilities, SDI AoIP Node is easy to configure. Its user-friendly web-based UI is device, OS, and browser-agnostic, and can be used on any desktop or laptop computer, tablet, or smartphone.

# SPECIFICATIONS

## HD/SD-SDI I/O

- Two independent auto-sensing 3Gb/s HD/SD-SDI inputs (SMPTE 292M, 259M, and 424M) with de-embedding for up to 8 audio pairs
- De-embedded audio is converted to AES67 and can be routed anywhere on the network
- Up to 8 audio pairs can be re-embedded to two independent HD/SD-SDI outputs

## AES67

- Fully AES67 compliant and supports SMPTE ST 2110-30 workflows
- Supports 2-ch streams with a 1 ms packet time (ptime)

## Reference

- User selectable reference clock
- Reference clock options include PTP (AES67), SDI, Internal 48 KHz

## Ethernet

- Two Gigabit RJ-45 connections – one for AES67, one for networked remote control

## Power

- Dual internal redundant auto-ranging power supplies
- 95-240 VAC, 50/60 Hz, 30W maximum

## Dimensions and Weight

- 19" W x 9" D x 1.75" H (approximately 48.2 x 22.8 x 4.5 cm )
- Net weight: Approximately 6.0 lbs (2.72 kg)

## Regulatory

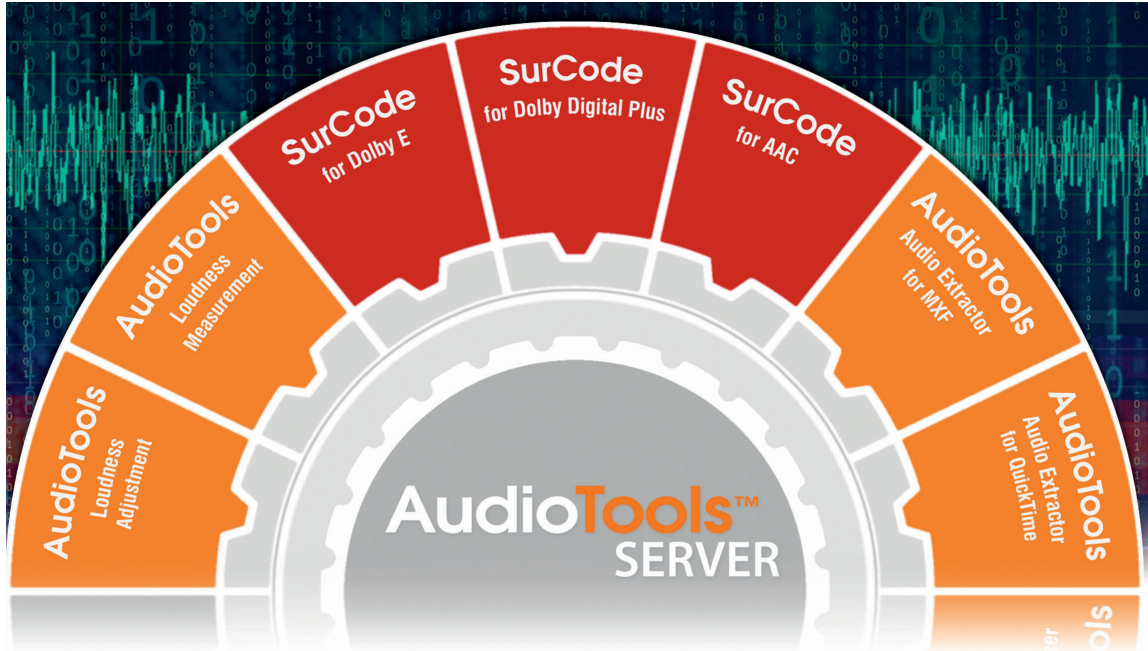
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## Warranty

- Standard Telos Alliance 2-year limited parts and labor

# Minnetonka Audio® AudioTools™ Server

## Quality-First Audio Automation



## OVERVIEW

AudioTools Server is a collection of enterprise-ready audio solutions designed to add file-based expertise to automated environments. The AudioTools Server family represents decades of expertise encapsulated in flexible, focused packages of audio specialization.

AudioTools Server automates the most sophisticated audio tasks and offers a wide variety of processing, specifically created for use in cable, satellite, terrestrial and IPTV, radio, and post production facilities. As a pure software platform running on commodity hardware, including VM or cloud deployment, AudioTools Server is flexible and customizable, allowing for new workflows as requirements inevitably change.

- State-of-the-art audio processing
- Customized, efficient file-based workflows
- Unrivaled loudness tools
- Compliance to broadcast standards
- Interoperability with major environments
- Modular scalable platform

## AudioTools Server - Leader in Loudness

Loudness Control is a significant use case that employs Linear Acoustic APTO™ loudness processing. Our loudness normalization processes are designed to fully preserve the existing audio and only apply a gain change combined with optional peak limiting. There are other use cases that require changing the dynamic range and more complex parameters of the audio content, such as dialog intelligibility. Advanced Loudness Adaptation is a collection of intelligent loudness profiles designed to adapt a theatrical audio mix for broadcast to create the best possible audio experience for all modern platforms such as OTT/web, mobile/handheld and VOD/SVOD.

## FEATURES



### Use Cases

#### Loudness Measurement & Adjustment

- State-of-the-art loudness control based on international standards & practices. Advanced Loudness Adaptation profiles for improved and compliant dialog intelligibility in high-dynamic range content. Netflix Compliance Profiles are available for both Loudness Adjustment and Advanced Loudness Adaptation.

#### Audio Adaptation

- Automated adaptation of audio content to specific output specifications, including: upmix, downmix, channel management, and frame rate conversion.

#### Dolby Automation

- Automated Dolby encoding and decoding including metadata handling. Dolby E quality control, with optional correction.

#### Quality Control

- Audio specific quality control of audio files or container formats, including channel assignment detection and correlation check.

# IN-DEPTH

## The Server Architecture

The AudioTools Server communicates directly with modules to configure the overall system for the required functionality. AudioTools Server, as a system, can then interface directly with your existing DAM, MAM, CMS or DBM workflow manager.

### Modular Design

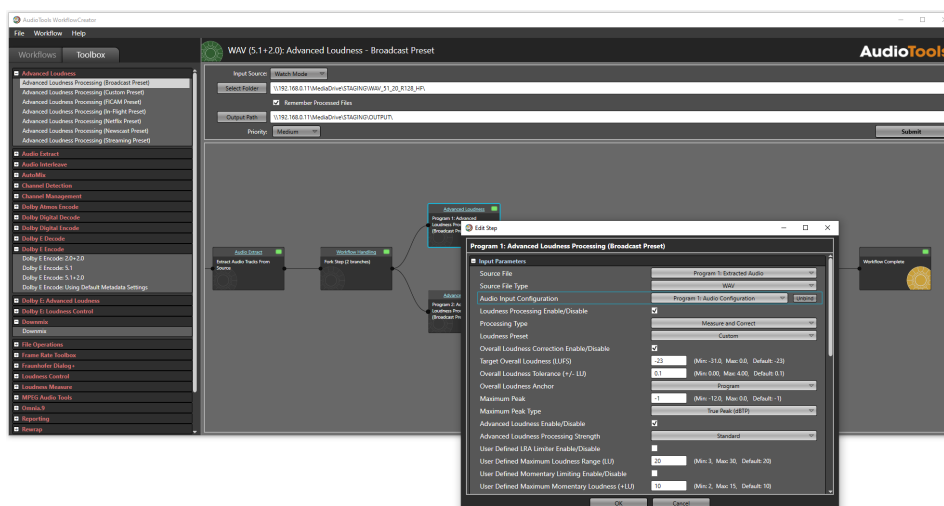
While a modular architecture allows AudioTools Server to always be “state-of-the-art”, the real power of this approach is using workflows to combine module functions in a sequential or highly conditional profile. AudioTools Server is also a VST plug-in host, allowing for 3rd party plug-ins to be used as part of an overall AudioTools Server workflow.

### Enhanced Workflows with AudioTools Server

AudioTools Workflow Control is the command and control option for AudioTools Server that enables standalone operation along with support for threaded multiple concurrent processes, load balancing and dynamic reconfiguration of workflows on the fly. AudioTools Server can deploy floating licenses through a license server, offering a scalable system for small businesses or enterprise class facilities.

AudioTools Server is internally driven from tailored XML profiles. For an operator, preset workflows can easily be called up and edited through the AudioTools Operator app or built on the fly and submitted with AudioTools WorkflowCreator, while Queue Control provides an overview with detailed access to all running processes.

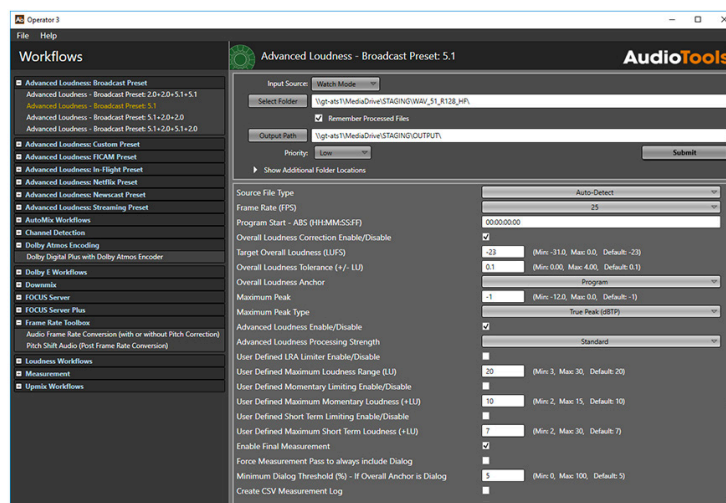
## AudioTools WorkflowCreator



AudioTools WorkflowCreator allows anyone to wield the full power and sophistication of AudioTools Server via a simple graphical user interface. WorkflowCreator provides users with the ability to quickly and easily build entirely new workflows from scratch, using a comprehensive toolset of AudioTools Server modules. Modifying workflows is also simple, with it possible to add, delete or rename steps in just a few clicks. Each step comes with its own set of controllable parameters that can be adjusted to meet requirements. Individual parameters can also be bound to upstream (customizable) references, or can be copied en masse between steps. The software also comes pre-installed with over 1000+, searchable workflow templates, covering the most common workflow types (all fully editable), meaning users can start building their own workflow library in minutes. Files and watch folders can be submitted to the server for processing directly from the WorkflowCreator, or workflows can be exported for submission via third-party tools, such as Telestream Vantage, or web services integration.

## AudioTools OPERATOR

Operators get assistance and access on parameters through a simple, custom user interface.



## AudioTools WebClient

The WebClient allows you to monitor AudioTools Server processes via the network. It is possible to check logs, results, and progress from any machine or mobile device with access to the network of AudioTools Server.

## Integration

AudioTools Server supports manual job submission, hot folders, and a full web services API, guaranteeing that it fits into any environment, on any integration level.

## Integration Partners

Arvato, Aspera, Aveco, AVID, Cinnafilm, Dalet, Dolby, Evertz, Geminisoft, Harmonic, IBM, Kantar Media/Civolution, Root 6, Sony, Tedral, Telestream, Vector 3, VIZRT, and others

# SPECIFICATIONS

## Content & Formats

AudioTools Server is a complete solution for managing and processing audio formats. With audio at the center of a complex audio ecosystem, a payload may contain “containerized” video assets, transport streams, Dolby–encoded content, and metadata, requiring that each layer of the asset must be carefully handled.

### Formats:

**Linear PCM Audio:** WAV, BWF, AIFF, RF64

**Codecs:** Dolby E, Dolby Digital, Dolby Digital Plus, Dolby Pro Logic II, mp2, mp3, MPEG-4, HE-AAC, AAC

**Container:** MXF, QuickTime™, LXF, GXF, selected Transport Streams

# Minnetonka Audio® AudioTools™ Cloud

## Quality-First On-Demand Audio Processing

The screenshot displays the 'PARAMETERS' tab of the AudioTools Cloud interface. The top navigation bar includes 'INPUT', 'JOB', 'PARAMETERS', 'OUTPUT', 'REVIEW', and a 'STATUS' button with a sun icon. The main content area is titled 'Custom Loudness Adjustment Parameters' and contains the following settings:

- Program Configuration: One Program, All Channels (dropdown)
- Target Program Loudness: ☒ -23.0 LU
- Anchor: Program (dropdown)
- Loudness Range: ☐ 10 LU
- Max Short-term Loudness: ☒ -12.0 LU
- Momentary Loudness: ☐ -9.0 LU
- Target Maximum True Peak: ☒ -1.0 dBTP
- Final Measurement: ☒

On the right side of the parameters section, there are two circular buttons: 'PREV STEP' (left arrow) and 'NEXT STEP' (right arrow). At the bottom of the interface, a dark blue banner reads 'We do Audio'.

## OVERVIEW

AudioTools Cloud™ is an advanced audio processing solution for audio, video, and broadcast professionals that provides loudness control, encoding, decoding, channel management, frame rate conversion, quality control, and container management from an easy-to-use user interface designed for the Amazon AWS Marketplace.

AudioTools Cloud is based on Minnetonka's AudioTools™ Server – a platform that delivers interoperable, scalable, file-based audio automation. AudioTools Server has become the number one enterprise level platform for automated and unattended file-based audio processing and has helped broadcasters add Loudness Management processes to their existing video-centric file-based environments.

From the occasional job, to expanding throughput for higher volume workloads, AudioTools Cloud brings proven processes to the cloud, allowing on-demand, case-by-case use (OPEX) vs larger CAPEX sized projects. Businesses only pay for the infrastructure they need, when they need it.



## FEATURES

- Professional file-based audio processing
- Extensive selection of job types
- Intuitive user interface enables complete control over every job parameter
- Support for global loudness compliance standards
- SurCode encoding and decoding technologies included
- 3 flexible configurations

### Submitting Jobs to AudioTools Cloud

AudioTools Cloud ON-DEMAND is available as different Amazon EC2 instances. Each instance will launch the AudioTools Cloud Web Client Interface. Users can choose to upload content to Amazon S3 (Simple Storage Service). After the upload is complete, select your input buckets, output buckets, and audio processing parameters.

Users pay for the EC2 instance, storage, and AudioTools Cloud software.

## IN-DEPTH

### AudioTools Cloud ON-DEMAND

AudioTools Cloud ON-DEMAND is designed for the Amazon AWS Market Place and offers ready-to-use audio processing profiles. A simple click-through browser based "configurator" is used to assign input and output locations and file types, or adjust loudness target levels for different specifications. These configurations can be downloaded and stored locally as templates for future use.

**Self-service:** Users choose what they want and when they want it.

**Scalable:** Users can choose how much capacity they want to ramp up if necessary.

### AudioTools Cloud BYOL - Bring Your Own License

AudioTools Server users can benefit from a cloud based deployment by adding AudioTools Server instances to any public or private cloud environment. An AudioTools LicenseServer will allow for floating licenses across all AudioTools Server instances in the cloud, on premise or any VM or datacenter deployment.

The AudioTools Server system in the cloud will ping the LicenseServer for available licenses, benefiting from cloud based flexible scalability within the existing license pool. AudioTools Cloud BYOL is perfect for users that want the flexible scalability of cloud based processing, combined with defined processing profiles and licenses. This is also the ideal strategy for smoothly and gradually moving work from an on premise installation to cloud based processes.

## AudioTools Cloud Node

AudioTools Server v4 will offer an on-demand Amazon Cloud-based AudioTools Server instance in addition to an existing AudioTools Server installation. The cloud-based service is being added as a processing node for AudioTools Server. AudioTools Workflow Control can then use the Cloud Node to add more processing resources to a local system. In a load-balanced environment, if a local system is not licensed for a specific ATS module, Workflow Control can assign those tasks to the Cloud Node, which by default includes all possible modules and licenses for AudioTools Server. **AudioTools Server Cloud Node** is the perfect add-on for flexible scalability and additional licenses on a project-by-project basis.

## SPECIFICATIONS

### AUDIO PROCESSING OPTIONS

#### Frame Rate Conversion

- Film - NTSC - PAL
- Pitch Shift
- Time Stretch
- Sample Rate Conversion

#### Loudness Control

- EBU R 128 Loudness Adjustment
- CALM A/85 Loudness Adjustment
- AS-11 UK DPP
- Loudness Measurement
- Linear Acoustic APTO audio processing
- Advanced Loudness Adaptation

## Quality Control

- Channel Detection
- Program Correlation Check
- Silence Detection
- Data Corruption Detection

## Audio Codecs

- MP2/MP3 Encoding and Decoding
- AAC Encoding and Decoding

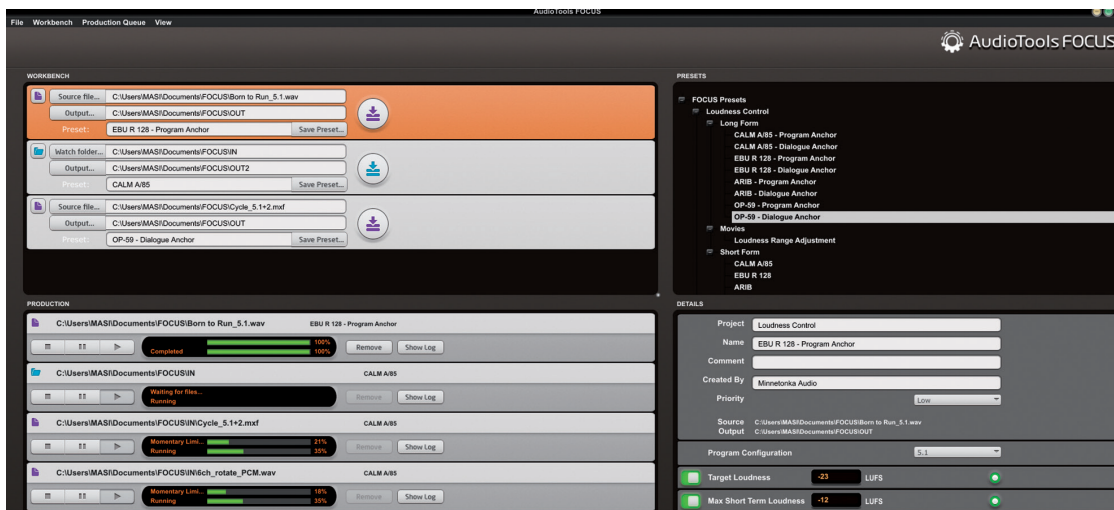
## Container Management

- Extract audio from MXF, LXF, GXF, QuickTime™, and Transport Streams
- Re-wrap audio to MXF, LXF, GXF, QuickTime™, and Transport Streams

## Channel Management

- Upmix with Linear Acoustic UPMAX™
- Downmix
- Channel Swapping
- Channel Replacement
- Channel Mixing

# Minnetonka Audio® AudioTools™ FOCUS for Loudness Control



## OVERVIEW

### Loudness in a Video World

AudioTools FOCUS for Loudness Control is an easy to use, standalone Windows application that takes the complexity out of the audio processing equation. Proven AudioTools presets conforming to every loudness standard are built in and ready to use or modify. With all the standards, file formats and deliverables needed today, loudness management adds one more layer of intricacy to an already complex ecosystem. In a video-centric world, we focus on handling the complexity and dependencies of automating loudness control...AudioTools FOCUS brings audio control into focus.

## FEATURES

### AudioTools FOCUS for Loudness Control is intended for:

- Sole proprietors needing painless yet high quality logging & adjustment
- Post houses & networks needing container handling
- Any facility that doesn't have deep automation in place

## Hit All Targets

AudioTools FOCUS for Loudness Control makes quality loudness management painless, taking the complexity of files, containers and processing, and making it all available in an easy to use, preset-driven application. A unique AudioTools feature is its ability to hit all loudness targets, not just one or two. With AudioTools FOCUS' logic-driven approach, you can simultaneously comply with Program Loudness, Loudness Range, and True-Peak, without exceeding your Maximum Momentary or Maximum Short Term loudness thresholds..

## Intricacy Unraveled

Simply type in your target parameter changes to the factory presets, and let FOCUS handle the processing complexity:

- Start with a preset, & type in your target requirements for each delivery spec
- Define your program configuration
- Set your file I/O – Watched Folders or Files
- Submit!

## AudioTools FOCUS provides:

- Loudness managed while preserving artistic intent
- Complete compliance with North American (CALM) & international loudness control standards including:  
EBU R 128, ARIB TR-B32 & OP-59
- Linear Acoustic APTO™ for Loudness Range processing
- File-based Omnia.9 processing for podcasts or on-demand (FOCUS Server for Radio)
- Hot Folder or File-driven processing
- MXF & QuickTime container handling – extract/process/rewrap
- Loudness adjustment or pure logging
- File type auto-detection
- Clearly labeled, proven presets right out of the box

## IN-DEPTH

### AudioTools FOCUS – An Affordable, Quality-First Solution For Loudness Control

Not only are there many variations of video file formats, but a quality loudness management process itself is complex. AudioTools FOCUS for Loudness Control provides:

- Program Loudness adjustments with combined True–Peak limiting
- Program Loudness combined with Maximum Short Term Loudness control for short for & interstitials
- Active & passive” Max. Short Term Loudness combined with Max Momentary limiting
- Pure gain adjustment versus dynamic processing

#### File-based In Mind

The world is moving toward IT-dominated, file–based workflows, and audio is only a part of the overall video picture. AudioTools FOCUS extracts the audio, processes that essence, preserves any audio metadata and rewraps the audio back into the container without modifying the video. This streamlines your workflow while ensuring downstream compatibility. The ITU-R BS.1770-3 Program Loudness standard was defined as file-based. AudioTools FOCUS directly answers that need with a standalone, software solution for loudness control automation.

#### Simplicity...It’s In The Details

Unlike hardware investments that cannot keep up with changing business strategy, delivery/platform requirements and government mandates, AudioTools FOCUS for Loudness Control is a pure software solution.

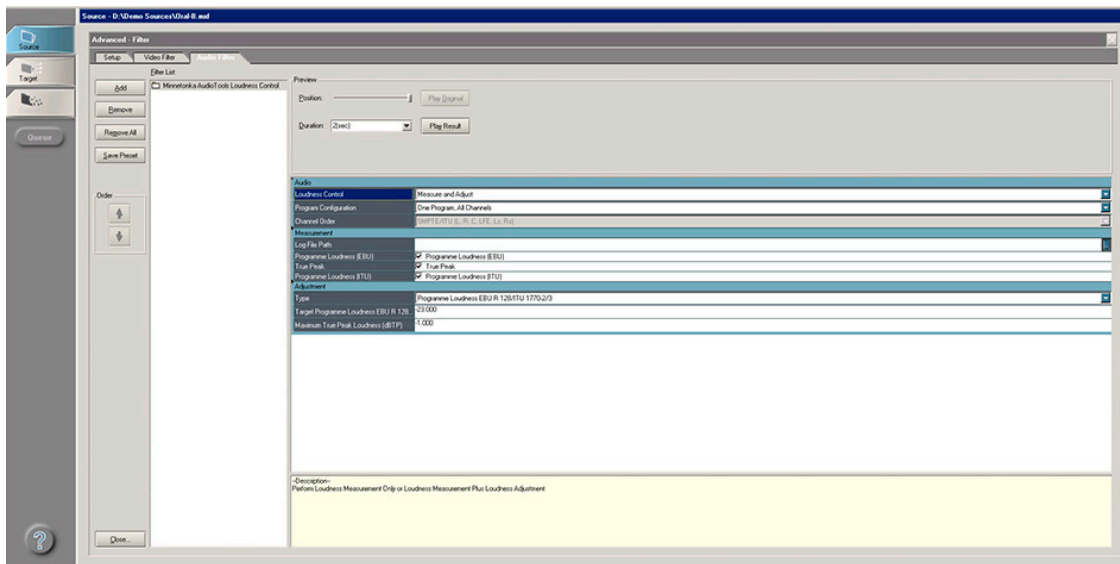
# SPECIFICATIONS

## The AudioTools FOCUS and Server Family

Features		FOCUS	FOCUS Server	FOCUS Server Plus	FOCUS Server for Radio	AudioTools Server
<b>Operation</b>	Automation through watch folders	✓	✓	✓	✓	✓
	Automation through web services API		✓	✓	✓	✓
	Number of concurrent jobs	up to 2	up to 4	up to 4	up to 4	flexible licensing
	Presets via graphical UI	✓	✓	✓	✓	✓
	Configurable graphical UI					✓
	Email Notification		✓	✓	✓	✓
	XML scriptable		✓	✓	✓	✓
	Custom Workflows					✓
<b>Format Support</b>	LPCM Audio: WAV, BWF, AIFF	✓	✓	✓	✓	✓
	Codecs: MP2, MP3, AAC, Dolby Digital Plus				✓	✓
	Dolby E Support			✓		✓
	Container: MXF, QuickTime	✓	✓	✓		✓
	Container: GXF, LXF, Transport Stream					✓
	Audio channels	up to 8	up to 16	up to 16	up to 16	up to 128+
<b>Loudness Processing</b>	Audio program configurations	Presets	Presets	Presets	Presets	Scriptable
	ITU 1770 & EBU R 128 Measurement	✓	✓	✓	✓	✓
	Program Loudness Adjustment	✓	✓	✓	✓	✓
	Momentary & Short-Term Loudness Adjustment	✓	✓	✓	✓	✓

AudioTools FOCUS and FOCUS Server can be upgraded to a full AudioTools Server configuration.

# Minnetonka Audio® AudioTools™ - Loudness Control for Harmonic ProMedia™ Carbon



## OVERVIEW

The AudioTools Loudness Control for Harmonic Pro-Media™ Carbon plug-in (a.k.a. ALCR) adds versatile and convenient loudness control to Harmonic's file-based ProMedia™ Carbon transcoding software. The plug-in provides comprehensive loudness measurement and flexible loudness adjustment using the same technology that powers Minnetonka Audio's AudioTools Server - the worldwide benchmark for file-based loudness control.



# FEATURES

## All Standards Supported

ALCR is compliant with all current standards and delivers your choice of loudness adjustment actions to cover all essential metrics, quantifying Program Loudness along with Maximum True Peak Level. EBU and CALM—specific profiles are provided to address all international regulations. Measurement results are formatted as XML, making them available to ProMedia™ Carbon for logging and subsequent reporting. The XML results are also compatible with the visualization and reporting application from Videomenthe and with other XML tools.

## More than Stereo

AudioTools Loudness Control for Harmonic ProMedia™ Carbon handles mono, stereo and multichannel configurations up to 24 channels, including 32 presets and 4 custom program configuration profiles. By processing all programs in one pass, users save time prepping material, whether it's a simple stereo or multi-program configuration.

# IN-DEPTH

## Recommended Practice

EBU and ATSC recommended practices discourage the use of preset compression and peak limiting for loudness control in file-based environments. The AudioTools Loudness Control for Harmonic ProMedia™ Carbon plug-in intelligently applies loudness adjustment to the incoming essence to reach the desired target Program Loudness value. Loudness adjustment can be performed in accordance with EBU R 128 and, as with the measurement module, mono, stereo and multichannel PCM configurations can be processed with target values set for Program Loudness according to ITU-R BS.1770-3. If the loudness level deviates from the Target Loudness Value, adjustment is applied, and Maximum True Peak Level can be limited to previously specified target levels.

Harmonic users now have a comprehensive solution that amplifies the capabilities of ProMedia™ Carbon — an adaptable AudioTools plug-in to measure and maintain loudness on your already familiar Harmonic ProMedia™ Carbon platform. AudioTools Loudness Control for Harmonic ProMedia™ Carbon can be added to an existing video transcoding process, providing loudness control functionality to a large variety of video and container formats on the fly.

AudioTools Loudness Control for Harmonic ProMedia™ Carbon is also supported in Harmonic WFS environments allowing users to create machine groups from a collection of authorized nodes.

# SPECIFICATIONS

## Measurement

- Supports ITU-R BS.1770-3, EBU R 128 and other international standards & practices
- Is in accordance with the Commercial Advertisement Loudness Mitigation (CALM) Act and ATSC's Recommended Practice A/85: Techniques for Establishing and Maintaining Audio Loudness for Digital Television
- Measures:
  - Program Loudness
  - Maximum Momentary Loudness
  - Maximum Short Term Loudness
  - Loudness Range
  - Maximum True Peak Level
  - Sample Peak Level

Measurement results are formatted as XML in a log file, & for use in 3rd party applications, such as the Videomethe plotter. In addition to overall loudness measurement results, maximum overall values are reported as well as measured loudness parameters throughout the file.

## Adjustment

- AudioTools Loudness Control for Harmonic ProMedia™ Carbon applies loudness adjustment to the incoming essence to reach the desired target program Loudness and control the Maximum True Peak
- Loudness adjustment is performed in accordance with ITU BS.1770, 1770-2/3, EBU R 128, ARIB TR-B32, DPP & OP-59
- Mono, stereo and multichannel PCM configurations can be processed - up to 24 channels
- All programs within an asset are processed in a single pass
- Target values can be set for all adjustable parameters

AudioTools Loudness Control for Harmonic ProMedia™ Carbon can be activated on a single machine using a license file. A user-supplied USB dongle provides portable licensing. On a single host or node, AudioTools Loudness Control for Harmonic ProMedia™ Carbon can be used as multiple instances for parallel processes.

# Jünger Audio™ AIXpressor

## Universal Audio Interface with optional Jünger Processing



## OVERVIEW

The AIXpressor offers unparalleled I/O flexibility and audio processing power. It takes converting many of the most widely used AoIP formats - including Telos Alliance Livewire+, AES67, SMPTE ST 2110-30, -31, -41 metadata support, and Dante\* from Audinate - to a whole new level while offering support for traditional analog, MADI, AES3, SDI\*, and microphone\* signals.

A new processing architecture, flexAI, makes deploying legendary Jünger Audio processing on the AIXpressor simple and straightforward. Easily tailored to match your exact needs, AIXpressor is a true processing powerhouse. When using Jünger Audio's new interface format, tieLight™, AIXpressor can transport up to 1024 channels of virtually latency-free audio to an additional processing unit such as the flexAIserver.

\* via optional I/O cards

# FEATURES

- Powerful x86 based processing core
- On board interfaces:
  - Audio-over-IP
    - AES67 / SMPTE ST 2110-30 and -31
    - ST 2110-41 Metadata over Ethernet
    - Telos Alliance Livewire+
  - 2x MAD1 or proprietary 1024-ch tieLight via SFP modules (sold separately)
  - AES3 I/O; user selectable between 4/4 or 2/6
  - Analog I/O; user selectable between 8/8 or 4/12
  - Reference Sync in
- 4 option card slots to support additional modules for SDI (3G/HD/SD),
- mic inputs, Dante, and additional analog and AES3 I/O
- Powerful headphone output
- Dual, redundant, universal Power Supplies
- Browser-based remote control
- Browser-based audio confidence monitoring
- 16.5 cm touch-sensitive display
- Optional Audio processing
  - Program Processing including Level Magic Loudness Processor
  - Voice Processing
  - Voice Over Mixing (stereo and 5.1) w/ mix-minus and output processing
  - Automixing (stereo and 5.1) with optional A.I. support
  - Upmixing up to 7.1.4 channels
  - Matrix Mixer with up to 16 input and output channels
  - Long, multi-channel, audio delay
  - FM Radio Conditioning
  - GfK Watermarking
  - Dolby E encoding/decoding
  - Dolby ED2 encoding/decoding
  - S-ADM authoring for Dolby Atmos
  - S-ADM renderer for Dolby Atmos
  - MPEG-H 3D Audio renderer
  - MPEG-H 3D Audio authoring
  - MPEG-H 3D Audio encoding
  - Immersive Monitor Controller
- SNMP
- Ember+ and NMOS IS-04 & IS-05

## IN DEPTH

### Maximum Interface Flexibility

The AIXpressor comes in a compact one rack unit high 19" housing, packed with a high-performance processing system and comprehensive media interfacing. It is equipped with a plethora of on-board media interfaces and four expansion slots for maximum flexibility. AIXpressor comes with redundant Ethernet ports as well as Audio-over-IP (AoIP) interfaces which support IP-based media formats and standards such as Telos Alliance Livewire+, AES67, and SMPTE ST 2110-30 and -31. Additionally, Metadata over Ethernet as standardized in SMPTE ST 2110-41 is supported. MADI, AES3 and analog I/O complete its comprehensive range of built-in audio connections.

Four expansion slots can be equipped with additional expansion cards, such as 3G/HD-SDI,\*\* Audinate's Dante AoIP, microphone inputs, optical and coaxial MADI, AES3 and analog inputs and outputs.

### Processing Power House

Powered by an x86 CPU-based processor, AIXpressor is Jünger Audio's most flexible and advanced audio processing solution to date with almost unlimited possibilities, both now and in the future as technology evolves and your needs change. The new processing core is powerful enough to handle coding, decoding, and audio processing without the need for additional DSP cards or codec boards.

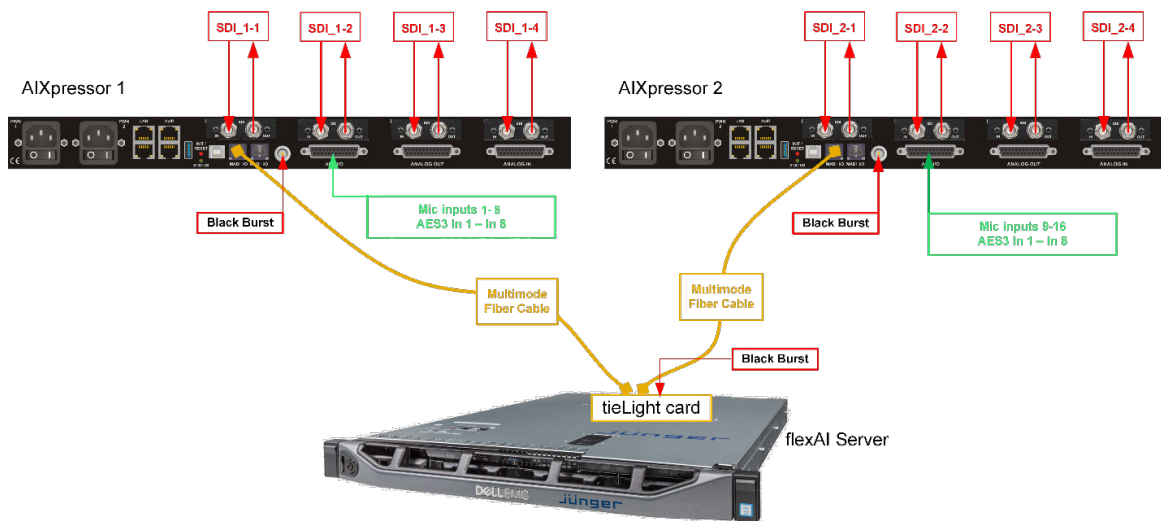
### flexAI - Any Process, All Platforms

AIXpressor is based on the entirely new audio processing infrastructure platform we call flexAI. With flexAI, user-specific solutions can be created without the usual limitations imposed by traditional hardware, much in the same way plug-ins are used in a digital audio workstation. All flexAI-based applications can run on the AIXpressor as well as Jünger Audio's growing range of flexAI audio processing servers, with virtualized and cloud-based solutions on the horizon.

\*\* UHD workflows can be supported via four SDI option cards

## Cascading Made Simple

The AIXpressor is a full-featured stand-alone audio processor, but one that was designed with scalability in mind. This philosophy applies not only to features and upgrades but also with regard to its role in larger systems. AIXpressor and flexAIserver devices are designed to work with a larger processing array to provide the distributed processing and load-balancing necessary for high channel-count applications. To help facilitate the exchange of audio and data between devices, Junger Audio has developed tieLight, a multichannel, low-latency, point-to-point connection for connecting and cascading across multiple devices. One optical tieLight interface is capable of transporting up to 1024 audio channels in each direction without introducing any relevant latency.



## Smart Operation

Following Junger Audio's tradition of comprehensive remote control and automation, all functionality is operated from a completely new designed web interface. Audio monitoring of various points in the processing paths is available via the browser interface for troubleshooting confidence monitoring.

## Eco and Budget Friendly

Considering its processing power and capabilities, AIXpressor's high-efficiency redundant power supplies use very little power and help reduce the carbon footprint of your facility.

# SPECIFICATIONS

The base AIXpressor unit is designed to be used as a flexible audio interface. Audio processing features are optional and enabled via field-installable software license keys.

## Analog I/O

- User selectable 8-channel analog input / 8-channel analog output, or 4-channel analog input / 12-channel analog output via AES59 standard DB-25 connector.
- Dedicated 8-channel analog output on AES59 standard DB-25 connector; +4 dBu balanced.

## AES3 I/O

- User selectable 4 stereo pairs input / 4 output, or 2 inputs / 6 outputs. AES3 I/O connections are balanced, 110 Ohms, DB-25 connector wired to the AES59 standard.
- Input sample rate converters (individually switchable for each stereo pair)

## SFP slot

- 2 x SFP slots, capable of supporting either 64-ch MADI or 1024-ch tieLight™ interfaces when populated with SFP modules (sold separately)

## MADI I/O

- Up to two 64-ch MADI I/O are supported via SFP modules (sold separately). Mutually exclusive with tieLight™ interfaces; user-configurable.
- Standard mode or redundant mode with automatic failure switch-over
- Single or multi-mode fiber interfaces or micro-BNC available

## tieLight™

- Up to two proprietary 1024-ch tieLight™ interfaces supported via SFP modules (sold separately). Mutually exclusive with MADI interfaces; user-configurable.
- Standard mode or redundant mode with automatic failure switch-over
- Single or multi-mode fiber interfaces available
- The tieLight protocol supports the transport of up to 1024 audio channels across a fiber optic connection

## Audio over IP (AoIP)

- Ethernet ports supporting bi-directional Livewire+ audio, AES67 I/O, and SMPTE ST 2110-30 and -31.
- ST 2110-30 Levels A, B, and C are supported
- ST 2022-7 redundancy
- Metadata over Ethernet: SMPTE ST 2110-41

## Optional I/O Interfaces

Four option card slots are supported in the AIXpressor.

Available option cards include:

- SDI I/O (3G/HD/SD)
- 4-ch Analog I/O
- 8-ch AES/EBU I/O
- 64-ch Audinate Dante™
- 64-ch MADI I/O
- 4-ch Microphone Input

\*Option cards should be ordered with the unit and are installed at the factory

## Reference/Sync

- 48kHz reference via AES3, MADI, PTP or external Sync Input
- Sync Input (75 ohm, internally terminated BNC connector) handles Word clock, AES3/AES11, Black Burst, Tri-Level sync inputs,
- Sync from option cards (when installed); SDI, Dante, MADI

## Sample Rate/Resolution/Frequency Response

- 48kHz, 24-bit, 5Hz – 24kHz

## Control

- Remote control via standard web browser, including web-based audio confidence monitoring at various points in the processing chains
- Ember+
- NMOS IS-04 & IS-05
- SNMP (monitoring)



## Audio Processing

Audio processing is available as optional software modules.

Processing options include:

- Program Processing including Level Magic Loudness Processor
- Voice Processing
- Voice Over Mixing (stereo and 5.1) w/ mix-minus and output processing
- Automixing (stereo and 5.1) with optional A.I. support
- Upmixing up to 7.1.4 channels
- Matrix Mixer with up to 16 input and output channels
- Long, multi-channel, audio delay
- FM Radio Conditioning
- GfK Watermarking
- Dolby E encoding/decoding
- Dolby ED2 encoding/decoding
- S-ADM authoring for Dolby Atmos
- S-ADM renderer for Dolby Atmos
- MPEG-H 3D Audio renderer
- MPEG-H 3D Audio authoring
- MPEG-H 3D Audio encoding

## Ethernet

- Four Gigabit RJ-45 connections

## Power

- Dual internal redundant auto-ranging power supplies
- 100-240 VAC, 50/60 Hz, 95W maximum total

## Dimensions and Weight

- 19" W x 17.5" D x 1.75" H (approximately 48,2 x 44,4 x 4,5 cm )
- Net weight: Approximately 7.7 lbs (3,5 kg)
- Approximate shipping weight 11 lbs (5 kg)

## Regulatory

- North America – CE tested and compliant with UL-approved power supplies
- Europe – Complies with European Union Directive 2011/65/EU on the restriction of use of certain hazardous substances in electrical and electronic equipment (RoHS 2 and WEEE)

## Warranty

- Manufacturer's standard warranty is one-year warranty on parts and labor.
- Additional warranty and software assurance available via TelosCare Extended Warranty

# JüngerAudio™ flexAlserver

## Jünger Audio's most powerful audio processing solution



## OVERVIEW

The flexAlserver provides maximum processing power and flexibility where high program counts and comprehensive processing are required. The flexAlserver can be used with traditional multichannel audio interfaces or with AoIP streams such as Telos Alliance Livewire+ or AES67 in support of SMPTE ST 2110-30, -31, and -41 (Metadata over Ethernet). A new processing architecture, flexAI, makes deploying legendary Jünger Audio processing on the flexAlserver simple and straightforward. Easily tailored to match your exact needs, flexAlserver is a true processing powerhouse. Jünger Audio's new interface format, tieLight®, enables virtually latency-free transport of large quantities of audio channels to an additional processing unit such as the AIXpressor.

## FEATURES

- Powerful x86-based processing cores
- Optional Audio processing includes:
  - Program processing including Level Magic Loudness Processor
  - Voice processing
  - Voiceover mixing (stereo and 5.1) with mix-minus and output processing
  - Automixing (stereo and 5.1) with optional A.I. support
  - Upmixing up to 7.1.4 channels
  - Matrix Mixer with up to 16 input and output channels
  - Long, multi-channel, audio delay
  - FM Radio Conditioning

- GfK Watermarking
- Dolby E encoding/decoding
- Dolby ED2 encoding/decoding
- S-ADM authoring for Dolby Atmos
- S-ADM renderer for Dolby Atmos
- MPEG-H 3D Audio renderer
- MPEG-H 3D Audio authoring
- MPEG-H 3D Audio encoding
- Immersive Monitor Controller
- Onboard interfaces include:
  - Audio-over-IP
    - AES67 / SMPTE ST 2110-30 and -31
    - Metadata over Ethernet: SMPTE ST 2110-41
    - Telos Alliance Livewire+
  - Dual MADI or 1024-channel tieLight via optional I/O card\*
    - \* SFP modules sold separately
- Dual, redundant, universal Power Supplies
- Browser-based remote control
- Browser-based audio confidence monitoring
- SNMP
- Ember+ and NMOS IS-04 & IS-05

## IN DEPTH

### Processing Powerhouse

Powered by an x86 based commercial server, flexAlserver is Jünger Audio's most powerful audio processing solution. Featuring the flexAI software platform, its flexibility and advanced audio processing architecture offers almost unlimited possibilities. License-based expansion makes future upgrades simple as technology evolves.

### Interface Flexibility

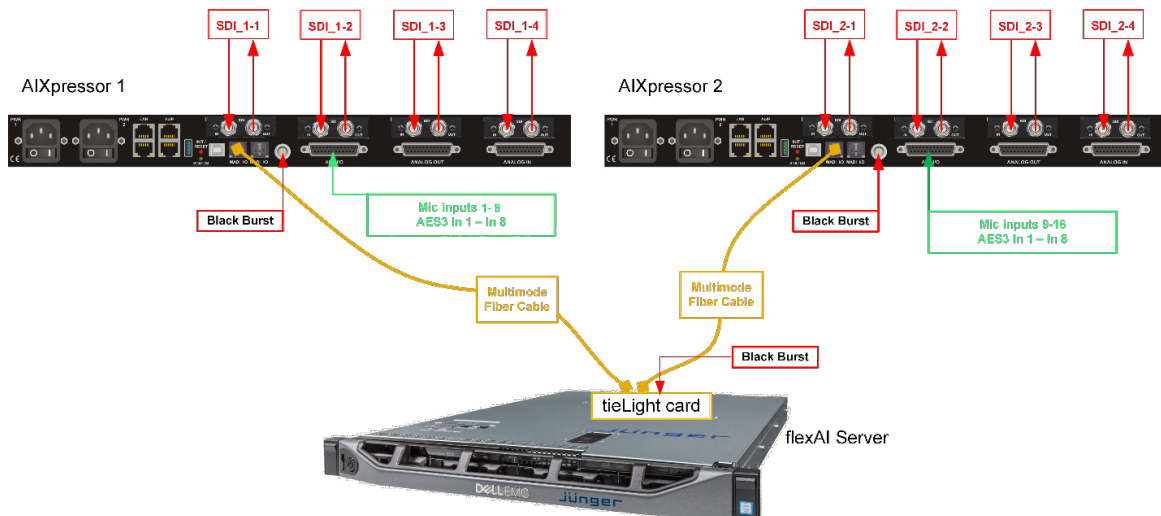
The flexAlserver comes in a compact 19" housing, packed with a high-performance processing system and built-in Audio-over-IP (AoIP) interfaces supporting Telos Alliance Livewire+, AES67, and SMPTE ST2110-30 and -31 with ST2022-7 stream redundancy. Metadata over Ethernet according to SMPTE ST 2110-41.

## Interface Options

To guarantee maximum compatibility, flexAlserver can be equipped with an optional tieLight PCIe card which provides either MAD1 or Jünger Audio's new tieLight connections. For demanding media connections, network cards with two 10-Gigabit Ethernet ports instead of the standard array of four 1-Gigabit Ethernet ports can be installed.

## tieLight – Any Channel, Anywhere

flexAlserver and AIXpressor can be linked to form a processing array, providing distributed processing and load balancing for high-program count applications. To exchange audio and data between devices, we developed tieLight, a multichannel, low-latency point-to-point connection for cascading several devices. One optical tieLight interface is capable of transporting up to 1024 audio channels in each direction. Since the flexAI system ensures that all necessary audio is distributed to where it is required, the system sees the entire array as a single device, making cascading units and processing simple and easy.



## Smart Operation

Following Jünger Audio's tradition of comprehensive remote control and automation, all functionality is operated from a newly-designed web interface.

## Easy Administration

flexAI runs on a highly customized Linux operating system, flexAI core, to guarantee broadcast-grade stability, easy administration, and the best system security possible. Administrators are empowered to maintain system functions, and critical security patches will be provided and integrated into standard administration procedures and schedules. Though flexAlserver is a powerful audio processing tool, it will also feel familiar from an IT standpoint, so supporting it on your network is simple for both the audio and IT departments.

\*\* UHD workflows can be supported via four SDI option cards

## Eco-Friendly

Considering its processing power and capabilities, flexAlserver's high-efficiency redundant power supplies use very little power and help reduce the carbon footprint of your facility.

## SPECIFICATIONS

The base flexAlserver unit supports basic AoIP audio I/O functionality. Audio processing is optional via field-installable software license keys. flexAlserver is based on commercial off-the-shelf servers of different brands and configurations. The following specifications are typical but may vary.

### Product:

Dell PowerEdge R450 Rack Server

### Chassis:

2.5" Chassis with up to 8 Hard Drives (SAS/SATA) 2 CPU

### Processors:

Intel® Xeon® Silver 4310 2.1G, 12C/24T, 10.4GT/s, 18M Cache, Turbo, HT (120W) DDR4-2666

### Memory:

16GB RDIMM, 3200MT/s, Dual Rank

### Hard Drives:

SATA SSD; 480GB SSD SATA Read Intensive 6Gbps 512 2.5in Hot-plug AG Drive, 1 DWPD

## Audio over IP (AoIP)

- Protocols include Livewire+, AES67, SMPTE ST 2110-30 and 31
- ST 2110-30 Levels A, B, and C are supported
- ST 2110-41 Metadata over Ethernet
- ST 2022-7 link redundancy

## Optional I/O Interfaces

### SFP Slot

The tieLight portal PCIe interface card provides two SFP slots and one BNC synchronization input. Each SFP module can be individually switched to either MADI or tieLight format. The 2x SFP slots are capable of supporting either a 64-channel MADI interface or a 1024-channel tieLight interface each when populated with the optional SFP modules. Single or multi-mode fiber interfaces or micro-BNC are available (micro-BNC for MADI only; tieLight not supported)

## MADI I/O

- Up to two 64-channels of MADI I/O
- Standard mode for 128 audio channels total, or redundant mode for 64 channels with automatic failure switch-over

## tieLight

- Up to two proprietary 1024-channel tieLight interfaces
- Standard mode for 2048 audio channels total or redundant mode for 1024 channels with automatic failure switch-over

## Sample Rate/Resolution/Frequency Response

- 48kHz, 24-bit, 5Hz – 24kHz

## Reference/Sync

- 48kHz reference via PTP or Livewire clock
- Sync from option card (when installed); Blackburst/Tri Level Sync, MADI, tieLight

## Control

- Remote control via standard web browser, including web-based audio confidence monitoring at various points in the processing chains
- Ember+
- NMOS IS-04 & IS-05
- SNMP (monitoring)

## Audio Processing

Audio processing is available as optional software modules. Processing options include:

- Program processing, including Level Magic Loudness Processor
- Voice processing
- Voiceover mixing (stereo and 5.1) with mix-minus and output processing
- Automixing (stereo and 5.1) with optional A.I. support
- Upmixing up to 7.1.4 channels
- Matrix Mixer with up to 16 input and output channels
- Long, multi-channel, audio delay

- FM Radio Conditioning
- GfK Watermarking
- Dolby E encoding/decoding
- Dolby ED2 encoding/decoding
- S-ADM authoring for Dolby Atmos
- S-ADM renderer for Dolby Atmos
- MPEG-H 3D Audio renderer
- MPEG-H 3D Audio authoring
- MPEG-H 3D Audio encoding
- Immersive Monitor Controller

## Ethernet

- Four Gigabit RJ-45 connections
- For demanding media connections, network cards with two 10 Gigabit Ethernet ports instead of the standard four 1 Gigabit Ethernet ports can be installed.

## Power

- Dual, internal, hot-pluggable, redundant auto-ranging power supplies
- 100-240 VAC, 50/60 Hz, 800W maximum total

## Dimensions and Weight

- 19" W x 27.5" D x 1.75" H (approximately 48.2 x 69.8 x 4.5 cm )
- Net weight: Approximately 36.5 lbs (16.6 kg)
- Approximate shipping weight 45 lbs (20.5 kg)
- Dimensions and weight may change without notice

## Regulatory

- North America – CE tested and compliant with UL-approved power supplies
- Europe – Complies with European Union Directive 2011/65/EU on the restriction of use of certain hazardous substances in electrical and electronic equipment (RoHS 2 and WEEE)

## Warranty

- Manufacturer's standard warranty is one-year warranty on parts and labor.
- Additional warranty and software assurance available via TelosCare Extended Warranty



