WHEATNET-IP

THE INTELLIGENT NETWORK

TOOLS TO RULE RADIO NOW • OFFICIAL WHEATSTONE

RULE RADIO NOW

Wheatstone

BROADCAST AUDIO PERFECTIONISTS℠

OVERVIEW/PRODUCT PLANNING GUIDE

THE INTELLIGENT NETWORK

Yesterday's IP audio network just doesn't cut it anymore. You need a modern, smarter audio network. It's all in the WheatNet-IP Intelligent Network: audio routing, mixing, processing, silence detection, logic control, 24/7/365 reliability, and third-party equipment integration, from your program automation to your transmitter link. Only WheatNet-IP distributes intelligence across all access points in one unified, robust Gigabit Ethernet network for reliability, scalability and extreme studio programmability. Best of all, WheatNet-IP is the driving engine under the hood for a wide range of control surfaces made by Wheatstone, which you'll also need for your modern network.

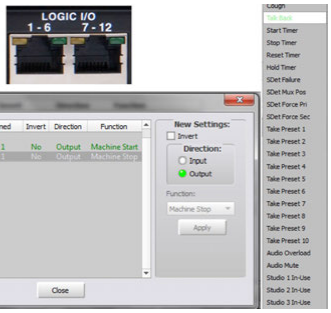
I TO O, BLADE-3 IS AMAZING

BLADE I/O access units make up the audio routing backbone of the WheatNet-IP Intelligent Network and use RJ45 StudioHub+ compatible connectors for input and output, and also have DB25 connectivity for transitioning from BRIDGE TDM networks.

But there's more inside their sleek, all-metal housing than mere I/O. The I/O BLADE has its own CPU and operating system; no additional PC required. It can operate alone or as part of a network, and can be located anywhere in the studio (no noisy fans inside). Each BLADE has a 1000-base-T (Gigabit) network interface. This single network connection is used to send and receive audio, logic, and communications from the I/O BLADE to the rest of the WheatNet-IP network. Gigabit Ethernet provides very low latency while allowing the use of readily-available switches and infrastructure for connectivity. Connect automation and production PC's, codecs, audio processors, controllers, and other devices directly to the network without installing specialized sound cards, A/D-D/A converters, audio wiring, or control connections. The I/O BLADE communicates at the speed of Gigabit Ethernet connectivity for optimum network QoS and reliability, and includes logic control, onboard utility functions and the dedicated controller that is at the core of its intelligence. Each individual I/O BLADE can hold the brain trust of the entire system's operation for exceptional network redundancy and scalability.

Logic follows audio like a puppy on a leash

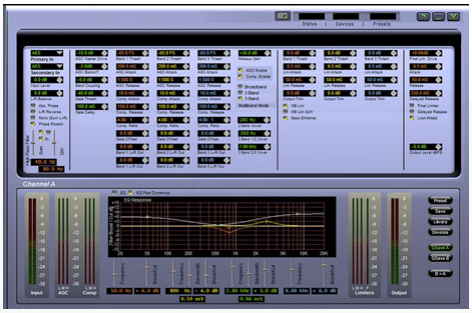
I/O BLADEs come with universal logic (GPIO) for interfacing various external switches, indicators and devices for control purposes – as well as software logic ports for routing and controlling devices anywhere on the network. Send any GPI to multiple GIOs or marry GPIOs to an audio source and have them follow that source through the system -- all through one RJ connector. Audio and the logic controls for that audio are all on the same CAT6 cable, to be used anywhere in the network. When routing the audio of a CD player to a console fader, for example, the START button logic is routed right along with it. These logical associations reside within the I/O BLADE itself, and do not require a PC or other controller to work.



Mixers and Audio Processing Included

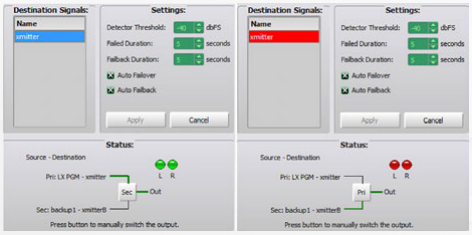
I/O BLADEs include two built-in 8x2 stereo mixers. In addition, newer third-generation BLADE-3 I/O units include a stereo multiband processor with 4-band parametric equalizer, 3-way crossovers, 3 compressors, 3 limiters, and a final, look-ahead limiter. By routing mixing and audio processing, these functions are no longer limited to a location in the studio and instead are resources available anywhere in the network.

The I/O BLADE's internal mixers are full-featured, stereo mixers implemented within its internal hardware. The inputs and output busses of these mixers are available as resources on the network, accessible anywhere and don't use up any of the inputs or outputs of the BLADE itself. From simple features like summing, splitting, and level adjustment all the way to creating custom mixes and intercom systems under automatic control and performing fades and segues, the potential uses for these mixers are nearly endless. The I/O BLADE includes the Wheatstone ACI (Automation Control Interface) "tool box" for third party control of its functions, such as routing ducking, panning, logic control, mixing and silence detection. Each I/O BLADE supports up to 20 ACI connections that can be used with devices like Talent Stations, GP panels and SideBoard surfaces as well as to integrate with automation systems and other Wheatstone partners for control purposes.



Silence detection, emergency audio

Each I/O BLADE comes with a headphone jack with volume control and source selection for local monitoring of any sources or mixes anywhere in the network. Each of its output channels can be programmed for silence detection and for automatic switchover and switchback to/from a standby device – or to the unit's onboard audio player – in an emergency. In addition, new I/O BLADE-3s come with embedded audio storage and playback for emergency or utility applications, or any other application requiring an hour or more of 24-bit, uncompressed audio. Silence alarms or LIO/SLIO can trigger playback or this can be manually controlled from the NAVIGATOR configuration and crosspoint software.

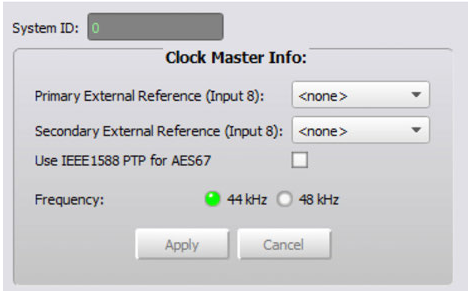


Interoperable and flexible

I/O BLADEs operate at 44.1k or 48k sampling rates while converting incoming signals up or down as needed. Newer third-generation I/O BLADE-3s provide selectable system clocking at 44.1kHz or 48kHz, External Reference or AES67.

I/O BLADE-3s support AES67 compliant devices using an IEEE1588 PTP grandmaster clock for synchronizing to and ingesting /streaming AES67 compliant packets. A 1588 Clock Loss Indicator is included for notifying operators when the AES67 clock source has been lost; an alarm is also generated when an AES input has lost its clock source or becomes disconnected.

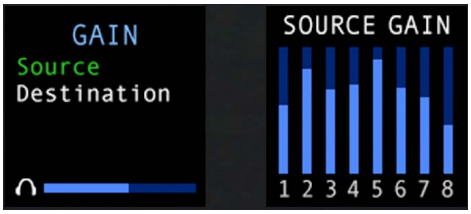
All BLADEs can take any analog and/or digital input or output and split it into two mono channels. Any stereo signal sent to a mono output is automatically summed. When routing a stereo source or stereo mix to a mono destination such as a hybrid or codec, for example, the unit will automatically "sum" the left and right channels together. It has gain control on every input and output, and balance control on every stereo input or output.

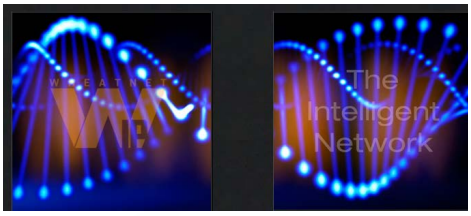


Easy to configure and maintain, with failsafe

Activating the I/O BLADE is as easy as plugging it in. No need to assign it an IP address or prioritize packets. Once plugged in, it will instantly recognize that it's been connected to a functioning network and configure itself into that network with almost no human intervention at all! All of its resources are instantly available so it can be pushing out or bringing in audio in little more than a minute after it is first plugged in.

New I/O BLADE-3s come with dual OLED displays for monitoring and control of most functions right from the front panel, including audio routing setup, monitoring, network information, alarm status, enabling and operating utility mixes, setting input and output gain, and connecting audio processing. Settings can also be done remotely using a PC.

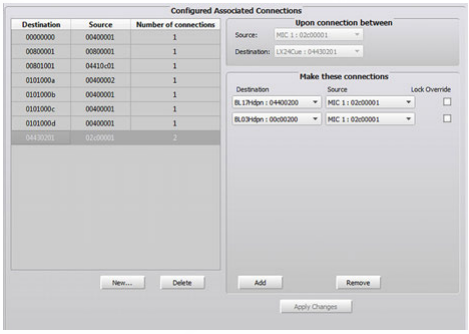




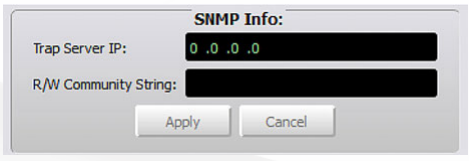
Ongoing changes and updates are just as easy. Change a signal name on the fly and it is instantly updated in every device on the network; no reboots or configuration file gymnastics required.

The I/O BLADE-3s' new Aliases feature allows the same source to be identified by different names. A signal can be given an alias that's more familiar to a particular operator, and multiple aliases can be used so different operators can share logic functions, source feeds and routing while using signal names they recognize.

Another new I/O BLADE-3 feature, Associated Connections, is useful for callers, codecs, networks, remote broadcasts and live talk shows that require a mix-minus. With this, operators can create a predetermined back haul, IFB feed or mix-minus to each device based on its location in the system and the fader to which it is connected. For a shared resource connected to your system, such as a codec, the software will 'automagically' give the proper return feed to the codec based on its source connection. When a base connection is made, up to ten additional connections can automatically follow. This significantly helps streamline studio routing, phone and codec work flow.



The I/O BLADE comes with maintenance and diagnostic tools, including built in SNMP capability for network management, statistics, and alerts. Newer BLADE-3s also include a new logging app that can be used for tracking LIO/SLIO activity throughout the system. This app shows time-stamped location activity messages in high resolution for when inputs come into and leave the system, and provides sophisticated filtering functions for revealing relevant information that otherwise might be buried in the clutter of system data.



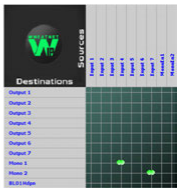
Any I/O BLADE can restore the settings for the entire network and allow remaining segments of the network to continue to operate in the event of a facility-wide disaster. Only the section of the network that has been brought down by a power failure, for example, is affected. When power is restored, affected BLADEs will seamlessly rejoin the network, all without any user interaction.

BETTER WAYS TO DO RADIO

BLADEs can do things that mere I/O nodes can't because of their embedded CPU and OS that make routable utilities such as audio mixing and processing possible. But what does that mean to you? For starters, it means faster, better and easier ways of doing radio. Here are some practical ways you can put BLADEs to use in your radio station.

Audio Routing and Control

Route any audio input to any output or all outputs. Send one GPI to multiple GPOs or marry GPIOs to an audio source and have them follow that source through the system. All BLADEs in the network live on a simple crosspoint matrix.



Auto Mono Summing

BLADEs have the onboard processing and intelligence to auto sum and level match a stereo output that is routed to a mono output or destination. If, for example, you want to feed a stereo console bus down a hybrid or codec, the audio will be available in both mono and stereo on the receiving end. If you route a mono source such as field recording device or remote interview through the router it will put that mono source on both channels.

Left: The above shows a mono source being routed to both stereo and mono destinations in a BLADE.

(Two dots indicate a stereo or dual channel connection. A single dot indicates it's a mono to mono connection.)

Right: The above shows a stereo source being routed to mono destinations.

Line levels and their approximate nominal voltage levels

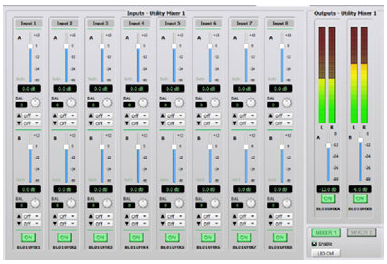
Use	Nominal level	Nominal level, V_{RMS}	Peak Amplitude, V_{PK}	Peak-to-Peak Amplitude, V_{PP}
Professional audio	+4 dBu	1.228	1.736	3.472
Consumer audio	-10 dBV	0.316	0.447	0.894

Input Gain Control

Calibrate levels for each source or destination using bargraph metering. Shown, audio levels for the individual channels color coded over a 40dB range, with the highest level being "+20" VU, corresponding to +24dBu, 0dBFS, and the onset of clipping. These meters show the actual input signal level as modified by the input gain setting. The bouncing bar at the top shows the peak audio level while the solid column shows the short-term average audio level using VU time constants. Adjusting source levels ensures that they have enough volume to keep noise levels low in comparison, but not so high that they overload the equipment and cause distortion.

Output Gain Control

Destination gain adjustments are useful for output signals known to be too low or too hot, such as those feeding headphones or amplified speakers with no gain control of their own, to bring them to the correct listening level. As shown, the audio gain of individual input channels can be adjusted over a range of +/-18dB in .1dB steps. The nominal setting is 0, corresponding to an output level of +4dBu analog, or -20dBFS digital, providing for 20dB of headroom.



Mixers for Mic Groupings, Talkback

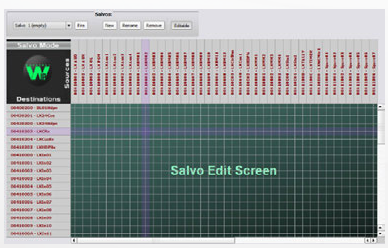
Each I/O BLADE contains two stereo 8x2 internal mixers that become a source or input to the system. This can be useful for grouping several mics to a single output. You can use the output of each mixer as a talkback source.

Mixers for Panning Mic and Caller Feeds

The BLADE's two stereo 8x2 internal mixers are independent of each other, so they can feed audio to each other or another BLADE. The output of mixer #1 can be brought up on a fader in mixer #2, for example. With balance control on each fader, this can be useful for recording a telephone mix with the "callers" on the left channel and the "announcers" on the right channel. The output of the mixer feeds the recording device.

Automation Mix-Down

The BLADE's stereo 8X2 internal mixers can be used to mix down multiple channels to a single output. Shown is a BLADE utility mixer being used to mix down multiple RCS automation channels to a stereo output, which can then be programmed as the automatic failover source in an emergency. This is also useful as a way to bypass the studio, so that with the push of a button or a command from the automation system, this output can feed the transmitter and free up the on-air studio for production or voice tracking, for example.



Unlimited Salvos or Macros

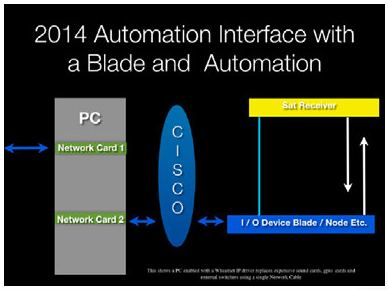
Each I/O BLADE can store hundreds of customized salvos, which can be useful for assigning feeds to codecs or hybrids and switching between studios. Group any audio source, logic and destination together that can be triggered by event or time.

Logic on RJ45 Connectors

Each I/O BLADE is equipped with 12 logic ports on RJ45 connectors, which can be individually designated during set up as inputs or outputs for interfacing to various external switches and indicators. Logic ports can output to closures for machine control, on-air lights, mic tallies, transmitter remote control and the like. They can also receive closures from external devices like satellite closures, remote mic panels or triggers from your automation system for channel ON/OFF.

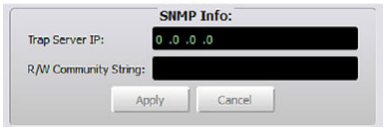
Selectable Master Clock

Automation PCs and other digital devices that require a specific sample rate are no problem. New I/O BLADE-3s provide system clock rates selectable at 44.1kHz or 48kHz, External Reference or AES67. While all AES inputs in I/O BLADE-3s are equipped with sample rate converters, the master clock sets the sample rate of all of the system's AES digital outputs.



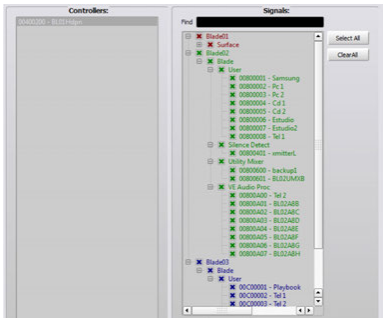
Automation Interface. One Cable

One cable is all it takes to integrate your automation system with a network of BLADEs. WheatNet-IP audio drivers replace expensive sound cards, GPIO cards and external switches.



Monitor Devices with SNMP (Simple Network Management Protocol)

BLADEs include SNMP agent software for centralized monitoring of all BLADEs in a large distributed network. You can configure alarms and set thresholds in order to be notified should a problem occur and therefore respond with quick corrective actions through e-mail, SMS, traps and executing custom scripts. SNMP is part of the Internet protocol suite defined by the Internet Engineering Task Force (IETF). Network management systems use SNMP to monitor network-attached devices such as BLADEs for conditions that may require action by the end user.

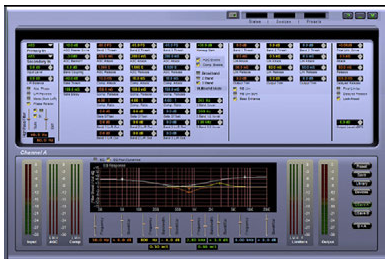


Quick Source and Destination Changes

Each BLADE can act as an X-Y controller sending any system source or input to any of its outputs. This comes in handy when changing feeds to monitors, codecs, hybrids or recording devices.

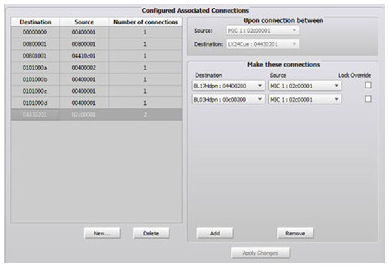
Silence Detection and Failover

Every single audio output channel can be programmed with silence detection and automatic switchover function. Showing on the left is the console PGM channel being routed to the station transmitter during normal operation. On the right shows a failover state after silence was detected.



Routable Audio Processing

New I/O BLADE-3s include a multiband processor useful for processing incoming audio from callers, remotes, codecs, satellite feeds and microphones. You can also use it to process output audio for headphones, web streams, pre-processors, IFB, or for level protection for STL applications. This is a routable processor that includes 4-band parametric equalizer, 3-way crossover, 3 compressors, 3 limiters, and final look-ahead limiter.

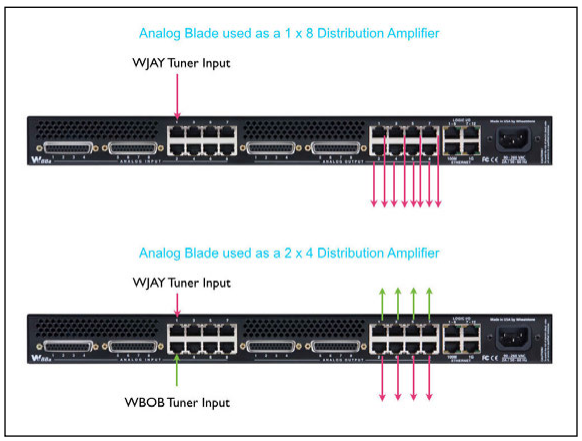


Share Resources, Connections

Create a predetermined back haul, IFB feed or mix-minus for each device based on its location in the network or on a fader. For shared resources like a codec, new I/O BLADE-3 software will 'automagically' give the proper return feed to the codec based on its destination. So, if you pull up the codec in Studio One, the mix-minus from Studio One will automatically and magically be routed to the return feed. Later, when you call up the same codec on the console in Studio Two, the Studio Two mix-minus will be routed to that Codec. This is useful for call-ins and live talk shows that require a separate mix-minus.

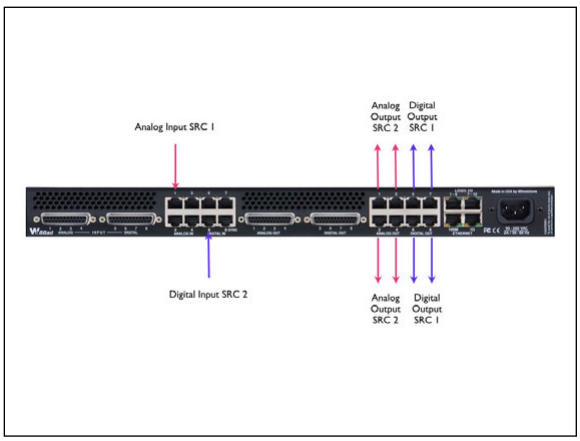
APPLICATIONS & CONFIGURATIONS

Here are just a few unique uses, configurations and applications for our BLADE access units that our customers have told us about. If you have a unique BLADE application, we'd like to hear from you. Drop us an email at wehearyou@wheatstone.com.



Analog BLADE as a 1x8 distribution amplifier

Analog BLADE as a 2x4 distribution amplifier

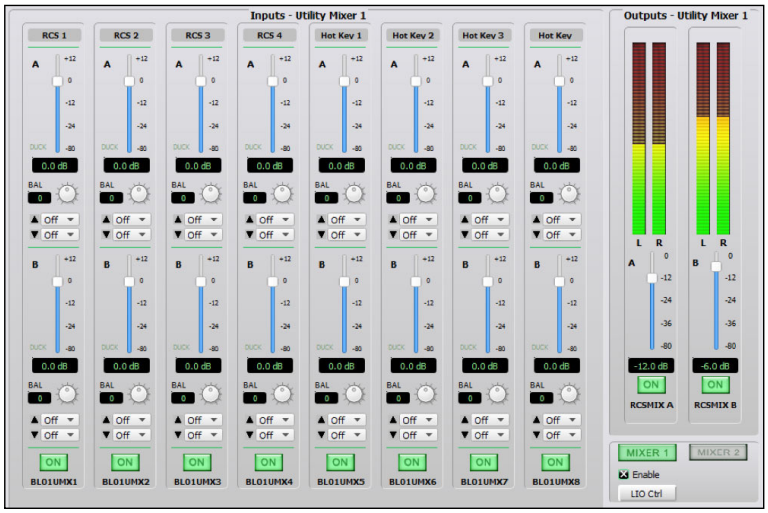


BLADE as an A/D and D/A converter

With a single IP88AD I/O BLADE, you can easily convert from analog to digital audio.

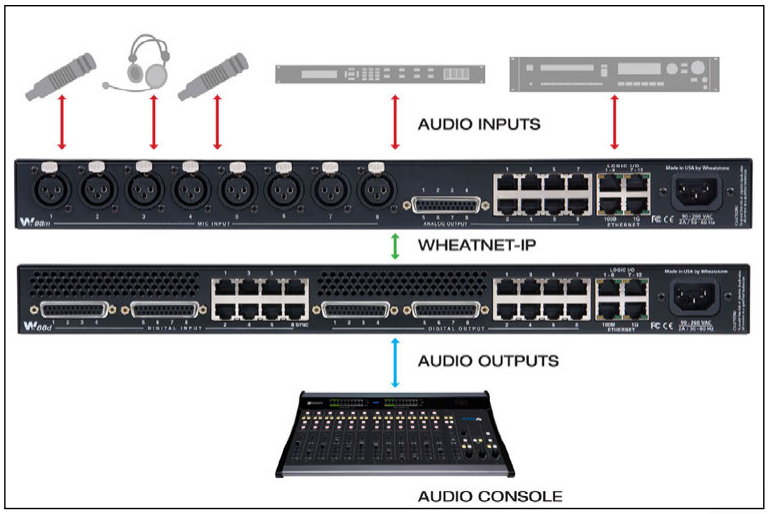
BLADE plus meter app = failover monitoring

You can wire your sources to the inputs of the BLADE 3 and then using the WheatNet-IP's meter app, build a meter screen to monitor all of the sources and destinations in the system. If silence is detected, the BLADE will failover and the particular meter will change color to give you a visual notification. Each time a failover is detected on an output, a logic signal is generated that can be routed to any logic port in the system.



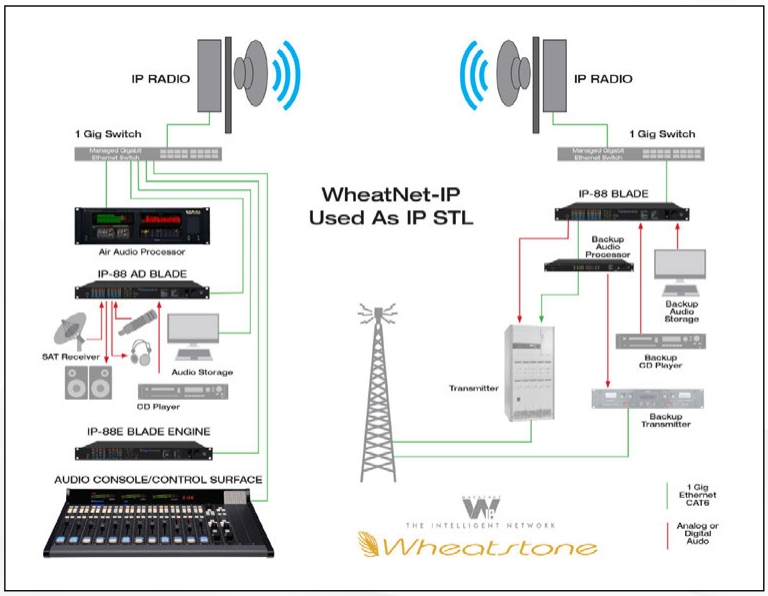
BLADE as a mixer

With two built-in 8x2 stereo utility mixers, the BLADE has more flexibility than some hardware solutions.



BLADE 3 as an audio snake

Use BLADEs to transport audio between the on-air or production studio and a performance studio using CAT6, wireless link or optical fiber. Carry the mic and direct feeds from the stage area to the network. Do separate mixes using the BLADE's 8x2 stereo mixers, or capture multitrack recordings that could be saved for future mixing projects (such as the CD or DVD release). All this can be done without the need for a conventional audio snake with transformer splits for the various feeds.



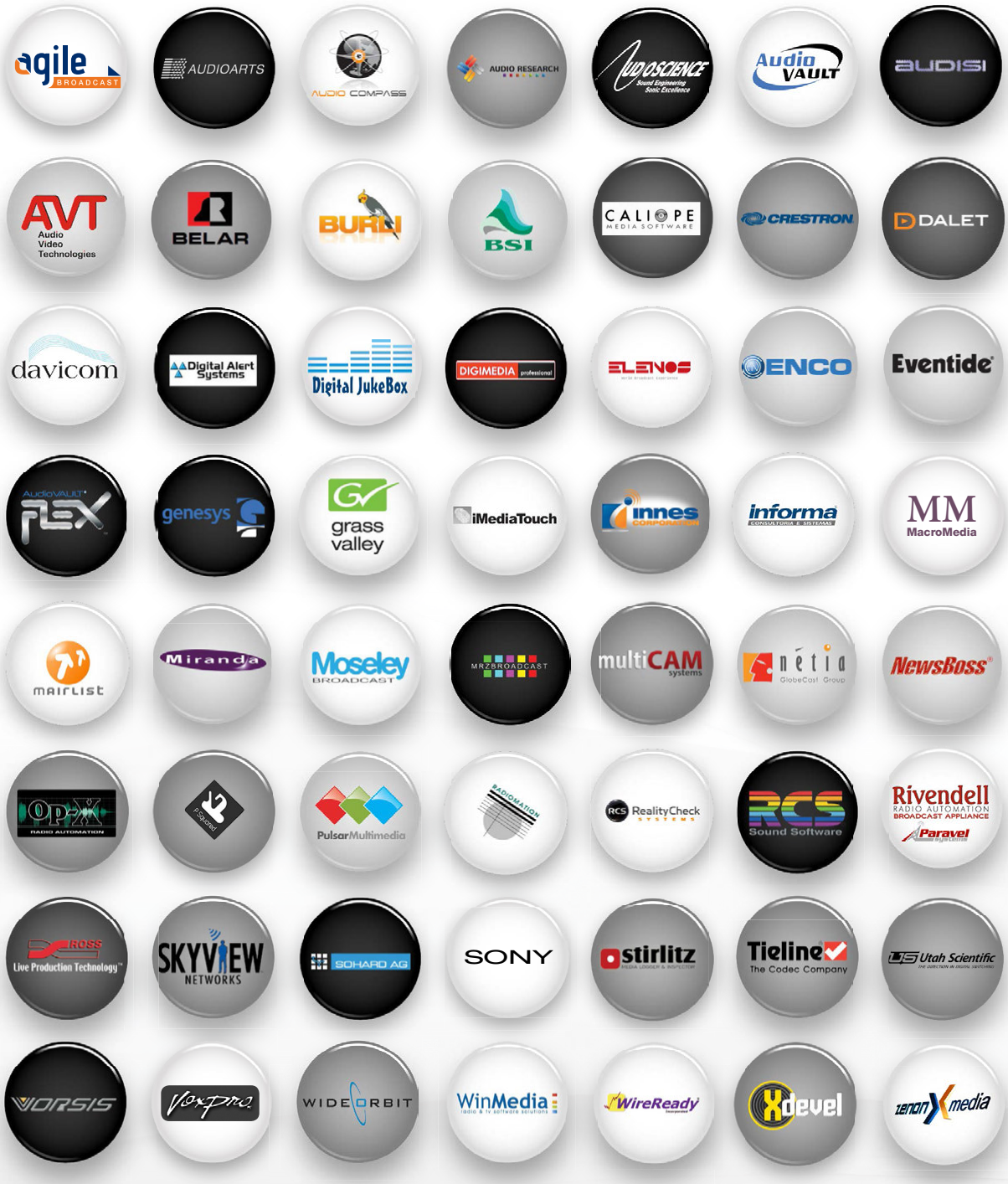
BLADE as part of an IP STL

Continue IP audio from the studio to the transmitter with BLADEs on both ends of an IP wireless audio STL. IP radios connect to the switch on each end, which are connected to the BLADE for managing audio and any devices hanging off the network. If the IP radio should lose connection, the new BLADE-3 will not only detect silence, it can trigger the startup of playback audio stored on the BLADE-3 itself.

PARTNERS & WHEATSTONE

It's our partnerships that open WheatNet-IP to the world

To be truly effective in the radio world, it takes working with the entire community to make the Intelligent Network all that it can be. We are thankful for our technology partners and their commitment to seamless interoperation. We consider it a privilege to work closely with them to achieve superior solutions.

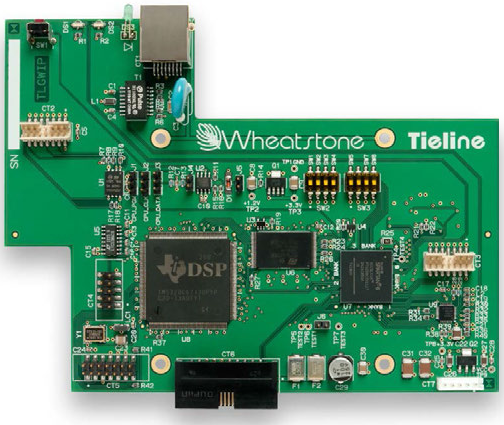


CUSTOM HARDWARE

Case Study: Tieline Genie/WheatNet-IP Interface:

At Wheatstone, it's always our mission to find the most open, transparent, partner-friendly solutions; ones that take the direct design route and lock no one into a proprietary situation.

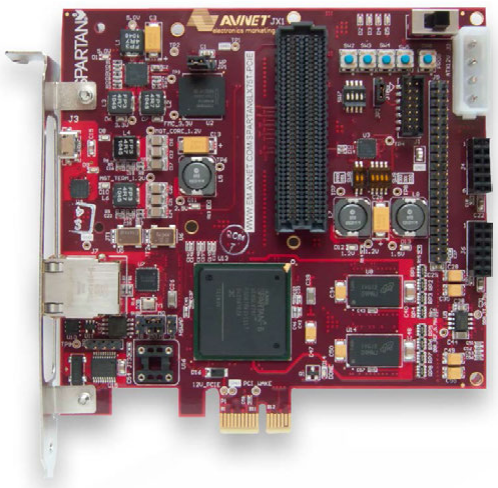
- With Tieline, the most efficient way to interface their Genie codec with WheatNet-IP was to create hardware that was the same size, shape and specs as their existing AES board, but with Wheatstone's Intelligent Network technology built in.
- Designed and fabricated by Wheatstone, these plug-in cards are provided to Tieline for installation into their Genie.
- Because Wheatstone uses modular design, universal standards, and non-patented technology with built-in provisions for interoperability, it was quick to engineer and put into production. The result is a seamless, plug-and-play solution.



PLUG-IN PCI CARDS

Our philosophy is straight-forward: utilize proven, off-the-shelf technology wherever possible to ensure 100% compatibility with our customers' existing hardware. This approach eliminates proprietary lock-out — even with custom solutions designed to fit our partners' technical and physical needs.

- Often a systems interface can reside directly on an off-the-shelf PCI Card with Wheatstone software code burned onto the card's programmable logic chip; an ideal solution with no increase in footprint size for those that use embedded PC cards in their designs.
- Wheatstone's built in provisions for 3rd party device integration and our use of universal standards (IP, TCP, UDP, IGMP, RTP, NTP, FTP) make these plug-and-play solutions seamless and easy to adapt into your designs.



CUSTOM SOFTWARE

Wheatstone's take on software is simple: work with open standards — such as Linux — to facilitate non-proprietary solutions that can be easily adapted and modified by our partners.

- Creating plug-ins and drivers that enable our partners in automation and other technologies to communicate with Wheatstone's Bridge-TDM and WheatNet-IP networks often requires generating code to handle the process. Here at Wheatstone we anticipated this in our initial designs, and the result is that every router, processor, and control surface we make has been designed from the ground up for external interface and control by other devices on a network.
- We've developed test applications and provide sample source code to make it easy for our partners to take full advantage of the power of these Automation Control Interfaces (ACIs).

- Due to Wheatstone's ACIs, libraries, test tools, and source code, and our adherence to open standards, our partners have had great success in developing the most innovative and powerful integration solutions.

SYSTEM PREPARATION

Working with Wheatstone

While it's incredibly easy to install, interface and operate, proper planning can make all the difference with your WheatNet-IP system.

Before we even begin to think about the gear you are going to need, we think about where it's going and consider the most efficient way to meet your needs.

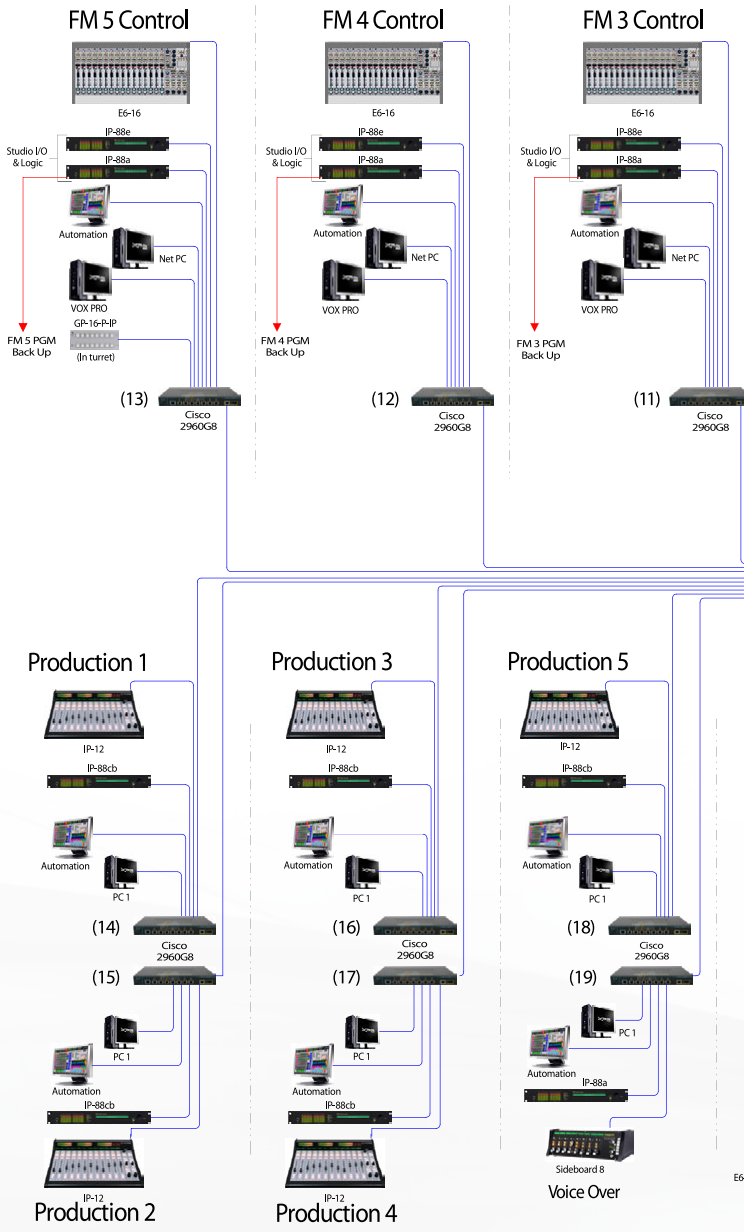
Wheatstone professionals work with you to ensure your system is perfect for your application and facility. Working very closely with you, we plan the entire system to determine the right gear for each room/need.

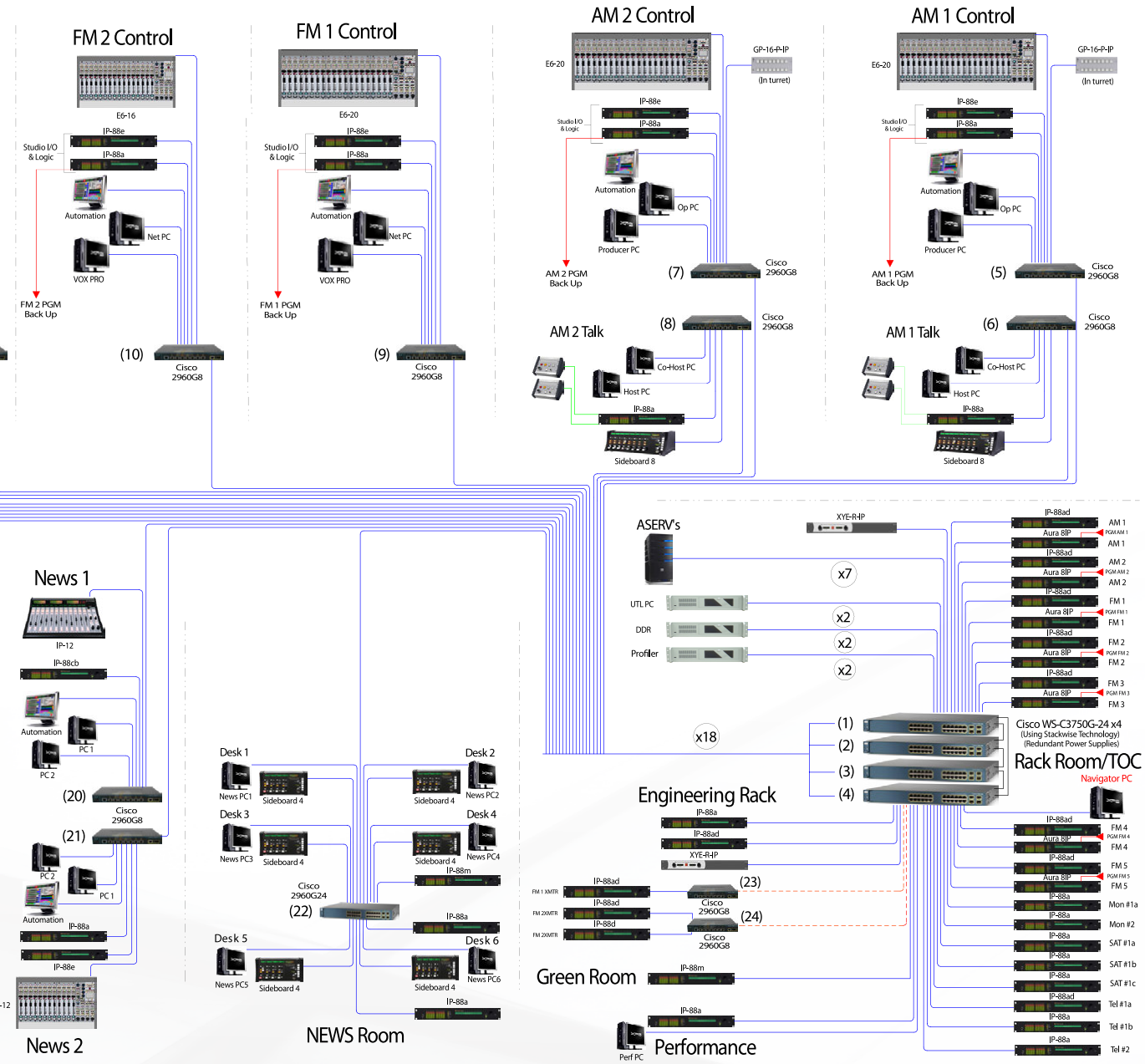
What you see to the right is a final plan for a customer in Portland, Oregon. Installation went exactly as pictured. Before the system ever got to Portland, it was completely set up in New Bern and fully tested for functionality.

Recently, during a test setup in New Bern, we decided to see how long it would take to completely reboot all the BLADES in the system at once. Over 60 BLADES, many control surfaces and a ton of peripherals were involved. The time from live to down to live? Just under 1 minute and 13 seconds! No kidding. You can see that video here:

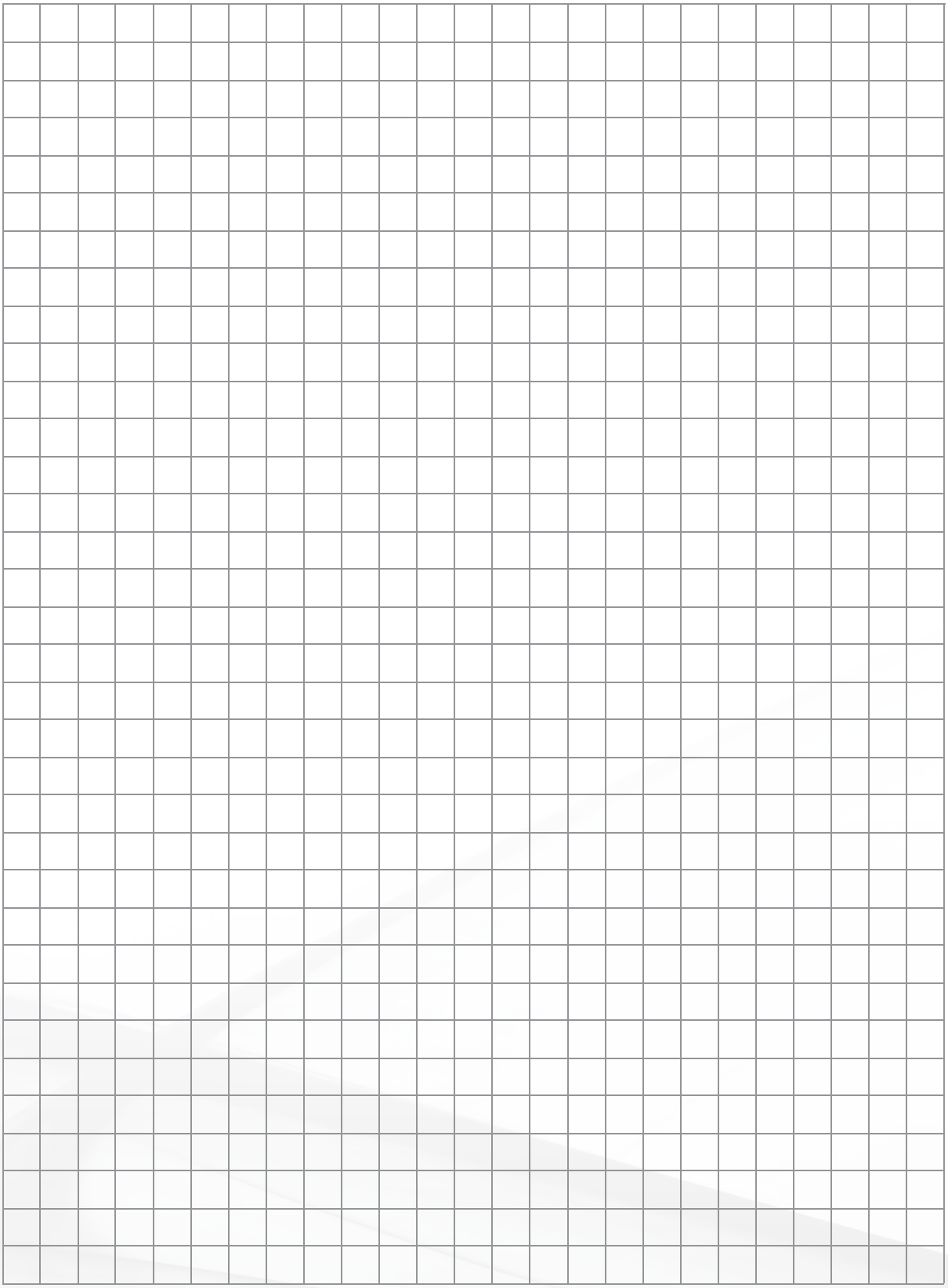
http://reboot.wheatstone.com

Of course we show this same level of commitment to every customer regardless of the size of their network. We look forward to working with you!




FM 2 Control
E6-16
IP-88e
Studio I/O & Logic
IP-88a
Automation
Net PC
VOX PRO
FM 2 PGM Back Up
(10)
Cisco 2960G8
FM 1 Control
E6-20
IP-88e
Studio I/O & Logic
IP-88a
Automation
Net PC
VOX PRO
FM 1 PGM Back Up
(9)
Cisco 2960G8
AM 2 Control
E6-20
GP-16-P-IP
(In turret)
IP-88e
Studio I/O & Logic
IP-88a
Automation
Op PC
Producer PC
AM 2 PGM Back Up
(7)
Cisco 2960G8
AM 2 Talk
(8)
Cisco 2960G8
Co-Host PC
Host PC
IP-88a
Sideboard 8
AM 1 Control
E6-20
GP-16-P-IP
(In turret)
IP-88e
Studio I/O & Logic
IP-88a
Automation
Op PC
Producer PC
AM 1 PGM Back Up
(5)
Cisco 2960G8
AM 1 Talk
(6)
Cisco 2960G8
Co-Host PC
Host PC
IP-88a
Sideboard 8
News 1
IP-12
IP-88cb
Automation
PC 1
PC 2
(20)
Cisco 2960G8
(21)
PC 2
PC 1
Automation
IP-88a
IP-88e
IP-12
News 2
Desk 1
News PC1
Sideboard 4
Desk 2
Sideboard 4
News PC2
Desk 3
News PC3
Sideboard 4
Desk 4
Sideboard 4
News PC4
IP-88m
Cisco 2960G24
(22)
IP-88a
Desk 5
News PC5
Sideboard 4
Desk 6
Sideboard 4
News PC6
IP-88a
NEWS Room
ASERV's
XYE-R-IP
x7
UTL PC
DDR
Profiler
x2
x2
x2
x18
(1)
(2)
(3)
(4)
Cisco WS-C3750G-24 x4
(Using Stackwise Technology)
(Redundant Power Supplies)
Rack Room/TOC
Navigator PC
Engineering Rack
IP-88a
IP-88ad
XYE-R-IP
IP-88ad
FM 1 XMTR
IP-88ad
FM 2XMTR
IP-88d
(23)
Cisco 2960G8
(24)
Cisco 2960G8
Cisco 2960G8
Green Room
IP-88m
IP-88a
Perf PC
Performance
IP-88ad
AM 1
Aura 8IP
PGM AM 1
AM 1
IP-88ad
AM 2
Aura 8IP
PGM AM 2
AM 2
IP-88ad
FM 1
Aura 8IP
PGM FM 1
FM 1
IP-88ad
FM 2
Aura 8IP
PGM FM 2
FM 2
IP-88ad
FM 3
Aura 8IP
PGM FM 3
FM 3
IP-88ad
FM 4
Aura 8IP
PGM FM 4
FM 4
IP-88ad
FM 5
Aura 8IP
PGM FM 5
FM 5
IP-88a
Mon #1a
IP-88a
Mon #2
IP-88a
SAT #1a
IP-88a
SAT #1b
IP-88a
SAT #1c
IP-88ad
Tel #1a
IP-88a
Tel #1b
IP-88a
Tel #2

PLANNING NOTES:



Designed and built by
Wheatstone Corporation
600 Industrial Drive | New Bern NC 28562-5440 USA
phone 1.252.638-7000 | fax 1.252.635-4857
wheatstone.com | sales@wheatstone.com

Wheatstone
BROADCAST AUDIO PERFECTIONISTS℠