WheatNet-IP BLADE4

AUDIO OVER IP NETWORK

TECHNICAL MANUAL

Wheatstone

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Wheatstone Corporation
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Wheatstone WheatNet-IP BLADE-4 Audio Over IP Network - 2nd Edition

Navigator GUI version 4.0.8 and higher

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Attention!

Federal Communications Commission (FCC) Compliance Notice:
Radio Frequency Notice

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This is a Class A product. In a domestic environment, this product may cause radio interference, in which case, the user may be required to take appropriate measures.

This equipment must be installed and wired properly in order to assure compliance with FCC regulations.

Caution! ***Any modifications not expressly approved in writing by Wheatstone could void the user's authority to operate this equipment.***

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General Information

Introduction

Congratulations on acquiring the Wheatstone fourth-generation intelligent WheatNet-IP system. The WheatNet-IP technology allows you to build a networked audio system of I/O devices, control surfaces, computers, and controllers, all without using a dedicated audio router. How do we do this? By using a LAN (Local Area Network) to connect the various devices together and distribute audio and logic data where needed.

Each WheatNet-IP device (we call it a “BLADE-4”) has its own intelligence/operating system that allows it to be a powerful standalone router, be part of a larger system, or control the entire routing system. WheatNet-IP is an embedded system that does not require outside intervention or control from 3rd party software running on PCs. The configuration of the entire network is stored in each BLADE-4.

Each BLADE-4 functions primarily as an audio access point, where analog or digital audio signals are connected to the WheatNet-IP network. BLADE-4s are built to handle native analog, microphone, AES/EBU, SPDIF, AOIP, MADI, SDI and AES 67-SMPTE 2110 signals. Once any type of audio is ingested into the WheatNet-IP network, it can be converted to any other type of output. Example: analog to digital, AES to IP, MADI to AES 67, mics to AOIP, etc. All BLADE-4s are AES67 compatible for use with other AES67-compatible systems and devices.

Within the WheatNet-IP unit, the audio channels are converted to packets of data that can travel over an Ethernet LAN. The Ethernet switches that compose the core of the LAN directly control the distribution of packets and perform the “switching” function of a traditional audio router. Once the audio packets have been forwarded to the desired destination endpoint (typically a PC or another WheatNet-IP device), they are reassembled into an audio signal and made available. The ability to support AES67 compliant devices allows WheatNet-IP system to synchronize to IEEE1588 from a PTP grandmaster clock and ingest/stream AES67 compliant packets.

By converting audio into data packets, the traditional audio wiring infrastructure of multipair cables, trunk lines, patch bays, and punchblocks is no longer needed. In fact all the distribution cables you need may already be in place – in the form of your LAN and its CAT 5e/CAT 6 cables. You’ll only need to wire your source and destination devices to “BLADE-4” to complete your system. Best of all, the dozens of audio cables and hundreds of logic connections you used to need to connect up each audio console have been replaced with a single network cable to the control surface. What could be easier?

BLADE-4 Features

Each BLADE-4 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, for example. You can use the output of each mixer as a talkback source. The BLADE-4’s mixers are independent of each other, so they can feed audio to each other or another BLADE-4. 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. These internal mixers are full-featured and include panning, channel ON/OFF, fader levels, and access to any source signal in the system. They also include a full ACI (Automation Control Interface) allowing remote control, ducking, auto fade, channel on/off, levels, source assign, etc., useful for interfacing with automation systems when the system is in bypass mode for maintenance and so forth.

All BLADE-4 devices have an 11” x 1.25” full-color high-resolution LCD display to show both Input & Output meters in the left half of the display alongside multiple status & control pages on the right half of the display. In regular use, the status & control page display typically has a screensaver applied to protect the display. The front panel supports the display of custom logos and images as well.

Source aliasing, or the ability to personalize sources and destinations is useful feature of the BLADE-4. For example, the same mic can be labeled “Chris” for the morning show and “Pete” for the afternoon show.

BLADE-4 boasts an expanded internal memory capacity over previous BLADE models, which provides for lots of space for installing apps and scripts and allows for enhanced clip storage for the two independent clip players, each with their own LIO controls for use with a hardware button panel or a virtual ScreenBuilder panel. The clip players can be used in real time for FX or sounder decks in addition to playing song playlists. BLADE-4 has increased memory to store more clips and supports playing both .WAV and .MP3 files. The clip players have level control and metering along with status showing elapsed play time and clip metadata in Navigator. Clip players can play files directly from a USB flash drive plugged into one of the available USB ports for even greater flexibility and capacity. The clip players are a licensed feature.

Each BLADE-4 has two built-in codecs that use the Opus compression algorithm and support SRT for enhanced security and reliabiliity. The Navigator Codec tab provides level control and metering for the two codecs. Codecs are a licensed feature of BLADE-4.

Each BLADE-4 also has an Aura stereo multiband processor with the following: Four-band parametric equalizer, three-way crossovers, three compressors, three limiters, and a final lookahead limiter. This is a “routable processor,” meaning it is not limited to the local I/O on the BLADE-4 – it can be considered a network resource. The I/O Blade-4 units have the option of expanding to Aura8 functionality with eight channels of routable processing instead of one. Contact our sales department for more info.

Dual NICs provide for either WNIP network redundancy or separate LAN and WAN connections when using the built-in audio codecs. The NICs can also now be setup for DHCP for ST2110-30-compatibility.

An optional redundant power supply can be installed to provide enhanced reliability.

Each BLADE-4 includes 128 virtual logic ports for triggering, managing and controlling the many feeds that have become standard in radio stations today.

Associated Connections is a great feature in BLADE-4s for callers, codecs, networks, remote broadcast and live talk shows that require a mix-minus. Smart associated connections take the hassle out of changing connections between locations, studios or announcers. Simply define the link you need (ISDN, studio feed, remote, etc.) and BLADE-4 can automatically set up a back link for it. Just trigger the connection and the back feed will follow – a helpful feature for remotes or for when you’re changing studios. Each I/O BLADE-4 comes with multiple associated connections limited only by available memory.

A word about latency

“Latency” refers to a finite and not insignificant delay from the time when audio or logic starts at the input of the system and when it appears at the output. Packet-based audio networks have a reputation of having significant latency issues due to the performance of the earliest implementations, some of which had tens and even hundreds of milliseconds of latency. Each component of the system contributes to latency. On the input side, the A/D converters (or Sample Rate Converters for digital inputs) take a little time to do their work. Multiple samples of audio data must be accumulated and formed into packets before being placed on the network. Ethernet switches take time to analyze the packets before they are sent on to their destinations, where they are disassembled and formed into audio streams which finally can be converted by D/A converters before the audio starts to play. All of this eats up a little bit of time at each step along the way.

The WheatNet-IP system has been designed from the outset to use Gigabit networks and .25ms packet timing on all channels for, among other reasons, minimization of latency. Total latency from a BLADE-4’s input through an Ethernet switch to a different BLADE-4’s output is roughly 1-2 milliseconds, which is well below the 5-10 millisecond human threshold of detection. Unfortunately, due to the non-real-time nature of the Windows operating system and the fact that Windows requires buffers for audio streams, latency to/from a Windows PC remains on the order of 50-100 milliseconds.

Software Enhancements

Along with the above hardware features, with its increased capability BLADE-4 also brings several software enhancements to any WNIP system:

- Source signals can now have various attributes assigned, including defining a corresponding back-feed or mix-minus signal to be connected, and audio processing to be activated, on whatever destination that source gets connected to.
- Enhanced system names—Signal, Blade, and Location names are no longer restricted to eight characters.
- Variable audio buffer sizes can be assigned on destinations receiving remote connections to compensate for signal jitter.
- Enhanced standards compliance for AES67 and SMPTE 2110 include auto-generating 1ms packet streams on all BLADE-4 signals with 1ms mono and 5.1 surround stream support, 0.125ms packet stream receive capability, NMOS stream visibility and exposure for third-party routing control.
- Built-in scripting support to run scripts directly on BLADE-4 so separate WNIP hardware devices or PCs are not required to run your scripts.
- Enhanced Navigator app. New tabs and controls for the new BLADE-4 hardware and software features. Custom configurable system metering & monitor tab. Other new features include simplified salvo controls and enhanced Logic tab status display, which adds functional status to SLIOs like LIOs have always had.

Each BLADE-4 comes standard with one on-board power supply and one six-foot IEC AC cord. Mains power from 90-240VAC 50/60 Hz is supported. An optional redundant power supply can be installed into any BLADE-4.

BLADE-4 Accessories

Most WheatNet-IP (WNIP) system peripheral devices can be networked with the BLADE-4. Here’s a sampling of the devices that can control the BLADE-4 or be controlled thru the BLADE-4: Talent Stations (TS-4 for guests and TS-22 for hosts), Button control panels like the SS-series of rackmount panels with scriptable buttons and color OLED displays, Wheatstone GP (General Purpose) control panels, Vorsis audio processors, WNIP-compatible peripherals available from Tieline, Eventide, and other vendors, and any PC/server running the WNIP AoIP audio driver. Logging software from BSI and iMediaTouch as well as others offer compatibility with WNIP for control logic.

Several WNIP system apps (PC-XY-IP, Meter & Monitor App, and ScreenBuilder) can also be used with the BLADE-4 since it supports ACI (Automation Command Interface). ScreenBuilder scripts can also be written for remote control of the BLADE-4 or to be run on the Linux CPU to create control screens for the connected 4K HDMI monitor.

Rack Mounting

The BLADE-4 is designed to fit into an industry standard 19" equipment rack, and requires one rack unit (1.75 inches) of vertical space. Every BLADE-4 model has a depth of 13-1/4" behind the rack rails (including chassis connectors). An additional five inches of space is required for wiring cables to pass through. The chassis of all BLADE-4 models has a width of 17-3/8". Space needed in front of rack rails is 3/4"for all BLADE-4 models. The BLADE-4 does not have top or bottom cover vent holes. Latent heat is vented out of the enclosure by natural convection through slots in the top of the rear panel. Cooler air is drawn into the unit through vertical slots positioned lower in the side panels. There is no fan inside the BLADE-4 because its power consumption is not high enough to require one.

The BLADE-4 may be mounted between other devices in the equipment rack, but in accordance with good engineering practice should not be mounted directly above devices that generate significant amounts of heat. If such a location is unavoidable then it is advisable to utilize an extra 1RU blank rack panel between the BLADE-4 and devices immediately above and/or below it. WheatNet-IP 88a analog BLADE-4s in particular run hotter and should be installed with spaces in between to avoid detrimental heat build up.

***WARNING!* Under no circumstances should the WheatNet-IP unit be opened! The unit contains high voltage circuits that are hazardous and potentially harmful. The unit has no user-serviceable parts inside! If your BLADE 4 has a problem the unit must be returned to Wheatstone Corporation for repair.**

Installation Tips

- Place any surge protection circuits as close as possible to the BLADE-4 or other device being protected.
- Establish a low-impedance common ground in your facility and try to route all grounds to that point.
- Choose the best power conditioning / UPS units that you can afford that are suitable for your equipment – focus on the features and options you need. The better UPS products can prevent thousands of dollars in equipment damage – some even come with an external equipment damage warranty.

Energizing

Assuming the BLADE-4 is correctly rackmounted, you may now energize it. There is no power switch. The AC line input voltage is permitted to be between 90 and 260VAC, 50 or 60Hz. Power consumption is under 100VA.

Aggressive AC input filtering is utilized at the AC input of the BLADE-4; however, it is always advisable to use external surge protection and/or an uninterruptible power supply (UPS), especially where AC power quality is questionable, such as at a remote transmitter site.

Power conditioning, surge suppression, and even power backup devices are wise investments when using sensitive modern electronic devices that use an internal computer.

Use of a UPS (uninterruptible power supply) is a good idea and will protect the BLADE-4 from short duration power interruptions which may cause it to reboot. During boot up, audio is interrupted for approximately 70 seconds.

A Word About Nomenclature

Throughout this manual references are made to “BLADE-4s,” “sources,” “destinations,” and other terms whose meanings may not be instantly understood by everyone. Let’s take a moment to clarify some terms.

1. BLADE-4: In the WheatNet-IP system a “BLADE” is taken to mean *an individual member of a WheatNet-IP system*; any device that has a unique BLADE ID. It commonly refers to an individual input/output rackmount unit, but a more complete definition would include any network-connected PC running a WheatNet-IP driver as well, including automation servers and even the Program Director’s PC if they are running the WheatNet-IP driver to listen to audio streams. Conversely, any PC that is running the WheatNet-IP Navigator GUI program is not a BLADE itself. Only those devices that can transmit and/or receive WheatNet-IP audio streams are considered “BLADEs.”

2. Source: A source is *any audio signal in the WheatNet-IP system that is uniquely generated*. Any WheatNet-IP signal that is created by accepting and packetizing an input is a source, as is any signal generated within the system. Source signals may be audio, logic, or both. A logic source might be a logic port triggered by an external switch. We generally avoid using the term “input” to describe WheatNet-IP signals because the term can be misleading. One would easily understand that an external audio input jack could be an “input” or “source,” but less obvious is the fact that an audio mix bus output is also a WheatNet-IP source because it is generating a unique signal (the mix) and making it available to stream throughout the system. Likewise, PCs streaming audio from a file via the WheatNet-IP driver can clearly be seen as a “source.”

3. **Destination**: A destination is the opposite of a source. It is *a signal that can accept any WheatNet-IP stream*. A des-

tination can take the received WheatNet-IP stream and convert it to a physical analog or digital output, or, in the case of a PC, a virtual output that subsequent PC application programs can convert to an audio output at the PC's speakers, or lay down as an audio track on a hard drive. Destinations can be audio, logic, or both. A logic destination might be a logic port wired to a lamp or relay. We avoid using the term "output" for WheatNet-IP signals. While it is clear that a WheatNet-IP destination wired to an output jack is an "output," control surface fader channels would not normally be considered "outputs" but they *are* "destinations" in the WheatNet-IP system, because you can route a WheatNet-IP audio stream to them.

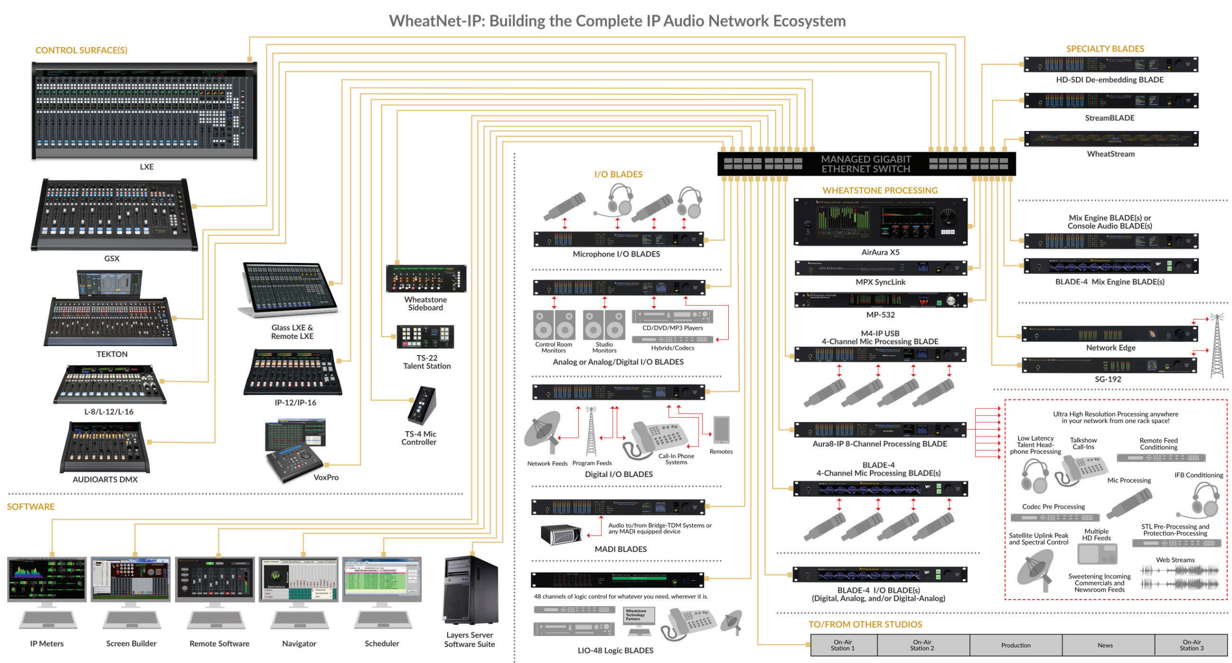
4. **LIO**: Shorthand for **L**ogic **I**nput or **O**utput. In the WheatNet-IP system, an LIO signal is *a signal that either generates or receives logic state information* created either physically via a logic port or virtually via some state change within a mixing control surface. In the WheatNet-IP system logic information can be routed and cross-connected just as audio can be.

5. **GUI**: Shorthand for **G**raphical **U**ser **I**nterface. A method of *providing for user interaction with the system* using a special computer program that displays information in the form of images and text on the computer screen and accepts user input via typing and mouse-clicking within the computer program. The WheatNet-IP Navigator is a computer program that provides a GUI.

WheatNet-IP System Description

Let's take a look at some of the parts of the WheatNet-IP system in more detail.

First there are the "BLADEs" themselves. The Wheatstone WheatNet-IP intelligent system includes following models of the BLADE-4: IP88a Analog, IP88d Digital, IP88ad Analog/Digital, IP88m4USB Microphone, IP88 Aura8 processing Blade and the IP88e and IP88tve Mix Engines.



A WNIP system can also include control surfaces (consoles), talent stations and other peripheral control units, mic processors, broadcast phone systems, audio codecs, audio processors, STLs, computers for control and/or audio playout and recording, automation systems and audio loggers. At the heart of it all is your Gigabit network switch stack that is configured according to the instructions in the Appendix for optimum transmission of audio and logic with minimal latency.

BLADE-4 Front Panel Controls

BLADE-4 uses the same two Arrow Keys and Rotary Encoder with push button controls as used on earlier generation blades to navigate around the status & control pages. The rotary encoder and push button are used to edit settings, select signals, and adjust levels.

The front panel of each BLADE-4 model includes metering for every input or output on the BLADE-4 on the left-hand side. A high-resolution, multi-color LCD display shows input and output levels for 8 stereo pairs or 16 mono signals (or any combination). The exception to this is the IP88m4USB Mic unit, which meters eight mono input signals. Please note that these meters show audio levels after any gain trimming has been applied, so if for some reason you have the gain for a particular channel cranked down, you may not see any meter indication even though audio is there.

There is a USB connector on the front of the BLADE-4 that is used for the Clip Players, and a headphone jack for monitoring.

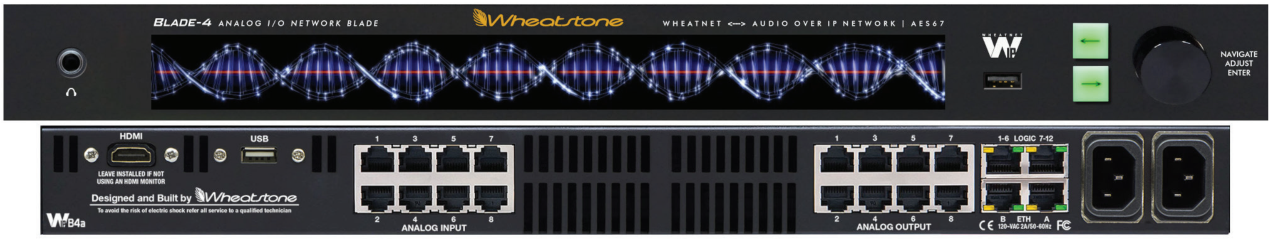
The right-hand side of the screen can be selected to display any of several status and control pages, each of which provides enhanced capabilities over previous generations of WNIP BLADEs:

- **Status**
- **Headphone**
- **Local Destinations**
- **Local Sources**
- **Utility Mixers 1 and 2**
- **Logic Status**
- **Clip Players 1 and 2**
- **Codecs (Encoders and Decoders)**
- **Passcode Setting**
- **Display**
- **Network Configuration**
- **Maintenance**

See Chapter 2 for details on the front panel menu options.

Following is a short discussion of each type of BLADE-4.

IP88a - Analog BLADE-4



IP88a is an access point for analog audio.

It has eight RJ-45 connectors for analog audio inputs. These can be set up as eight stereo, 16 mono, or any combination up to a maximum of 16 discrete channels.

It also has eight RJ-45 connectors for analog audio outputs. These can also be set up as eight stereo, 16 mono, or any combination up to a maximum of 16 discrete channels.

The IP88a has two more RJ-45 connectors to provide 12 logic ports, which can be individually designated during set up as inputs or outputs. These ports are where you wire the various external switches, indicators, and control functions you need in your facility.

There are two RJ-45 jacks for Ethernet. Ethernet Port “A” is for your Gigabit Ethernet connection to your WNIP network. Port “B” can be selected during initial setup as a redundant WNIP connection, or as a WAN connection that can facilitate your use of BLADE-4’s embedded CODECs.

Consult the wiring diagram for “Model IP88a” on page 1-17 for detailed information.

The unit has a standard IEC power connector. The BLADE-4s have an internal power supply that will accept 100-240 volts 50/60 hertz AC power. The unit shown in the photo includes the optional redundant power supply.

IP88d - Digital BLADE-4

IP88d is an access point for digital audio.

It has eight RJ-45 connectors for AES audio inputs. These can be set up as eight stereo, 16 mono, or any combination up to a maximum of 16 discrete channels. Please note that because AES audio signals represent two audio channels on one connection, some of the input connections on the IP 88d are unused.

It also has eight RJ-45 connectors for AES audio outputs. These can be set up as eight stereo, 16 mono, or any combination up to a maximum of 16 discrete channels. Please note that because AES audio signals represent two audio channels on one connection, some of the output connections on the IP88d are unused.

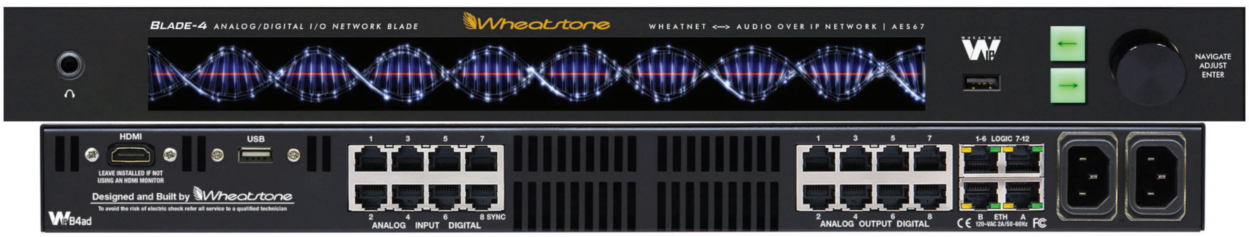
The IP88a has two more RJ-45 connectors to provide 12 logic ports, which can be individually designated during set up as inputs or outputs. These ports are where you wire the various external switches, indicators, and control functions you need in your facility.

There are two RJ-45 jacks for Ethernet. Ethernet Port “A” is for your Gigabit Ethernet connection to your WNIP network. Port “B” can be selected during initial setup as a redundant WNIP connection, or as a WAN connection that can facilitate your use of BLADE-4’s embedded CODECs.

Consult the wiring diagram for”Model IP88d” on page 1-18 for detailed information.

The unit has a standard IEC power connector. The BLADE-4s have an internal power supply that will accept 100-240 volts 50/60 hertz AC power. The unit shown in the photo includes the optional redundant power supply.

IP88ad - Analog/Digital BLADE-4



IP88ad is a hybrid access point for analog and digital audio.

It has eight RJ-45 connectors for audio inputs. These can be set up as eight stereo, 16 mono, or any combination up to a maximum of 16 discrete channels. The first four RJ-45 jacks are set up as analog inputs. The second four are set up as AES digital inputs.

It also has eight RJ-45 connectors for audio outputs. These can be set up as eight stereo, 16 mono, or any combination up to a maximum of 16 discrete channels. The first four RJ-45 jacks are set up as analog outputs. The last four RJ-45 jacks are set up as AES digital outputs.

The IP88ad has two more RJ-45 connectors to provide 12 logic ports, which can be individually designated during set up as inputs or outputs. These ports are where you wire the various external switches, indicators, and control functions you need in your facility.

There are two RJ-45 jacks for Ethernet. Ethernet Port “A” is for the Gigabit Ethernet connection to your WNIP network. Port “B” can be selected during initial setup as a redundant WNIP connection, or as a WAN connection that can facilitate your use of BLADE-4’s embedded CODECs.

Consult the wiring diagram for “Model IP88ad” on page 1-19 for detailed information.

The unit has a standard IEC power connector. The BLADE-4s have an internal power supply that will accept 100-240 volts 50/60 hertz AC power. The unit shown in the photo includes the optional redundant power supply.

IP88m4USB - Microphone BLADE-4

The M4 Microphone Processing BLADE-4 is two devices in one package: it’s a complete WheatNet-IP BLADE-4 with four microphone inputs, four high quality microphone processors, and both digital and analog outputs. The M4 also includes four independent USB ports built in to facilitate the individual use of USB audio devices. The four USB ports are bi-directional, providing (4) audio inputs (1 stereo input per port) from a USB audio device and (4) audio outputs (1 stereo output per port) to a USB audio device. The USB audio inputs appear as sources on the BLADE while the USB audio outputs are in parallel with the BLADE destinations 5 - 8 stereo (9 - 16 mono).

The Wheatstone M4 hosts four discrete, very high quality microphone processors. The Vorsis Embedded™ processing features of the M4, the processing capabilities of the M4 and how to control it with the included Windows-based GUI application are described in the M4 Microphone Processing BLADE-4 technical manual.

This unit has four XLR female connectors for microphone-level inputs. It also has eight RJ-45 connectors for audio outputs. Two RJ-45 connectors provide 12 logic ports, which can be individually designated during setup as inputs or outputs. Use these ports to wire the various external switches, indicators, and control functions you need in your facility.

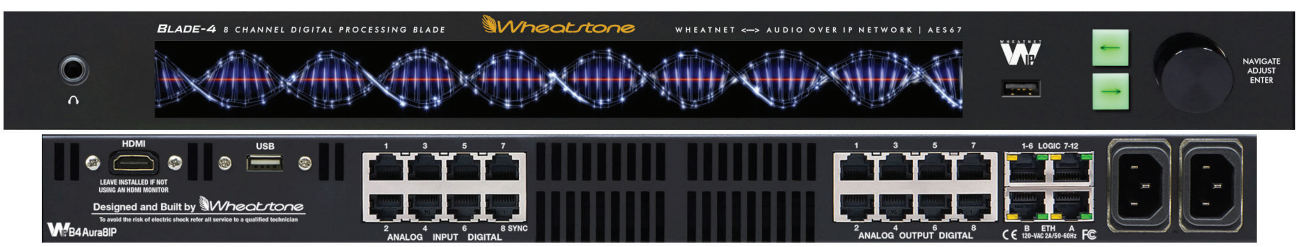
The IP88m4 has two more RJ-45 connectors to provide 12 logic ports, which can be individually designated during set up as inputs or outputs. These ports are where you wire the various external switches, indicators, and control functions you need in your facility.

There are two RJ-45 jacks for Ethernet. Ethernet Port "A" is for the Gigabit Ethernet connection to your WNIP network. Port "B" can be selected during initial setup as a redundant WNIP connection, or as a WAN connection that can facilitate your use of BLADE-4's embedded CODECs.

Consult the wiring diagram for "Model M4IPusb" on page 1-21 for detailed information.

The unit has a standard IEC power connector. The BLADE-4s have an internal power supply that will accept 100-240 volts 50/60 hertz AC power. The unit shown in the photo includes the optional redundant power supply.

Aura8ip - Vorsis Embedded BLADE-4



The WheatNet-IP Aura8ip Audio Processing BLADE-4 brings two of Wheatstone's core technologies together (Vorsis Audio Processing and the WheatNet-IP Intelligent Network) to provide a convenient and cost effective way to bring access to audio processing wherever you need it on your WheatNet-IP network.

The Aura8ip BLADE-4 occupies a single rack space, but packs an impressive complement of eight fully independent Vorsis Embedded multi-band stereo audio processors. Refer to the *Aura8ip Vorsis Embedded Processing BLADE-4* Technical Manual for audio processor description and configuration.

This BLADE-4 has eight RJ-45 connectors for audio inputs. The first four RJ-45 jacks are set up as analog inputs. The last four jacks are set up as AES digital inputs.

The BLADE-4 also has eight RJ-45 connectors for audio outputs. The first four RJ-45 jacks are set up as analog outputs. The last four RJ-45 jacks are set up as AES digital outputs.

The Aura8IP has two more RJ-45 connectors to provide 12 logic ports, which can be individually designated during set up as inputs or outputs. These ports are where you wire the various external switches, indicators, and control functions you need in your facility.

There are two RJ-45 jacks for Ethernet. Ethernet Port "A" is for the Gigabit Ethernet connection to your WNIP network. Port "B" can be selected during initial setup as a redundant WNIP connection, or as a WAN connection that can facilitate your use of BLADE-4's embedded CODECs.

Consult the wiring diagram for "Model Aura8ip" on page 1-20 for detailed information.

The unit has a standard IEC power connector. The BLADE-4s have an internal power supply that will accept 100-240 volts 50/60 hertz AC power. The unit shown in the photo includes the optional redundant power supply.

Signal Configuration

The Aura8ip BLADE-4 can be operated as a stand alone unit, or can be operated as part of a larger WheatNet-IP network.

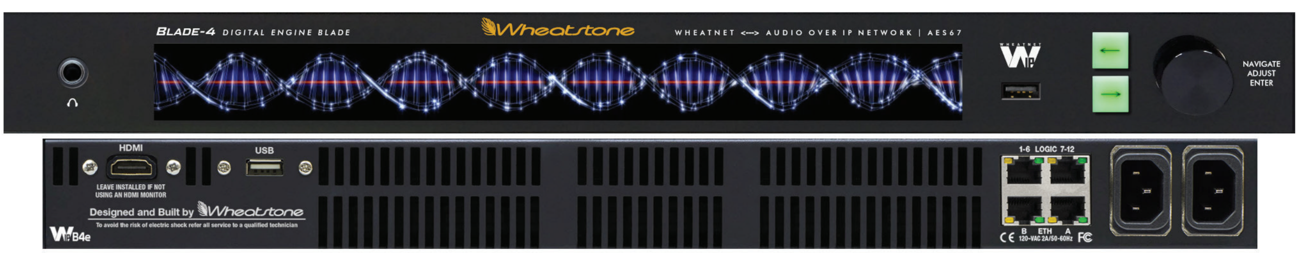
If the Stand alone option is selected when the BLADE-4 is configured, the rear panel inputs and outputs are automatically configured to provide the required connections to the eight channels of audio processing. Line 1 Input feeds signal to the first channel of audio processing, Line 2 Input feeds signal to the second channel, and so on. Likewise, Line 1 Output provides the output connection for the first channel of processing, Line 2 Output for the second channel, and so on. In this mode, all inputs and outputs are configured as stereo signals. Thus, in Stand alone mode, the Aura8ip BLADE-4 functions as eight independent channels of stereo audio processing, four with analog inputs and outputs, and the other four with digital inputs and outputs.

If the Mono, Stereo, or Custom template is selected when the BLADE-4 is configured, the eight channels of audio processing are divorced from the unit's input and output connections, and these inputs and outputs can then be routed to other BLADE-4s in the system. In this Networked mode the inputs of the eight audio processing channels become destinations in the system, to which any available sources in the system can be routed. Likewise, the outputs of the eight audio processing channels become sources in the system, and may be routed to any available destinations.

Also in this Networked mode, signals wired to the BLADE-4's input connections become sources in the system and can be freely routed to any available destinations, which can include the processing channel inputs if desired. Meanwhile, the BLADE-4's output connections become destinations to which any available system sources can be routed, including the processing channel outputs, if so desired.

In the Networked mode the BLADE-4's inputs and outputs can be configured as mono, stereo, or any combination of mono and stereo required. Whether in Networked or Stand alone mode the audio processing channels are always stereo in and out.

IP88e - Mix Engine BLADE-4



The WheatNet-IP 88e blade is a special device that contains the mix engine and signal processing needed for a control surface. One WheatNet-IP 88e is needed for each control surface. As you can see, it has no connections for audio inputs or outputs.

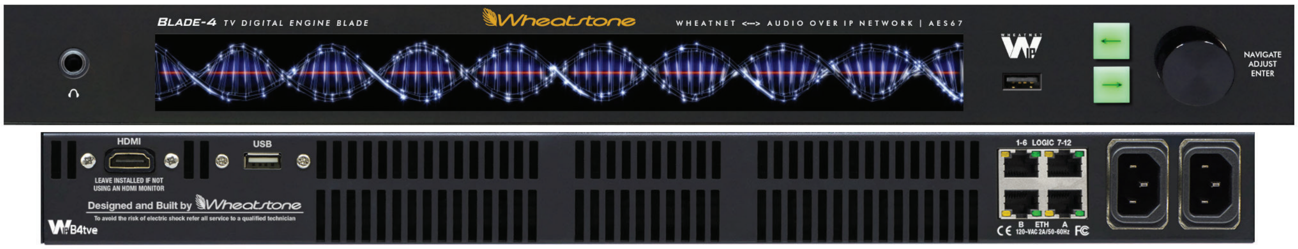
It has two RJ-45 connectors to provide 12 logic ports, which can be individually designated during set up as inputs or outputs. These ports are where you wire the various external switches, indicators, and control functions you need in your facility.

There are also two RJ-45 jacks for Ethernet. Ethernet Port "A" is for the Gigabit Ethernet connection to your WNIP network. Port "B" can be selected during initial setup as a redundant WNIP connection, or as a WAN connection that can facilitate your use of BLADE-4's embedded CODECs.

Consult the wiring diagram for "Model IP88e and IP88tve" on page 1-22 for detailed information.

The unit has a standard IEC power connector. The BLADE-4s have an internal power supply that will accept 100-240 volts 50/60 hertz AC power. The unit shown in the photo includes the optional redundant power supply.

IP 88tve - Mix Engine BLADE-4 for TV Surfaces



WheatNet-IP 88 tve is a special device that contains the mix engine and signal processing needed for a TV control surface. One WheatNet-IP 88 tve is needed for each control surface. As you can see, it has no connections for audio inputs or outputs.

It has two RJ-45 connectors to provide 12 logic ports, which can be individually designated during set up as inputs or outputs. These ports are where you wire the various external switches, indicators, and control functions you need in your facility.

There are two RJ-45 jacks for Ethernet. Ethernet Port "A" is for the Gigabit Ethernet connection to your WNIP network. Port "B" can be selected during initial setup as a redundant WNIP connection, or as a WAN connection that can facilitate your use of BLADE-4's embedded CODECs.

Consult the wiring diagram for "Model IP88e and IP88tve" on page 1-22 for detailed information.

The unit has a standard IEC power connector. The BLADE-4s have an internal power supply that will accept 100-240 volts 50/60 hertz AC power. The unit shown in the photo includes the optional redundant power supply.

Network Switches

The next component of the WheatNet-IP system is your network switch(es). These are standard Ethernet devices that form the core of your LAN. You may already have a suitable one in place in your facility. There are literally hundreds of different models available in the market place which vary widely in size and capability, costing anywhere from $30 to $30,000 and up. Obviously the $30,000 switch has more features and capability than the $30 switch. The important thing to remember is that most Gigabit switches will work with WheatNet-IP – up to a point.

As the size of your system increases, it's easy to exceed the capability of inexpensive switches. Large systems need high capacity managed switches to avoid the bane of Ethernet audio systems, network overload. Simply put, if the WheatNet-IP devices are streaming packets faster than the Ethernet switch can distribute them, packets get dropped and the audio starts to break up. This is why your Ethernet switches must be sized appropriately, and your network traffic managed and controlled so that the sizing assumptions you made remain valid.

Because 24-bit 48K sample rate audio streams with .25ms packet timing represent a much larger packet rate than Ethernet networks were originally assumed to contain, they can represent the vast majority of data in the network, using up 5 Mbit/second per stream. Consequently just about any switch or link can get overloaded if you are streaming lots of channels and don't attempt to manage your network and switch configuration. Consult the Chapter 4 Ethernet Network and Switches for more information about switches, or call us at Wheatstone Corporation for help with switch recommendations.

CAT5e/CAT6 Wiring

The next component of your WheatNet-IP system is the CAT5e or CAT6 wiring itself. Each BLADE-4 requires a single 1 Gigabit network connection, which is typically a CAT5e or CAT6 cable. Due to the nature of Ethernet and CAT6 cabling, these connections must be at least 1 meter but less than 100 meters in length. If you must connect devices together that are more than 100 meters apart, use an interim Ethernet "edge" switch, or else use optical fiber and copper/fiber converters to extend the range of the Ethernet LAN connections.

AoIP Driver

The next component of your system is the WheatNet-IP AoIP driver. This is a software driver that will allow any Windows 7 or later device to send and receive audio packets as a member of the WheatNet-IP system. Typically, this driver would be installed on your Automation PCs to allow them to play back audio into the WheatNet-IP system without using a sound card. You can install the driver on any PC that you wish to get audio to/from. On a modern PC, the driver will allow up to eight different audio streams playing back simultaneously while accepting eight different audio input streams. Please note that any PC can use the WheatNet-IP AoIP driver; it doesn't need to be an Automation server. If you want to stream your station's Program output to the PD's office PC, you can. Likewise, many modern audio devices such as codecs are really PCs at heart. If they are running Windows and can work with standard WDM drivers, they can most likely be directly connected to the WheatNet-IP system.

We now have a version of the audio driver that works on most Linux systems as well.

I/O Connections

All audio input and output, control and Ethernet connections are made via RJ-45 jacks mounted on the WheatNet-IP rear panel. The pinout drawings on the following pages summarize all audio and logic wiring connections.

BLADE-4 models with I/O have eight stereo inputs and eight stereo outputs on sixteen RJ45 jacks. All RJ45 audio jacks are wired per the StudioHub+ convention for CAT5 cables with the left analog audio or AES-3 signal on pair 1 and the right analog audio on pair 2. Wire pairs 3 and 4 are unused. Figure on page 1-22 has signal pinout tables for the RJ45 jacks for audio and logic.

All analog inputs on RJ45 jacks are designed for balanced +4 dBu nominal signals. The input circuit has a gain range of +/- 18 dB so inputs can also accept unbalanced -10 dBV signals without needing a match box. The female XLR jacks on the M4 mic processor have extended gain range since they're designed for a nominal -50 dBu level from a microphone. Phantom power is available on all mic inputs.

Analog outputs are active balanced +4 dBu nominal signals. Do not directly connect them to unbalanced inputs. This shorts out the active output which can cause crosstalk and may cause the balanced line driver output IC to fail over time. Analog outputs connecting to unbalanced input devices must use a balun or a matchbox since there is no ground reference on the RJ45 jacks.

Digital inputs and outputs are designed for AES-3 (AES/EBU) signals. In most cases an S/PDIF output signal from consumer gear can directly connect to a digital input, but an AES-3 output signal cannot be directly connected to an S/PDIF input, a signal translation device must be used.

Any stereo input or output can be reconfigured, using the WheatNet-IP Navigator application, to split it into two mono signals. Multiple audio inputs or outputs can also be combined to connect discrete 5.1 surround signals. Mono and 5.1 inputs and outputs have level controls in Navigator. Stereo signals have a level and a balance control in Navigator.

All BLADE-4 models except the M4IP have an HDMI port for an optional customer-supplied 4K monitor to run various WNIP applications on the BLADE-4's Linux processor. The USB port can be used for audio files to supply the clip players, or for a mouse/keyboard receiver or touchscreen connection. The front USB port on the BLADE-4 can be used for audio files if the rear one is used for a pointing device.

BLADE-4 has two 1GB Ethernet ports (A & B). Port A is the main WNIP network port which is typically set to a fixed IP address. Port B can be setup as a redundant WNIP network port or it can be designated as a WAN port, which can use either a fixed or a DHCP-assigned address, to connect the BLADE-4's dual codecs to your facility LAN or directly to an ISP.

Model IP88a

The WheatNet-IP 88a is fed from analog line level inputs via eight RJ-45 connectors.

The line level analog audio inputs are +4dBu balanced. The analog line inputs exhibit a bridging impedance and can handle signals up to +20dBu. The line level analog output signal is +4dBu, balanced.

Inputs

Analog 1-8 RJ-45

RJ-45 Input #1 L Pin 1 – HI
RJ-45 Input #1 L Pin 2 – LO
RJ-45 Input #1 R Pin 3 – HI
RJ-45 Input #1 R Pin 6 – LO

RJ-45 Input #2 L Pin 1 – HI
RJ-45 Input #2 L Pin 2 – LO
RJ-45 Input #2 R Pin 3 – HI
RJ-45 Input #2 R Pin 6 – LO

RJ-45 Input #3 L Pin 1 – HI
RJ-45 Input #3 L Pin 2 – LO
RJ-45 Input #3 R Pin 3 – HI
RJ-45 Input #3 R Pin 6 – LO

RJ-45 Input #4 L Pin 1 – HI
RJ-45 Input #4 L Pin 2 – LO
RJ-45 Input #4 R Pin 3 – HI
RJ-45 Input #4 R Pin 6 – LO

RJ-45 Input #5 L Pin 1 – HI
RJ-45 Input #5 L Pin 2 – LO
RJ-45 Input #5 R Pin 3 – HI
RJ-45 Input #5 R Pin 6 – LO

RJ-45 Input #6 L Pin 1 – HI
RJ-45 Input #6 L Pin 2 – LO
RJ-45 Input #6 R Pin 3 – HI
RJ-45 Input #6 R Pin 6 – LO

RJ-45 Input #7 L Pin 1 – HI
RJ-45 Input #7 L Pin 2 – LO
RJ-45 Input #7 R Pin 3 – HI
RJ-45 Input #7 R Pin 6 – LO

RJ-45 Input #8 L Pin 1 – HI
RJ-45 Input #8 L Pin 2 – LO
RJ-45 Input #8 R Pin 3 – HI
RJ-45 Input #8 R Pin 6 – LO

Outputs

Analog 1-8 RJ-45

RJ-45 Output #1 L Pin 1 – HI
RJ-45 Output #1 L Pin 2 – LO
RJ-45 Output #1 R Pin 3 – HI
RJ-45 Output #1 R Pin 6 – LO

RJ-45 Output #2 L Pin 1 – HI
RJ-45 Output #2 L Pin 2 – LO
RJ-45 Output #2 R Pin 3 – HI
RJ-45 Output #2 R Pin 6 – LO

RJ-45 Output #3 L Pin 1 – HI
RJ-45 Output #3 L Pin 2 – LO
RJ-45 Output #3 R Pin 3 – HI
RJ-45 Output #3 R Pin 6 – LO

RJ-45 Output #4 L Pin 1 – HI
RJ-45 Output #4 L Pin 2 – LO
RJ-45 Output #4 R Pin 3 – HI
RJ-45 Output #4 R Pin 6 – LO

RJ-45 Output #5 L Pin 1 – HI
RJ-45 Output #5 L Pin 2 – LO
RJ-45 Output #5 R Pin 3 – HI
RJ-45 Output #5 R Pin 6 – LO

RJ-45 Output #6 L Pin 1 – HI
RJ-45 Output #6 L Pin 2 – LO
RJ-45 Output #6 R Pin 3 – HI
RJ-45 Output #6 R Pin 6 – LO

RJ-45 Output #7 L Pin 1 – HI
RJ-45 Output #7 L Pin 2 – LO
RJ-45 Output #7 R Pin 3 – HI
RJ-45 Output #7 R Pin 6 – LO

RJ-45 Output #8 L Pin 1 – HI
RJ-45 Output #8 L Pin 2 – LO
RJ-45 Output #8 R Pin 3 – HI
RJ-45 Output #8 R Pin 6 – LO

Model IP88d

The WheatNet-IP 88d is fed from digital inputs via eight RJ-45 connectors.

The WheatNet-IP 88d will accommodate digital inputs having a wide range of sample rates. These inputs will be sample rate converted to the system's chosen sample rate of 44.1kHz or 48kHz, which is set via the WheatNet-IP Navigator GUI. The GUI also allows you to select input 8 of the digital BLADE-4, or of any BLADE-4 that has a digital input as input 8, to be a primary external reference, and a digital input 8 from a different BLADE-4 to be a secondary external reference. Please note that the sample rate of a digital input 8 should be the same, either 44.1kHz or 48kHz, as the system's chosen sample rate.

AES sources are by design stereo; if the BLADE-4 is not set to be stereo the appropriate Left or Right signal within the AES stream will be applied to the signal path.

Inputs

Digital 1-8 RJ-45

RJ-45 Input #1 Pin 1 – HI
RJ-45 Input #1 Pin 2 – LO

RJ-45 Input #2 Pin 1 – HI
RJ-45 Input #2 Pin 2 – LO

RJ-45 Input #3 Pin 1 – HI
RJ-45 Input #3 Pin 2 – LO

RJ-45 Input #4 Pin 1 – HI
RJ-45 Input #4 Pin 2 – LO

RJ-45 Input #5 Pin 1 – HI
RJ-45 Input #5 Pin 2 – LO

RJ-45 Input #6 Pin 1 – HI
RJ-45 Input #6 Pin 2 – LO

RJ-45 Input #7 Pin 1 – HI
RJ-45 Input #7 Pin 2 – LO

RJ-45 Input #8 Pin 1 – HI
RJ-45 Input #8 Pin 2 – LO

Outputs

Digital 1-8 RJ-45

RJ-45 Output #1 Pin 1 – HI
RJ-45 Output #1 Pin 2 – LO

RJ-45 Output #2 Pin 1 – HI
RJ-45 Output #2 Pin 2 – LO

RJ-45 Output #3 Pin 1 – HI
RJ-45 Output #3 Pin 2 – LO

RJ-45 Output #4 Pin 1 – HI
RJ-45 Output #4 Pin 2 – LO

RJ-45 Output #5 Pin 1 – HI
RJ-45 Output #5 Pin 2 – LO

RJ-45 Output #6 Pin 1 – HI
RJ-45 Output #6 Pin 2 – LO

RJ-45 Output #7 Pin 1 – HI
RJ-45 Output #7 Pin 2 – LO

RJ-45 Output #8 Pin 1 – HI
RJ-45 Output #8 Pin 2 – LO

Model IP 88ad

The WheatNet-IP 88ad is fed from a combination of analog and digital inputs via eight RJ-45 connectors.

The digital inputs of the WheatNet-IP 88ad (inputs 5-8) will accommodate digital inputs having a wide range of sample rates. These inputs will be sample rate converted to the system's chosen sample rate of 44.1kHz or 48kHz, which is set via the WheatNet-IP Navigator GUI. The GUI also allows you to select input 8 of the digital BLADE-4, or of any BLADE-4 that has a digital input as input 8, to be a primary external reference, and a digital input 8 from a different BLADE-4 to be a secondary external reference. Please note that the sample rate of a digital input 8 should be the same, either 44.1kHz or 48kHz, as the system's chosen sample rate.

AES sources are by design stereo; if the BLADE-4 is not set to be stereo the appropriate Left or Right signal within the AES stream will be applied to the signal path.

Inputs

Analog 1-4 RJ-45

RJ-45 Input #1 L Pin 1 – HI
RJ-45 Input #1 L Pin 2 – LO
RJ-45 Input #1 R Pin 3 – HI
RJ-45 Input #1 R Pin 6 – LO

RJ-45 Input #2 L Pin 1 – HI
RJ-45 Input #2 L Pin 2 – LO
RJ-45 Input #2 R Pin 3 – HI
RJ-45 Input #2 R Pin 6 – LO

RJ-45 Input #3 L Pin 1 – HI
RJ-45 Input #3 L Pin 2 – LO
RJ-45 Input #3 R Pin 3 – HI
RJ-45 Input #3 R Pin 6 – LO

RJ-45 Input #4 L Pin 1 – HI
RJ-45 Input #4 L Pin 2 – LO
RJ-45 Input #4 R Pin 3 – HI
RJ-45 Input #4 R Pin 6 – LO

Digital 5-8 RJ-45

RJ-45 Input #5 Pin 1 – HI
RJ-45 Input #5 Pin 2 – LO

RJ-45 Input #6 Pin 1 – HI
RJ-45 Input #6 Pin 2 – LO

RJ-45 Input #7 Pin 1 – HI
RJ-45 Input #7 Pin 2 – LO

RJ-45 Input #8 Pin 1 – HI
RJ-45 Input #8 Pin 2 – LO

Outputs

Analog 1-4 RJ-45

RJ-45 Output #1 L Pin 1 – HI
RJ-45 Output #1 L Pin 2 – LO
RJ-45 Output #1 R Pin 3 – HI
RJ-45 Output #1 R Pin 6 – LO

RJ-45 Output #2 L Pin 1 – HI
RJ-45 Output #2 L Pin 2 – LO
RJ-45 Output #2 R Pin 3 – HI
RJ-45 Output #2 R Pin 6 – LO

RJ-45 Output #3 L Pin 1 – HI
RJ-45 Output #3 L Pin 2 – LO
RJ-45 Output #3 R Pin 3 – HI
RJ-45 Output #3 R Pin 6 – LO

RJ-45 Output #4 L Pin 1 – HI
RJ-45 Output #4 L Pin 2 – LO
RJ-45 Output #4 R Pin 3 – HI
RJ-45 Output #4 R Pin 6 – LO

Digital 5-8 RJ-45

RJ-45 Output #5 Pin 1 – HI
RJ-45 Output #5 Pin 2 – LO

RJ-45 Output #6 Pin 1 – HI
RJ-45 Output #6 Pin 2 – LO

RJ-45 Output #7 Pin 1 – HI
RJ-45 Output #7 Pin 2 – LO

RJ-45 Output #8 Pin 1 – HI
RJ-45 Output #8 Pin 2 – LO

Model Aura8ip

The WheatNet-IP Aura8ip is fed from a combination of analog and digital inputs via eight RJ-45 connectors.

The WheatNet-IP Aura8ip will accommodate digital inputs having a wide range of sample rates. These inputs will be sample rate converted to the system's chosen sample rate of 44.1kHz or 48kHz, which is set via the WheatNet-IP Navigator GUI. The GUI also allows you to select input 8 of the digital BLADE-4, or of any BLADE-4 that has a digital input as input 8, to be a primary external reference, and a digital input 8 from a different BLADE-4 to be a secondary external reference. Please note that the sample rate of a digital input 8 should be the same, either 44.1kHz or 48kHz, as the system's chosen sample rate. If you are using the Aura8ip in a stand-alone application, one involving no other BLADE-4s, and if the outputs from Aura8ip must be synchronized to downstream digital equipment, you must use input 8 for your external reference, even if you are not using all 8 inputs.

AES sources are by design stereo; if the BLADE-4 is not set to be stereo the appropriate Left or Right signal within the AES stream will be applied to the signal path.

Inputs

Analog 1-4 RJ-45

RJ-45 Input #1 L Pin 1 – HI
RJ-45 Input #1 L Pin 2 – LO
RJ-45 Input #1 R Pin 3 – HI
RJ-45 Input #1 R Pin 6 – LO

RJ-45 Input #2 L Pin 1 – HI
RJ-45 Input #2 L Pin 2 – LO
RJ-45 Input #2 R Pin 3 – HI
RJ-45 Input #2 R Pin 6 – LO

RJ-45 Input #3 L Pin 1 – HI
RJ-45 Input #3 L Pin 2 – LO
RJ-45 Input #3 R Pin 3 – HI
RJ-45 Input #3 R Pin 6 – LO

RJ-45 Input #4 L Pin 1 – HI
RJ-45 Input #4 L Pin 2 – LO
RJ-45 Input #4 R Pin 3 – HI
RJ-45 Input #4 R Pin 6 – LO

Digital 5-8 RJ-45

RJ-45 Input #5 Pin 1 – HI
RJ-45 Input #5 Pin 2 – LO

RJ-45 Input #6 Pin 1 – HI
RJ-45 Input #6 Pin 2 – LO

RJ-45 Input #7 Pin 1 – HI
RJ-45 Input #7 Pin 2 – LO

RJ-45 Input #8 Pin 1 – HI
RJ-45 Input #8 Pin 2 – LO

Outputs

Analog 1-4 RJ-45

RJ-45 Output #1 L Pin 1 – HI
RJ-45 Output #1 L Pin 2 – LO
RJ-45 Output #1 R Pin 3 – HI
RJ-45 Output #1 R Pin 6 – LO

RJ-45 Output #2 L Pin 1 – HI
RJ-45 Output #2 L Pin 2 – LO
RJ-45 Output #2 R Pin 3 – HI
RJ-45 Output #2 R Pin 6 – LO

RJ-45 Output #3 L Pin 1 – HI
RJ-45 Output #3 L Pin 2 – LO
RJ-45 Output #3 R Pin 3 – HI
RJ-45 Output #3 R Pin 6 – LO

RJ-45 Output #4 L Pin 1 – HI
RJ-45 Output #4 L Pin 2 – LO
RJ-45 Output #4 R Pin 3 – HI
RJ-45 Output #4 R Pin 6 – LO

Digital 5-8 RJ-45

RJ-45 Output #5 Pin 1 – HI
RJ-45 Output #5 Pin 2 – LO

RJ-45 Output #6 Pin 1 – HI
RJ-45 Output #6 Pin 2 – LO

RJ-45 Output #7 Pin 1 – HI
RJ-45 Output #7 Pin 2 – LO

RJ-45 Output #8 Pin 1 – HI
RJ-45 Output #8 Pin 2 – LO

Model M4IPusb

The M4IP analog mono mic level input (-50dBu nominal) is fed from the female XLR connector to the internal microphone preamplifier. The mic preamp has digitally controlled gain, up to a maximum of 70 dB, and displays remarkably high performance and accuracy. Phantom power is available.

The output signals are available as analog line level (+4dBu, balanced) on the four RJ-45 (#1 through #4) connectors, and as four digital AES formatted outputs on the RJ-45 (#5 through #8) connectors.

Four independent USB ports are built in to facilitate the individual use of USB audio devices. The four USB ports are bi-directional, providing (4) audio inputs (1 stereo input per port) from a USB audio device and (4) audio outputs (1 stereo output per port) to a USB audio device. The USB audio inputs appear as sources on the BLADE while the USB audio outputs are in parallel with the BLADE destinations 5 - 8 stereo (9 - 16 mono).

Inputs

Analog 1-4 XLR

XLR#1 Pin 1 – SH
XLR#1 Pin 2 – HI — Mic 1 In
XLR#1 Pin 3 – LO

XLR#2 Pin 1 – SH
XLR#2 Pin 2 – HI — Mic 2 In
XLR#2 Pin 3 – LO

XLR#3 Pin 1 – SH
XLR#3 Pin 2 – HI — Mic 3 In
XLR#3 Pin 3 – LO

XLR#4 Pin 1 – SH
XLR#4 Pin 2 – HI — Mic 4 In
XLR#4 Pin 3 – LO

Outputs

Analog 1-4 RJ-45

RJ-45 Output #1 L Pin 1 – HI
RJ-45 Output #1 L Pin 2 – LO
RJ-45 Output #1 R Pin 3 – HI
RJ-45 Output #1 R Pin 6 – LO

RJ-45 Output #2 L Pin 1 – HI
RJ-45 Output #2 L Pin 2 – LO
RJ-45 Output #2 R Pin 3 – HI
RJ-45 Output #2 R Pin 6 – LO

RJ-45 Output #3 L Pin 1 – HI
RJ-45 Output #3 L Pin 2 – LO
RJ-45 Output #3 R Pin 3 – HI
RJ-45 Output #3 R Pin 6 – LO

RJ-45 Output #4 L Pin 1 – HI
RJ-45 Output #4 L Pin 2 – LO
RJ-45 Output #4 R Pin 3 – HI
RJ-45 Output #4 R Pin 6 – LO

Digital 5-8 RJ-45

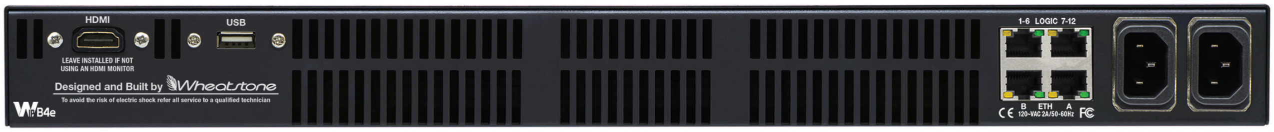
RJ-45 Output #5 Pin 1 – HI
RJ-45 Output #5 Pin 2 – LO

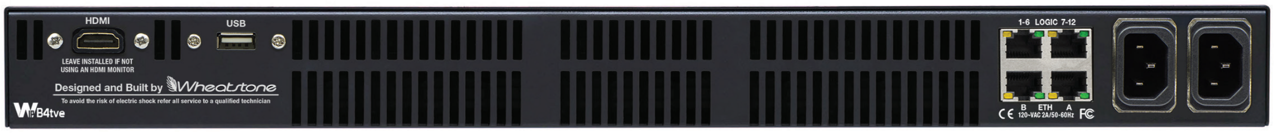
RJ-45 Output #6 Pin 1 – HI
RJ-45 Output #6 Pin 2 – LO

RJ-45 Output #7 Pin 1 – HI
RJ-45 Output #7 Pin 2 – LO

RJ-45 Output #8 Pin 1 – HI
RJ-45 Output #8 Pin 2 – LO

Model IP88e and IP88tve





The IP88e and IP88tve models of BLADE-4 have no audio inputs or outputs. Their job is to provide mixing and processing for a variety of control surfaces. They only have the HDMI, USB, Logic, Ethernet and power connections present on all other models of BLADE-4.

Logic Ports - All BLADE-4 Models

All models of the BLADE-4 (except the TVE model) have two LOGIC I/O RJ-45 connectors that provide 12 Universal logic input or output (LIO) ports. LIO signals 1-6 appear on the left-hand port labeled and LIO signals 7-12 appear on the right-hand port.

LOGIC I/O 1 - 6 RJ-45

RJ-45 Pin 1 – Digital Ground
RJ-45 Pin 2 – Logic 1 In/Out
RJ-45 Pin 3 – Logic 2 In/Out
RJ-45 Pin 4 – Logic 3 In/Out
RJ-45 Pin 5 – Logic 4 In/Out
RJ-45 Pin 6 – Logic 5 In/Out
RJ-45 Pin 7 – Logic 6 In/Out
RJ-45 Pin 8 – +5V Digital

LOGIC I/O 7 - 12 RJ-45

RJ-45 Pin 1 – Digital Ground
RJ-45 Pin 2 – Logic 7 In/Out
RJ-45 Pin 3 – Logic 8 In/Out
RJ-45 Pin 4 – Logic 9 In/Out
RJ-45 Pin 5 – Logic 10 In/Out
RJ-45 Pin 6 – Logic 11 In/Out
RJ-45 Pin 7 – Logic 12 In/Out
RJ-45 Pin 8 – +5V Digital

AUDIO WIRING

RJ45 PIN (WIRES*)	SIGNAL
1 (WHT/ORG)	LEFT + / AES +
2 (ORG)	LEFT - / AES -
3 (WHT/GRN)	RIGHT +
6 (GRN)	RIGHT -
4, 5, 7, 8	UNUSED

* EIA/TIA T568B WIRE COLORS

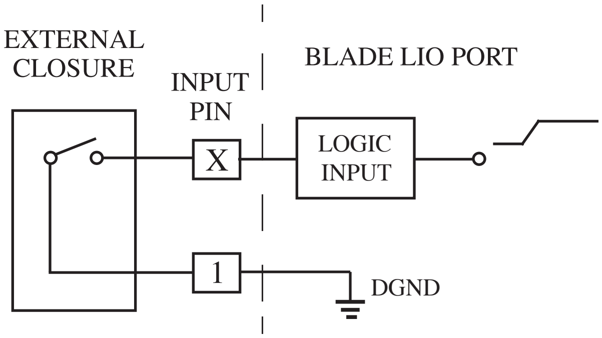
LOGIC WIRING

RJ45 PIN (WIRES*)	SIGNAL
1 (WHT/ORG)	GROUND
2 (ORG)	LIO 1
3 (WHT/GRN)	LIO 2
4 (BLU)	LIO 3
5 (WHT/BLU)	LIO 4
6 (GRN)	LIO 5
7 (WHT/BRN)	LIO 6
8 (BRN)	+5 VDC

Figure 1.

Simplified BLADE Logic I/O

Input Logic



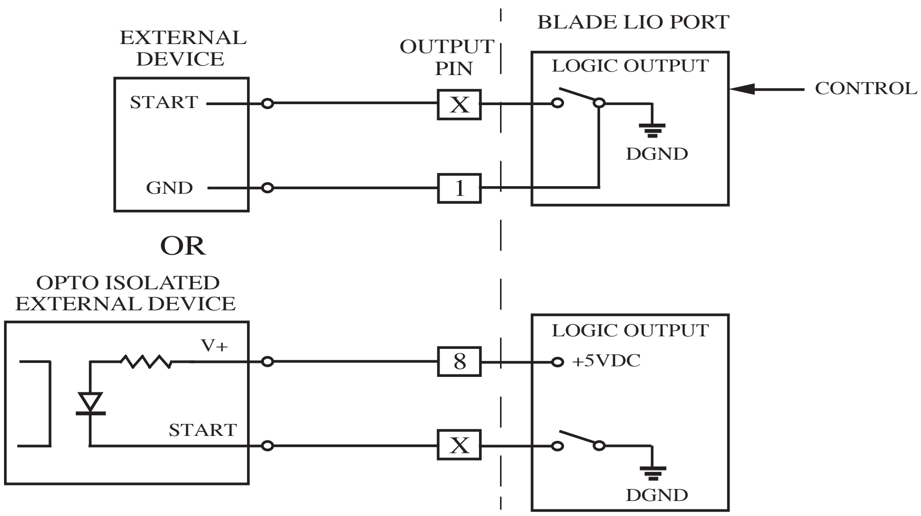
Input Port Specs

- Internally current limited
- No pull up required

Logic Inputs are activated when the input pin is pulled to DGND.

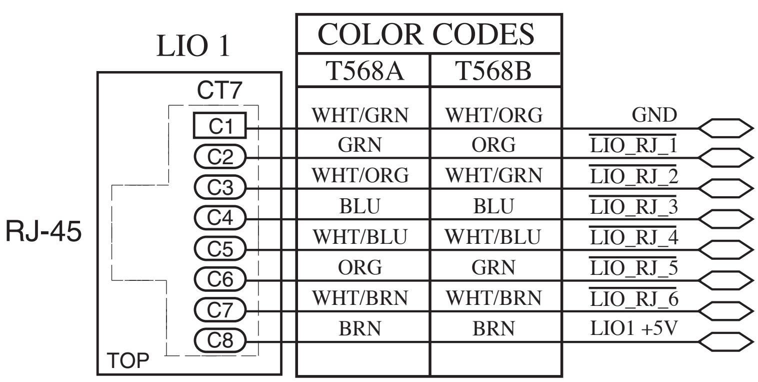
Output Logic

Logic Outputs are pulled to DGND when activated.



Output Port Specs

Sink: • 50mA nom
• 100mA max

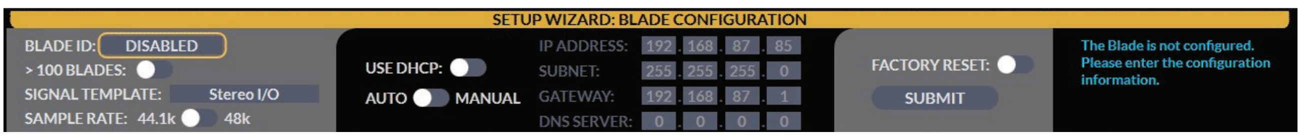


Setup and Configuration

Chapter Contents

Setup and Configuration

BLADE-4 Setup



As shipped from the factory, each BLADE-4 will initially start up in Blade Setup mode.

The BLADE-4's cursor will be on the BLADE ID field which will initially display the message "DISABLED."

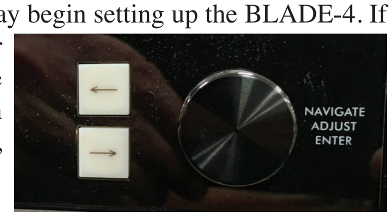
Setting System Size

Your first decision involves "System Size" and is something that should be well thought out before doing **Blade Setup** on your first BLADE-4. Here are the two choices, and their significance:

- **1-99 Blades** – This would be your choice for a small to medium sized system. When you choose this size the setup wizard will automatically assign network settings to the BLADE-4 based on your choice of Blade ID (see below). IP addresses will be assigned within the 192.168.87.xxx subnet, with the last octet being assigned a value of 100 plus the Blade ID. The subnet mask will be set to 255.255.255.0, and the gateway will be set to 192.168.87.1. Once you have gone through the complete **Blade Setup** process you will be able to change the network settings, if desired. If you are setting up a system that you know will never grow beyond 99 BLADE units, then this is your best choice.
- **100+ Blades** – This would be your choice for a large system. When you choose this size the setup wizard will automatically assign network settings to the BLADE-4 based on your choice of Blade ID. For IDs in the range of 1 to 99, IP addresses will be assigned within the 192.168.87.xxx subnet, with the last octet being assigned a value of 100 plus the Blade ID. The subnet mask will be set to 255.255.0.0, and the gateway will be set to 192.168.87.1. For IDs in the range of 100 to 199, IP addresses will be assigned within the 192.168.88.xxx subnet, with the last octet being assigned a value equal to the Blade ID. The subnet mask will be set to 255.255.0.0, and the gateway will be set to 192.168.88.1. Once you have gone through the complete **Blade Setup** process you will be able to change the network settings, if desired. If you are setting up a system with more than 100 BLADE-4 units, or a system that you know will grow beyond 99 BLADE-4 units in the future, then this is your best choice.

BLADE ID

Once you have determined your system size and the desired BLADE ID, you may begin setting up the BLADE-4. If your system will be larger than 100 BLADES, turn the front panel encoder, or selector knob, to highlight the "**> 100 BLADES**" option, press the selector knob to enable the option and turn it to enable this option. Another press of the selector knob will lock in your selection. Then you can go back to the "**BLADE ID**" field and repeat the process, turning the selector knob to select the desired BLADE ID.



Wheatstone recommends using our default IP addressing/Blade numbering scheme to make setup and troubleshooting easier—for yourself and for Wheatstone in the event you need to contact Tech Support. Choose a Blade ID from 1 to 99. The next available unused Blade ID is always a good choice, but you may wish to use the

Blade ID numbers as a way to help organize your system—it is not necessary that you use Blade IDs in any particular order. For example, Blades 1-9 might be in your rack room, Blades 10-19 in Studio 1, Blades 20-29 in Studio 2 etc.

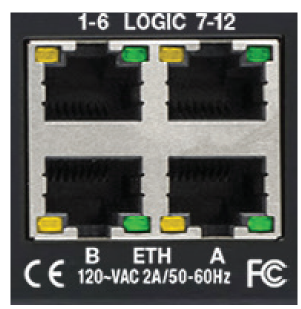
The Blade will automatically receive an IP address of the form 192.168.87.xxx, in which the fourth octet is the chosen Blade ID number plus 100. This means for systems under 100 Blades, they will all fall in the range 192.168.87.101-192.168.87.199.

Once you have selected your system size and BLADE ID, your next decision will be which **I/O Template** to use. Not all of these choices will appear on every model of BLADE-4. Here are the three choices and the significance of each:

- **Stereo I/O** – This would be the most common choice if your facility consists primarily of equipment with stereo inputs and outputs, such as tape machines, CD players, computers, etc. When this template is employed the setup wizard will configure the inputs and outputs of the BLADE-4 as stereo signals and add these signals to the system. If you choose this template, you can later on change some of your signals to mono if necessary.
- **Mono I/O** – This would be the most common choice if your facility consists primarily of monophonic equipment, such as microphones, phone systems, etc. When this template is employed the setup wizard will configure the inputs and outputs of the BLADE-4 as mono signals and add these signals to the system. If you choose this template, you can later on change some of your signals to stereo if necessary. Please note that if you have a lot of mono sources you may be tempted to use this template, but you should also consider the rest of your audio equipment; you may actually still have more stereo signal requirements than mono ones. This decision can be made on a Blade-by-Blade basis; they don't all need to use the same I/O template.
- **Custom** – This would be a tempting choice if you have a fairly even balance between mono and stereo signals in your facility. However, if you choose this template the setup wizard will not configure the BLADE-4 inputs and outputs, nor will it add input and output signals to the system. With this template, you will need to create the signals for each input and output connection.

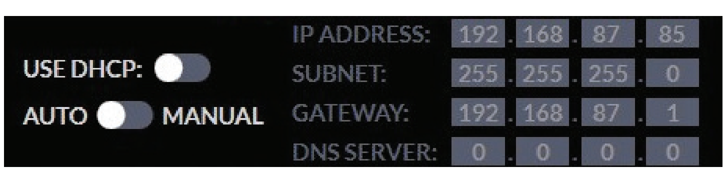
Next, you need to decide whether to set the BLADE-4 up as : **44.1K** (41kHz), or **48K** (48kHz). If you are not sure which one to select, and you are not working with audio for television or AES67 audio, use **44.1K**. If your system is already set up with other BLADES you should match the sample rate of your other blades. You can change the sample rate at a later time if needed. Scroll to the desired selection and press the right arrow button. The Blade will assume the sample rate of the system once it joins so this option is mainly useful when the Blade is running by itself.

Your next decision concerns the second Ethernet port on the back of the BLADE-4. This is the port that is labeled as "**ETH B**." The choices are "WNIP and WAN" and "Active Backup Redundant." If you choose "WNIP and WAN," ETH B will be used to provide connectivity for the BLADE-4's built-in codecs over the internet provider that you connect to this port. If you choose "Active Backup Redundant," ETH B will become a backup WheatNet-IP connection which will be used in the event your primary WheatNet-IP connection on ETH A becomes inactive. In this case, both Ethernet connectors should be connected to your WheatNet-IP subnet.



Next is the **Network Configuration**. Unlike previous BLADE models, the BLADE-4 supports DHCP IP address allocation and will obtain an address from your DHCP range if you turn on the DHCP option and there is a DHCP server running in the network segment. However, in most cases it is recommended to let the BLADE-4 Setup Wizard automatically set the BLADE's IP address for you. It will assign an address in the 192.168.87.1xx range, using the BLADE ID to complete the fourth octet. For example, for BLADE ID 23, the IP address will automatically be set to 192.168.87.123.

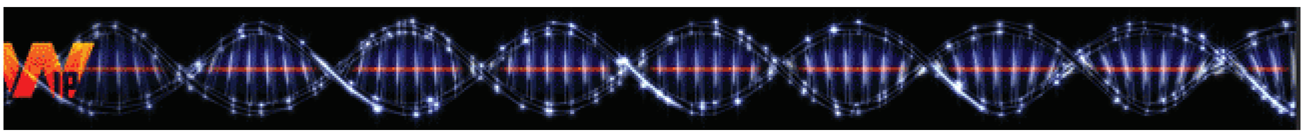
Should you choose to set the IP address manually, after enabling the MANUAL option, the network setting fields will become enabled and you can use the front panel arrow keys and selector knob to configure them.



Once all the basic setup choices have been made, turn the selector knob until the **SUBMIT** option is highlighted. The setup wizard will complete the configuration process and the display will indicate that the BLADE-4 is entering the system. The Status page will be displayed on the front panel. If you already have audio connected, you will see levels on the meters on the left side of the screen, and the status display on the right. The front panel will show the status of the two network interfaces: Green if they are connected, red if not.

When the front panel controls have been idle for a while, the right-hand OLED display will show the Screen Saver.

If the screensaver has been set to **FULL** (see”Display Screen” on page 2-8), the BLADE-4 screen will look like this:



If it has been set to **HALF**, the screen will look like this:

Front Panel Configuration

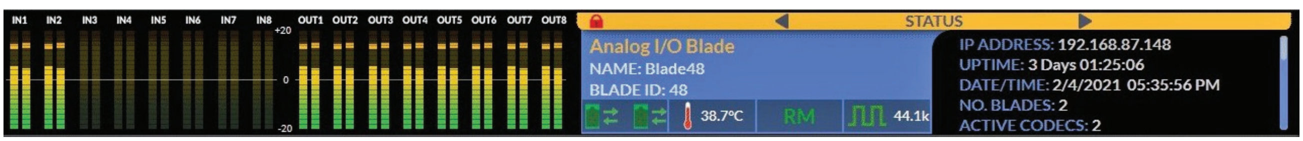
Activating any of the front panel controls will replace the right-hand side screen saver display with the Status screen.

From this point, you may scroll through the various BLADE-4 screens by turning the selector knob. When turning it clockwise, you proceed from the Status screen to the Headphone, Local Destinations, Local Sources, Utility Mixer 1, Utility Mixer 2, Logic, Clip Player 1, Clip Player 2, Codec Encoders, Codec Decoders, Passcode, Display, Network Configuration and Maintenance screens. You can also access these screens by using the Right Arrow key. These screens are available on the Blade front panel to allow for various adjustments (Gain, Level, Connections, UMIX, etc) directly from the front panel without the need for a PC.

The Left Arrow key, or Back button, will always take you back to the previous menu item or to the main Status Screen. Clockwise rotation of the knob navigates up and down a menu when there is a list, or scrolls thru options in a submenu once one has been selected. Pressing the right arrow button navigates through sub-menu options. Pushing the knob "takes" an option.

We will discuss the settings available on each of the Front Panel screens in this section.

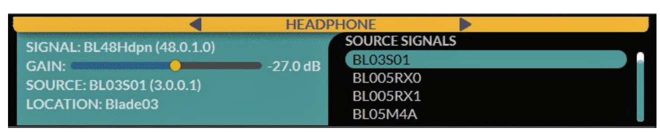
Status Screen



On the Status screen you can see all of the most basic information about your BLADE-4. The left side of this screen shows the type of BLADE-4 (ie; Analog, Analog/Digital, Digital, etc.) as well as the BLADE's name and ID. Below this you can see the status of the two Ethernet connectors, the internal temperature of the BLADE's CPU and the BLADE's sample rate.

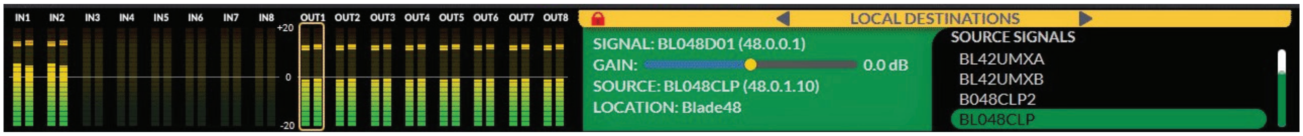
The right side shows you the BLADE's IP address, its current uptime, the current date and time, the number of BLADEs in the system, the number of active (enabled) Codecs on the BLADE, the number of CLIP players, as well as the number of GUI, FP, App Mgr and ACI connections to the BLADE-4. Here you will also find version numbers for all the various BLADE-4 hardware and software components. In order to see all of these you will need to press the selector knob or use the right arrow key to enter the status display, then you will be able to scroll through all the status indications using the selector knob.

Headphone Screen



The Headphone screen is used to configure the front panel headphone jack. The left side shows the name of the Headphone signal and the default gain setting headphone jack. Below this is the source currently connected to the headphone jack (if any) and the location (BLADE name or ID) of the BLADE that provides this signal. On the right side, you can select any source in your WheatNet-IP system to feed this front panel headphone jack. Use the encoder to select the headphone level option to adjust the audio level for the headphone jack.

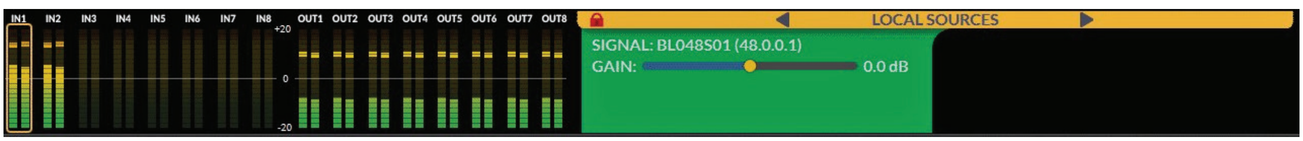
Local Destinations Screen



The Local Destinations Screen gives you a level of control over each of the Destinations configured locally on this BLADE-4. Pressing the selector knob once will highlight the **SIGNAL** field and the display will show the Source that is connected to the currently-selected Local Destination and its Location. The corresponding output will be highlighed on the left-hand side of the screen (see **OUT1** on the graphic above). Press it again and you can select a different Destination to control. After selecting the desired Destination, press the knob to enable the **GAIN** menu item and you can gain the Destination up or down by turning the selector knob. From the **GAIN** control menu item, turn the selector knob once again and the Source Signals list on the right will take focus. One more press of the knob and you can scroll through all the Source Signals in your system from this menu item. Highlight the desired Source and press the button to connect that Source to the current Destination.

Of course, you can also use the Navigator GUI to control the GAIN of the BLADE-4's Destinations, and to make Source connections to them. The GUI is described in the chapter titled *WheatNet-IP Navigator*.

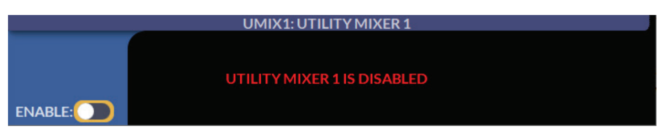
Local Sources Screen



The Local Sources screen allows you to see each Source that has been connected to and configured on the BLADE-4, and allows you **GAIN** control over these Sources. To enter this screen, press the selector knob. This gives focus to the Signal field. Another press will allow you to select a different Local Source. Once the deisred Source has been selected, another turn of the selector knob will bring the **GAIN** control into focus, and you can press the knob again to enable the **GAIN** control.

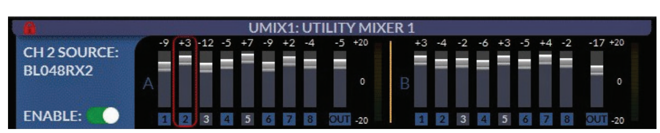
You can also set the GAIN for the BLADE-4's Sources via the Navigator GUI. The GUI is described in the chapter titled *WheatNet-IP Navigator*. Please remember that this GAIN adjustment will affect the destination gain for every signal that may be connected to it. Use this setting only when the actual destination output needs adjusting (for example, to prevent overloading a phone channel or providing the proper gain for an amplifier). If there is a level problem only when a particular source is connected, you should adjust the source gain instead.

Utility Mixer Screens



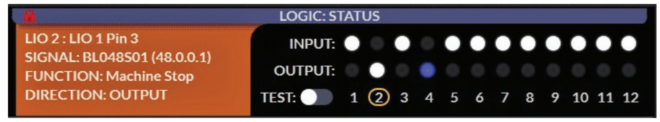
Each BLADE-4 includes two Utility Mixers. These mixers can be fed with up to eight sources from the BLADE you are configuring or any other BLADE in your WheatNet-IP system. The outputs from the Utility Mixes can be used as sources anywhere in your system. Both Utility Mixers are configured in the same manner so we will just talk about Utility Mixer 1 here.

When you first land on the Utility Mixer 1 screen during initial setup, it will be disabled. The only option available is to ENABLE the mixer. By now you have learned how to maneuver with the selector knob and arrow keys, so go ahead and enable the Utility Mixer. When you do, it will look like this:



Now you can use the selector knob and arrow keys to highlight mixer inputs and adjust their levels up or down as necessary. You can also turn the individual fader channels OFF and ON. You are not able to select the sources connected to the mixer inputs from the front panel; that will be done in the WheatNet-IP Navigator GUI program.

Logic Status Screen



The Logic Status screen allows you to see the state of all of the logic signals on your BLADE-4. This is useful for a visual confirmation as you are connecting discrete signals to your BLADE and from your BLADE to other devices.

You are not able to configure the Logic signals from the BLADE-4's front panel (Navigator, once again) but you can use the front panel to activate the Logic outputs for testing purposes. To do this, navigate to the TEST field and enable it, and then when you select a Logic output and either press the selector knob or the right arrow, you will be able to toggle the Logic output on and off.

Clip Player Screens

Just as with the Utility Mixers, the CLIP Players are identical so we will just discuss CLIP Player 1.

Click the selector button or press the right arrow key to enter the CLIP Player function. This will highlight the STOP button. Turn the knob or use the arrow key to proceed to the PAUSE and NEXT TRACK buttons. Pressing the selector knob on any of these functions will activate it.

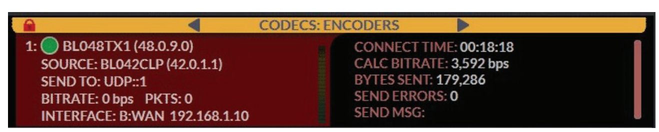
Once you proceed past the NEXT TRACK button you will be in the File List. Navigate through the list and when you press the selector knob to select a track, it will appear on the left side of the CLIP player and you can use the control buttons to start, pause or skip to the next track.

The songs in the CLIP Players must be loaded through the WheatNet-IP Navigator GUI. They can be uploaded to the BLADE-4 CLIP player's flash memory via your computer or via the built-in USB ports on the front or rear of the BLADE-4. You can also choose, through the Navigator GUI, to play files directly from the USB flash drive rather than files that are loaded into the Player's flash memory.

The Clip Player has built-in logic control so you can set it up for clips to be fired by programmable buttons or Screen-Builder scripts to make it easy to make hot-button players or automate audio playback from a silence detection alert and so forth.

Note that the Clip Player is an optional feature that may not be installed on your Blade. The available options are No Clip Player, one Clip Player, or two independent Clip Players. Contact Wheatstone sales or tech support about these options if needed.

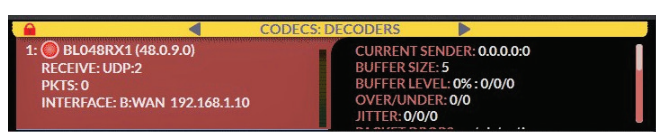
Codecs: Encoders Screen



Codecs in BLADE-4 are an optional, licensed feature. To obtain a license to use the Codecs, please contact the Wheatstone Sales Department. The options are No Codec, one Codec or two independent Codecs.

The Codecs have full send/receive capability for remote audio using the ISP which you have connected to the ETH B Ethernet port, with the BLADE-4 set up in WNIP and WAN configuration (see "Codecs: Encoders Screen" on page 2-7). The Codecs use the Opus compression algorithm and support SRT for enhanced security and reliability. On this screen, you can see various information about each encoder including its audio source if one is connected, packet counts and bitrate, connect time and error count.

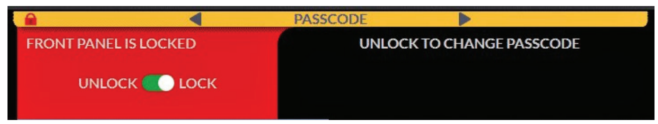
Codecs: Decoders Screen



As mentioned above, Codecs in BLADE-4 are an optional, licensed feature. To obtain a license to use the Codecs, please contact the Wheatstone Sales Department.

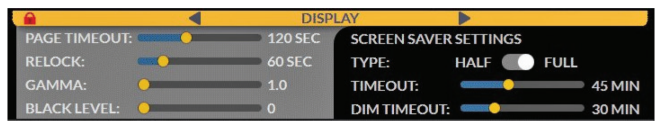
The Codecs have full send/receive capability for remote audio using the ISP which you have connected to the ETH B Ethernet port, with the BLADE-4 set up in WNIP and WAN configuration (see “Codecs: Decoders Screen” on page 2-7). The Codecs use the Opus compression algorithm and support SRT for enhanced security and reliability. On this screen, you can see various information about each decoder including the address of any connected remote sender, packet counts and bitrate, connect time, buffers and error count.

Passcode Screen



On this screen, you can set a two-digit passcode to secure front panel access. Simply select a digit in each passcode field and click SUBMIT. You will be asked if you are sure, because once you do this you will no longer be able to make system changes from the front panel without the code. If you forget your front panel passcode,you will need to factory reset the BLADE-4 in order to regain front panel configuration access. You will still be able to fully configure the BLADE-4 from the WheatNet-IP Navigator GUI.

Display Screen



The Display Screen is where you configure a number of settings that control how the BLADE-4 display works:

Page Timeout: If you have selected or enabled a setting on a page but haven’t touched it for a period of time equal to the Page Timeout setting, that setting will timeout and the page will go back to its initial settings. Range is from 10 seconds to 300 seconds. Default setting is 30 seconds.

Relock: If you have enabled the Passcode, this is the screen idle time until the front panel locks after having been unlocked. Range is from 10 seconds to 300 seconds. Default setting is 30 seconds.

Gamma: Adjusting the Gamma level provides a better way to control the “brightness” of the screen than an ordinary “brightness” control. The Gamma setting doesn’t adjust the blacks on the screen, so use it in combination with the Black Level control (see below) to make the screen look the way you want. Default setting is 1.0. Range is from 1.0-4.0.

Black Level: Used in combination with Gamma to adjust the blacks on the display. Setting is from 0 to 128, with 0 being the darkest blacks and 128 being the lightest. Default setting is full black (0).

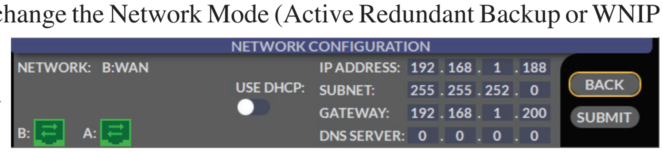
On the right-hand side of the Display Screen you can set the type of Screensave and the timeouts for it. The **HALF** setting will only apply the screensaver to the right side of the screen, leaving the Input and Output levels on the left side visible at all times. The **FULL** setting will apply the screensaver, after the timeout has been reached, to the entire screen.

Timeout: The amount of idle time after which the screensaver will automatically turn on. Range is from OFF to 120 minutes. Default setting is 2 minutes.

Dim Timeout: The amount of idle time after which the screen will automatically turn on. This setting ranges from OFF to 120 minutes as well. Default setting is 1 minute. Using the Dim function, especially where the Blade front panel is not normally seen (rack rooms, transmitter sites, etc.) will extend the life of the LCD display and backlight LEDs. Touching the front panel controls instantly defeats the Dim function for when you need to use the front panel.

Network Configuration Screen

The Network Configuration Screen allows you to set or change the Network Mode (Active Redundant Backup or WNIP and WAN), IP addresses, subnet masks, gateways and DNS values for both of the back-panel Ethernet ports. The system will display which port is being configured at the top left of this screen as shown in the photo. Note that if you have set the Network Mode to Active Backup Redundant, you will only have one settings screen. If you have set the mode to WNIP and WAN, you will have two setup screens; one for each port.



The small Ethernet port representations at the bottom left indicate which port or ports are connected. Green indicates a connected port and red indicates a port with no connection. Port A is the primary WNIP port and Port B is either the backup port or the WAN port which is designed to provide connectivity for the BLADE's built-in codecs (when licensed and enabled).

As mentioned above, we recommend allowing the BLADE-4 to select its own IP address based on the selected Blade ID number for most applications. Although DHCP is available for both the ETH A and ETH B ports, it is unlikely that you will need or want to use it for ETH A, which is the connection you will use for all of your BLADE-4 units and other Wheatnet-enabled devices, or for ETH B if you chose Active Backup Redundant mode on initial setup.

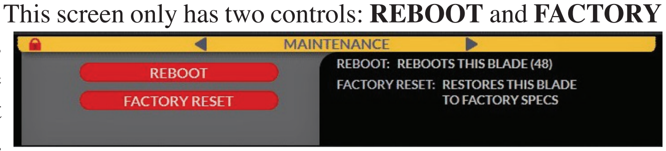
If you have selected the WNIP and WAN networking model for your BLADE-4 and wish to allow the ETH B (WAN) port to operate in DHCP mode, follow the instructions below for the ETH B port.

First, use the selector knob to navigate to the settings for ETH B. Highlight the **USE DHCP** setting and turn the setting on. If not using DHCP, proceed to the IP address settings and use the selector knob to enable a field and set each octet by turning the selector knob/encoder. When done, **SUBMIT** your settings.

When changing the network mode, the DHCP setting or any IP address settings, the BLADE-4 will require a reboot in order for the changes to take effect. The system will prompt you when a reboot is required. Note that you will experience a temporary loss of audio from the blade during the reboot process.

Maintenance Screen

The final front panel screen is the Maintenance Screen. This screen only has two controls: **REBOOT** and **FACTORY RESET**. Performing either of these two functions requires you to pass through the PASSCODE screen. If a passcode has been set for the BLADE-4, you will need to enter that two-digit code in order to perform a reboot or a factory reset.



If no passcode has been set, simply proceed to the SUBMIT button and the action will be performed. You'll likely need this screen only if you are updating optional functions or revising the basic settings of the Blade (Blade ID, etc.)

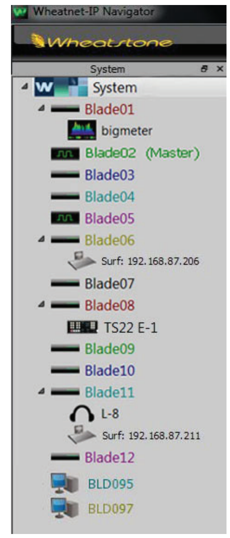
WheatNet-IP Networks

Chapter Contents

WheatNet-IP Networks

What is a WheatNet-IP Network?

What exactly is a “WheatNet-IP network”? Simply put, it is a collection of WheatNet-IP devices and AOIP-driver-equipped PCs connected together via an Ethernet LAN. In a WheatNet-IP network, each device is represented as a “BLADE” with a unique BLADE ID. Each WheatNet-IP rackmount unit is a BLADE, each control surface rackmount engine is a BLADE, and even each driver-equipped PC is a BLADE. The Navigator GUI gives a Windows Explorer-style device tree system view showing all of the devices currently connected in the system.

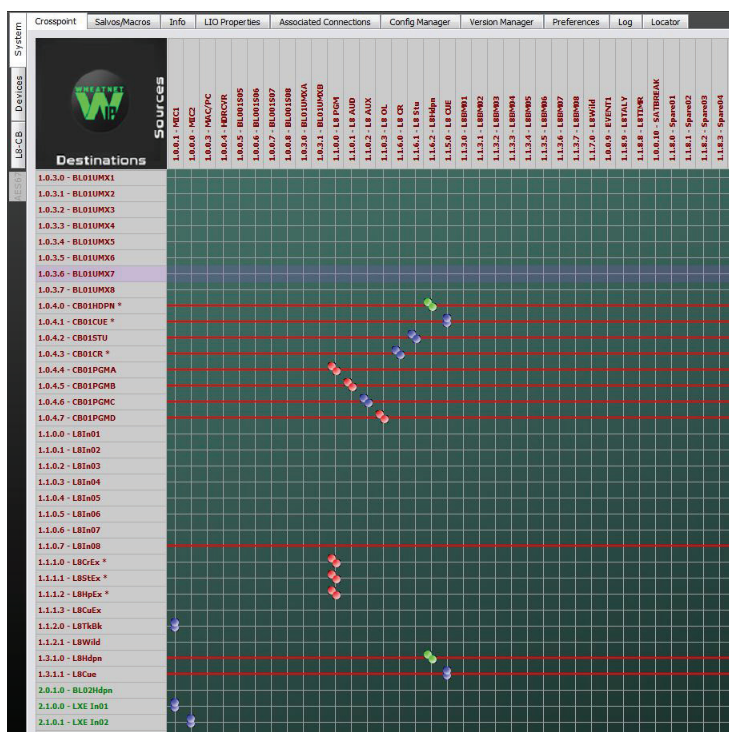


You’ll notice in the example at the right that there are twelve WheatNet-IP rackmount units connected in this system, with IDs 1-12. You’ll notice BLADES 6 and 11 are control surface mix engines, and the control surfaces having IP addressess 192.168.87.206 and 192.168.87.211 respectively are associated with them. Finally, you’ll notice PCs with IDs 95 and 97 connected as well; these might be automation system or production room computers, but in the WheatNet-IP system each is represented as a PC-style BLADE.

This system tree view given by the Navigator GUI is a very handy tool for monitoring your system. It sure beats scrolling through a long list of names from the front panel of a BLADE-4. It will always show your system connection status. This is a very important point and indicates a big feature of the WheatNet-IP system.

Dynamic System

Every WheatNet-IP network system is dynamic. Devices can be added to it or removed from it at will, in real-time, just like computers in your LAN. Creating and managing a LAN is beyond the scope of this manual, but a few things must be taken into account. First, the WheatNet-IP system uses fixed IP addresses for each BLADE, therefore your LAN must have the required IP addresses available. Second, the WheatNet-IP system comes configured with a default IP address scheme to make it easy to configure; the default addresses are 192.168.87.101 through 192.168.87.199, corresponding to BLADE ID=1 to BLADE ID=99. (The IP address 192.168.87.100 should not be used because this is the default address of a new BLADE or one that has been factory reset.) Third, to make sure that audio can be streamed throughout the network without disruption, the bandwidth and traffic patterns on the network must be carefully controlled. For these reasons, Wheatstone strongly recommends that the WheatNet-IP system and its various components be isolated (either physically or virtually) on its own LAN using the default IP addressing scheme. If this is done, a good sized WheatNet-IP system can be brought up and streaming audio in less than an hour.



As you add a WheatNet-IP device to the network (by plugging it in and assigning it a BLADE ID) its associated signals are also automatically added and made available to the system. They will show up in the front panel displays of other BLADEs, and insert themselves into the crosspoint grid of the Navigator GUI. No complicated configuration or IP management is required; the BLADE-4s take care of it all for you.

Should you need to remove a device (say because you want to borrow it to use elsewhere), no problem. Just unplug it from the network and it and its signals will automatically enter the “Inactive Blade” category after a preset timeout. A restart of Navigator will remove the BLADE from the Inactive Blade list.. Later on, if you want to add it back in, again no problem. Just plug it back in and use the same BLADE ID it previously had when it was in the system. It will reappear in the network with all of its old signal names, logic connections, silence detection settings, etc. The distributed intelligence of the WheatNet-IP system “knew” it was missing and reserved all of the information for when it came back. You don’t have to reconfigure anything.

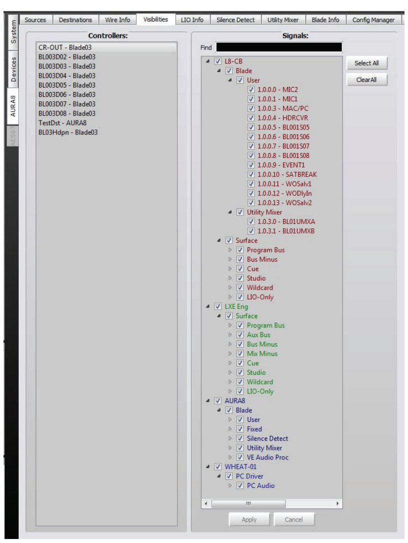
What Does This Network Do?

So what *does* this WheatNet-IP network actually do? Actually, quite a lot of things. First and foremost, it transports audio from one device to another. It matters not whether the devices are analog or digital, rackmount BLADE3s, BLADE-4s, PCs or control surfaces. Once an audio signal is present in the system, it can be made to appear anywhere else with the scroll of a knob or the click of a mouse. That’s all there is to it; go to the destination you want the audio to appear at and click on the source channel you want to appear there and you’re done.

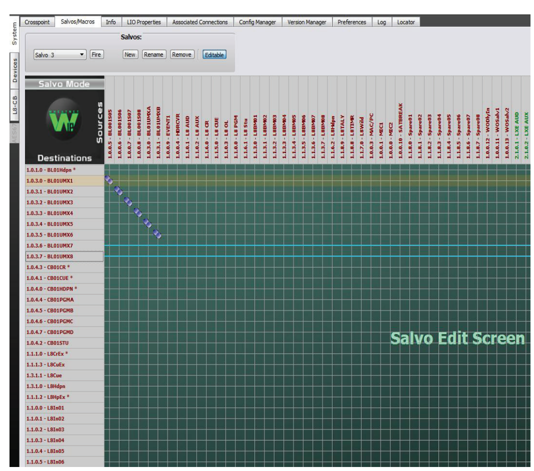
There are some purpose-built extensions to this arrangement. Perhaps you would like a particular destination, say an airchain connection, to be protected from unauthorized connection changes. You can “lock” a connection so that it cannot be changed. Control surfaces automatically issue a temporary connection “lock” whenever a channel goes to the ON state so that someone doesn’t disconnect a source while it is playing out a program channel on the air.

Locking a signal also “locks” any logic associated with the source signal to that particular destination. This is a desired condition, but it can lead to undesired results if the source is taken to multiple destinations. The first destination connected typically will be only one to use the “logic” if assigned.

Maybe you want to restrict connection choices in some places. After all, a large system can have hundreds and hundreds of sources available. Why force your air talent to scroll through hundreds of names looking for the few choices he actually needs to have? You can create a “visibility” list so he or she sees only what you want them to. Each of the hundreds of destinations can have its own visibility settings.

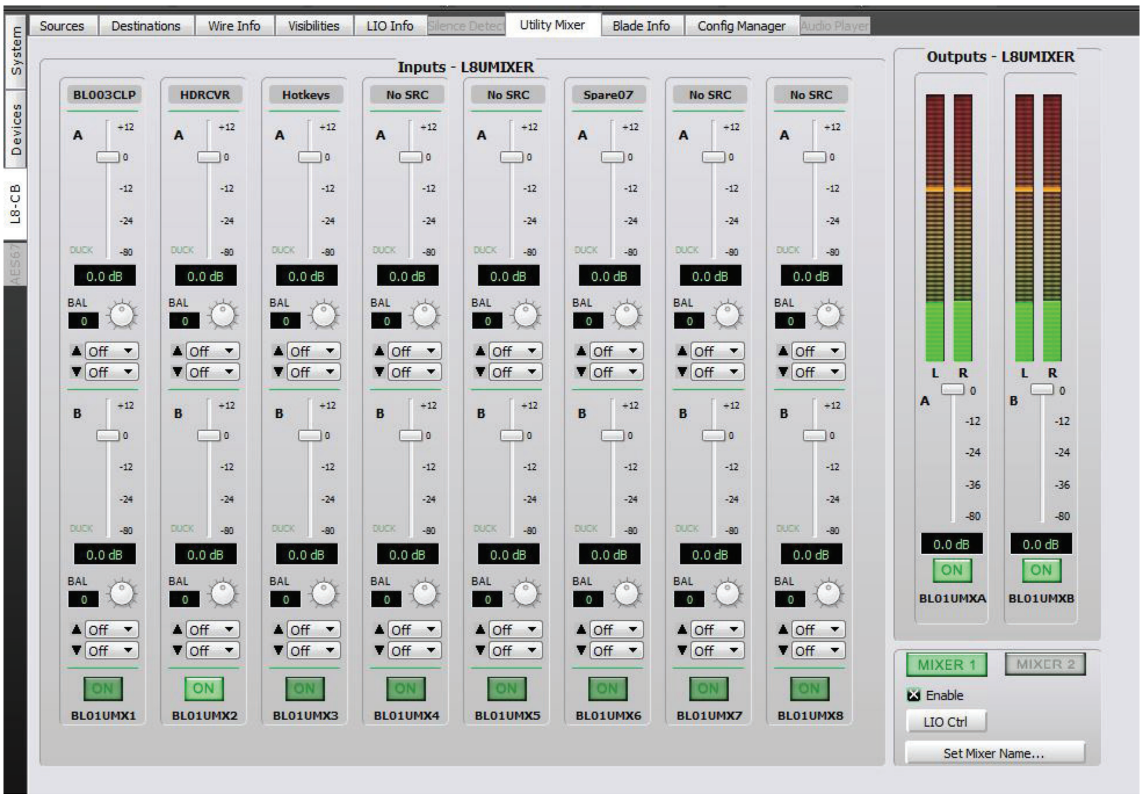


Audio connections can also be combined into groups. We call these salvos. A salvo can be an assortment of up to 120 connections. Once defined, all of these multiple connection changes can be initiated with a single mouse click. These salvos can also be programmed to fire from logic connections or control surface buttons, making it easy to manage large changes. They can even be programmed to fire based on time of day from the Event Scheduler software.

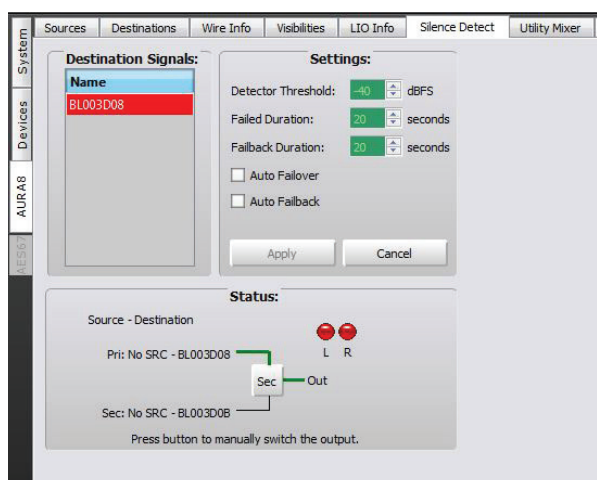


Audio connections can be mixed, or combined together. That’s obviously what a control surface is for. You assign various sources to the fader channels (in the WheatNet-IP system, console fader channels appear as destinations just like physical outputs do) and combine them into different buses and/or outputs, which can then be sent on to other destinations (again, in the WheatNet-IP system, all of the mix buses and console outputs appear as sources, just like physical inputs do). This is a huge advantage in system design, because you don’t need to buy physical inputs or outputs for your consoles, nor do you need to buy distribution amps to get the same signal to multiple places. You need only one connection for each physical input or output device (say a microphone or speaker) and the WheatNet-IP network takes care of the rest.

But control surfaces aren't the only ways you can combine signals in the WheatNet-IP system. After all, a control surface can be a fairly expensive proposition if all you need to do is mix a few channels together. So each rackmount BLADE-4 includes two built-in Utility Mixers. Each mixer can select up to eight WheatNet-IP network sources, and provides two stereo buses which become available throughout the WheatNet-IP network. Each mixer channel has a separate fader for each bus output in the same mixer. The mixers are configured with the Navigator GUI, with the mixer inputs showing up in the crosspoint grid as destinations and the mixer bus outputs showing up as sources. And, for simple summing, such as combining the left and right channels of a stereo source into a mono destination, the WheatNet-IP system does that too.



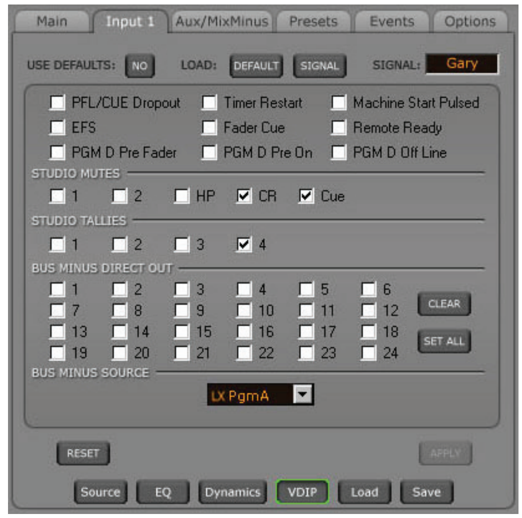
What about when an audio connection goes bad? You'll be pleased to know that each physical output destination in each and every BLADE-4 has the ability to automatically detect silence and, if need be, switch to an alternate source defined by you should the silence endure for longer than a specified period. Furthermore, it can be programmed to automatically switch back when the audio is restored. You can use this extensive capability to map out multiple levels of automatic failover to enhance your system's reliability. If a program output from a control room goes away, you can switch to an alternate. If a mix-minus feed to a remote drops out, you can feed him a back up. If your entire network goes down, you can have the BLADE-4 that feeds your air chain switch to a backup playback machine and start it playing. Because every output on every BLADE-4 has this capability, you can layer as many levels of failover as you care to.



With the optional CLIP players (two available on every BLADE-4) you can simply have the BLADE itself play music from a pre-determined playlist that you have uploaded until the desired audio source comes back.

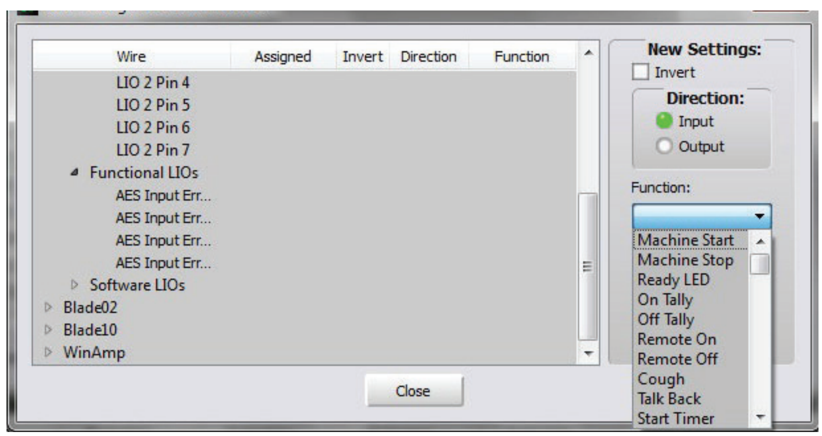
Consult the Navigator GUI section of this manual for specific details on audio signals, connections, salvos, mixing, CLIP players and more.

What About Logic?



There's more that the WheatNet-IP network can do besides transport audio. It can also transport logic changes. No modern broadcast facility can operate without logic control. This is what lights a warning light when a studio goes On-Air, mutes the speakers when a microphone turns on, starts a playback machine when a console button is pushed, or starts a recording when a relay is closed. The WheatNet-IP network transports logic change information between every BLADE-4, control surface, and PC that is attached to the system, via the same CAT5/5e/6 LAN connections and Ethernet switches used for audio. You don't need to add anything. Each physical BLADE-4 has 12 general purpose logic connections that can be individually mapped as inputs or outputs. Each control surface has a number of automatically defined logic functions (Start, Stop, On, etc.) for each fader, as well as a number of programmable buttons and indicators, plus an assortment of mutes, tallies, and other functions. Between the jacks on the BLADE-4s for physical connections and all of the virtual ones on the control surfaces, just about any logic function you need can be accomplished. On top of that, Wheatstone can provide dedicated switch panels for host and talent locations, some of which contain their own scripting language for creating complex conditional logic configurations.

Built-In Functions



Logic functions in the WheatNet-IP system come in a number of different types. First there is the simple but direct self-contained functions that are typically found in consoles and control surfaces. "If this mic channel is on then mute the control room output" and "if this channel is turned on then start the timer" are examples of direct logic. In the WheatNet-IP system, these functions and many similar ones are programmed in the VDIP (Virtual DIPswitch) screens of the control surfaces.

Audio-Associated Logic

A second type of logic in the WheatNet-IP system is audio associated logic. A "START" or "STOP" command for a playback device or an "ON" or "OFF" command for a microphone channel is an example of audio associated logic. What we mean by audio associated is that the particular logic function is "associated with," or "belongs to" the audio signal being programmed. For instance, playback deck 1 of your Automation PC has a START command reserved only for deck 1, and playback deck 2 has a similar START command reserved for deck 2. If you make audio connections between these playback decks and faders 1 and 2 of a control surface, how can you use the buttons on the surface to activate the playback? In the WheatNet-IP system, audio channels can have these common logic functions "associated" with the audio such that any other device (such as a control surface for instance) that has matching logic functions associated with it will allow the logic functions to work as long as there is a crosspoint connection (which is of course necessary for the audio to flow) between them. Audio associated logic is very powerful, because the "associations" take care of most of your common logic functions without lots of physical wired connections or undue programming. In the WheatNet-IP system, as many as 12 logic functions can be attached to each audio signal.

Discrete Logic

A third type of logic in the WheatNet-IP system is discrete logic. In this case you have some input device somewhere that needs to control some output device somewhere else. A profanity delay DUMP button is a good example. This is where the 12 physical logic connections on each BLADE-4 come in especially handy. In the WheatNet-IP system, you can create a special class of signal called “LIO only.” These signals appear in the crosspoint matrix as logic “sources,” i.e. switches, and logic “destinations,” i.e. relays or indicators. When a logic source is cross connected to a logic destination, via the Navigator GUI for instance, then the logic state of the source will affect the logic state of the destination; the switch will fire the relay. No actual logic wiring between the switch and the relay is required, it all happens (with sub millisecond latency, by the way) over the LAN.

Action Logic

A fourth type of logic function in the WheatNet-IP system is called “action logic.” This is where you want some kind of system action to be controlled by a logic state. An example of this might be switches that are programmed to fire a salvo, or make a connection, or recall a control surface preset. Action logic is easily programmed with the Navigator GUI and is described in detail along with the other logic types in the GUI section of this manual.

One of the most challenging parts of any logic system is getting it all right, making sure the senses, polarities, timing, and connections are all correct. In the WheatNet-IP system we provide a number of useful tools to help. First of all, logic pin outs, functions, and polarities can all be changed with a click of a mouse. You can also specify what you want a logic connection to do when it’s disconnected (go to a specific state or retain its last setting), and then change your mind about it later. Each logic input or output is fully independent and not linked into a scheme or template that uses them up needlessly. The physical logic connections on each BLADE-4 are fully programmable; they can be all inputs, all outputs, or any combination. Changing them is simple via the Navigator GUI. The GUI provides on-screen indication of logic state changes so you can see that your buttons are actually triggering the right ports. The BLADE-4s themselves have a logic test display mode that will show the state changes on every logic input or output. They also have a front panel LOGIC PORTS indicators that show status for active logic and direction (in or out) of the BLADE-4. Best of all, the WheatNet-IP logic functionality is a completely integrated part of the WheatNet-IP system itself and does not require the Navigator GUI or any other PC to be running to make it work. The GUI is needed only for programming.

There is one last feature of a WheatNet-IP audio system that should be mentioned. Because WheatNet-IP is based on standard network models, the system has SNMP capability. Simple Network Management Protocol is a standard built into some networked devices to allow for a third party remote program to query them and retrieve important information regarding the status and operation of the networked devices. Depending on its complexity and set up, this remote program can acquire statistics, issue alarms, and even send email reports of the systems functionality. Consult the “Ethernet Networks and Switches” chapter of this manual for more information regarding the SNMP capability of WheatNet-IP systems.

The above descriptions of the functionality of the WheatNet-IP system are a brief overview of what it can do. For more details about these functions and others, please read the Navigator GUI section of this manual.

Ethernet Networks and Switches

Chapter Contents

Ethernet Networks and Switches

Overview

The underlying network plays a major role in the successful deployment of your WheatNet-IP system. In the IP audio world, the Ethernet network is the analog of the punch block wall in a traditional broadcast plant. As such, careful consideration should be given to network topology when planning the installation. Because the size and type of network you design and deploy directly depends on the amount of WheatNet-IP and surface hardware you are installing, it is wise to build a network that has reasonable overhead and room to grow as formats and audio distribution needs change over time.

Gigabit Ethernet Technology

The WheatNet-IP system uses 1000BASE-T gigabit Ethernet technology exclusively to transport audio and control packets between BLADE-4s. Because the WheatNet-IP system uses gigabit connectivity, the possibility of link overload is drastically reduced when compared to competing 100BASE-TX systems. Each Gigabit connection is capable of handling literally hundreds of audio streams, along with associated GPIO, system configuration, and network monitoring capabilities. Advantageously, the cost of gigabit technology is rapidly decreasing due to economy of scale benefits gained by cross -application use of the technology.

Choosing Ethernet Switches

There are literally hundreds of choices of Ethernet switches on the market today. Chances are you have a compatible switch in your facility already. However it is recommended that the WheatNet-IP network be isolated from any existing network using separate switches or a unique VLAN on existing switches.

Switch Feature Considerations

10/100/1000 Ports – When looking at switches, make sure all the ports support full-duplex 1000BASE-T connections. Some switch models are touted as Gigabit, but really only have one or two 1000BASE-T ports.

- **Hubs** – Packets entering a hub or repeater are broadcast out of every other port on the device. Hubs are not useful for Audio Over IP networks except for the occasional use as a troubleshooting tool.
- **Throughput** – This is an important specification when deciding on a Gigabit switch. Throughput is the amount of cumulative data traffic a switch is capable of transceiving. Ideally an eight-port 1000BASE-T switch should incorporate at least an 8Gbps non-blocking switch fabric. Low throughput switches typically use input buffering techniques susceptible to Head-Of-Line blocking which can adversely affect the real time performance of medium to large IP audio networks.
- **Rack Mounting** – Rack mounting is a useful option for most broadcast systems.
- **Chassis Based** – Large enterprise systems may benefit from installing or expanding existing chassis-based managed switch solutions.

Unmanaged vs. Managed Switches

An unmanaged Ethernet switch is a low cost WYSIWYG device and has no configuration software interface. Unmanaged switches do not support IGMP snooping and will therefore act as repeaters to IP audio multicast packets, effectively flooding all ports with audio packet traffic. They may be useful for troubleshooting multicast ethernet traffic problems but, like hubs, should not be used for your Wheatnet audio network.

Managed switches, on the other hand, allow users to configure the switch hardware with a software interface of some kind, such as Telnet, Web, Terminal, etc. Primary configuration features applicable to your Ethernet audio network are the ability to configure VLAN's, IGMP management, built in diagnostics, and routing. We highly recommend the deployment of managed switches throughout the network.

Managed switches fall into several market niches. Low end managed switches, or "Smart Switches," offer some configuration, but may not provide the level of configurability required in a medium to large Ethernet audio network. For example, these switches may forward IGMP host messages and multicast traffic but cannot act as the IGMP router. In medium to large applications at least one switch capable of being the IGMP Querier is required. Mid-priced managed switches are better suited to the task and will provide more configuration flexibility.

In larger systems it makes sense to employ a "core and edge" model. This type of system balances the switching horsepower (cost) according to the throughput requirements at different physical segments of the network. Lighter bandwidth "edge" segments can use lower cost switches, while central rack room "core" segments utilize higher performance devices.

Rules of Thumb

The WheatNet-IP system requires that an IGMP-compliant, managed switch be used.

In large systems, careful attention must be paid to the placement of core and edge switches.

- Each I/O (88a, 88d, 88ad) BLADE-4 requires 36.9Mb/s for eight Stereo connections.
- Each I/O (88a, 88d, 88ad) BLADE-4 Requires 73.7Mb/s for 16 Mono connections.
- Each Engine (e) requires 147.5Mb/s for 32 unique stereo connection streams.
- Each Surface requires an Engine (e) connected to the same GbE switch.
- Each PC driver requires 19.6Mb/s for eight Stereo outputs.
- An aggregate of eight BLADE-4s (64 streams) requires roughly 295Mb/s of bandwidth when each BLADE-4 has eight stereo connections.

The Multicast channels used by the WheatNet-IP System are as follows:

- one per audio source
- one for system announce and control messages
- one for metering data

What's on the Wire?

The WheatNet-IP system uses the standard 1000BASE-T gigabit Ethernet hardware infrastructure to distribute audio, logic, and control over copper UTP CAT5/5e or CAT6 cable. Because the WheatNet-IP system uses a standard, non-proprietary Ethernet network for connecting devices, the digital audio network supports the universal suite of Ethernet protocols, including TCP/IP, HTTP, FTP, Telnet, SNMP, RTP, IGMP, etc.

The WheatNet-IP system software utilizes RFC standards initially developed for VoIP applications to synchronize and distribute packetized audio between BLADE-4s (nodes), control surface processing, and PC's. Specifically, the Internet Group Management Protocol (IGMP) is used to manage the distribution of multicast audio packets, which are integral to WheatNet-IP design.

Designing the WheatNet-IP Network

Where to Start

Before you buy any network equipment, it may be beneficial to sketch out or formally draw a block diagram of your system. A few typical system block diagrams are included later in this chapter for your reference. Note the number of Ethernet ports required, wire length estimates, potential Ethernet switch locations as well as the number of BLADE-4s, PC drivers, and control surfaces. Remember this exercise is intended to give you a general idea on what physical topology might work best in your facility so it is probably best not to get bogged down in the details. This information will also help guide you in network hardware purchasing decisions.

Many small Ethernet audio network applications may be assembled without much preparation or difficulty while medium to large systems will require careful planning to eliminate potential bottlenecks. When designing your Ethernet audio network it is useful to consider the following parameters:

- **Scope** – Does the network design meet current interconnectivity requirements?
- **Physical Infrastructure** – Topology, switch placement, CAT5/5e/CAT6 cabling.
- **Throughput** – Is there enough switching throughput?
- **Headroom** – Is there room for growth built into the network?
- **Applications** – Will this be an audio only or shared use network?
- **Serviceability** – What is the maintenance plan?
- **Monitoring** – What network monitoring software tools are required?
- **Remote Access** – Is there a secure path to remotely monitor or troubleshoot the network?

Cabling

The wiring requirements for the WheatNet-IP system follow the specifications for 1000BASE-T set forth in IEEE 802.3ab. That specification calls for UTP CAT5e or CAT6 cabling, jacks, and patch cables to be used throughout the network. When wiring with CAT6 cable, use CAT6 rated RJ-45 connectors that are designed to accommodate the thicker wire insulation. Note that unlike common 1000BASE-T/100BASE-TX Ethernet networks, the 1000BASE-T gigabit networks use all four twisted pairs inside the cable. This specification requirement makes the system less tolerant of problems stemming from sub-standard wiring installation. Because Auto-negotiation is part of the 1000BASE-T specification either straight or crossover cabling may be used. We recommend that all cables be wired identically simply to avoid potential confusion.

One often-overlooked but critical step in the installation of Ethernet networks is Certification. Poor installation methods can easily degrade your CAT5/5e/6 cabling into CAT3 performance. It is recommended that all Ethernet audio network cable runs and patch cords be certified onsite to confirm that wiring patterns, bandwidth, and cable length all meet specifications. This relatively easy but important step gives you peace of mind and can save hours of troubleshooting time chasing connectivity and bandwidth problems.

GbE Network Cabling Guidelines

- 1000BASE-T Standard – All four twisted pairs are used.
- Use UTP CAT5e or CAT6 cable exclusively.
- Use the correct connectors for the cable type.

- Certify all end to end runs and patch cables.
- 100M (328ft) port to port distance limit.
- Auto-MDI/MDI-X supported on GbE switches.
- Switches may be linked with fiber using GBIC modules.

1000BASE-T vs. 1000BASE-TX

Note that these very similarly named standards specify different wiring methods. The prevailing Gigabit Ethernet 1000BASE-T standard uses all four pairs of wire, while the outdated 1000BASE-TX standard uses only two pairs. To add to the confusion some products marketed as 1000BASE-TX may actually be 1000BASE-T designs.

Wireless Connectivity

Wireless routers of the 802.11ab/g/n variety are currently not up to the task of reliably distributing multicast audio at the data rates required by the system. Each audio stream requires between 3600 and 4000 packets (depending on system sample rate) per second, continuously with no breaks or pauses. Wi-Fi was never intended for this degree of packet rate. A wireless access point could be added to the network but should only be used for administration, monitoring, or remote access purposes.

Configuring the Network

The WheatNet-IP system is very friendly when it comes to network configuration. By default, BLADE-4s will configure their IP Address and Multicast parameters automatically based on the BLADE-4 ID number. This auto-configuration method is similar to the Dynamic Host Configuration Protocol (DHCP) used on many Ethernet networks to configure PC wired and wireless NIC's on power-up. A provision for user override of this functionality is provided for customers wishing to manually configure their network.

Configuring your WheatNet-IP network breaks down into four categories:

- Managed Switch configuration
- BLADE-4 configuration
- Surface configuration
- PC Configuration

Managed Switch Configuration

At first glance, the number of configuration options for a managed switch can be overwhelming. Luckily, there are only a few parameters that need to be configured on the managed switch to set it up for WheatNet-IP multicast traffic.

Default LAN Parameters

- IP Address Settings – Set the IP address of the core switch or WheatNet-IP VLAN to 192.168.87.1.
- Stacking switches – Give each subsequent switch an IP address on the same subnet.
- VLAN's – Modern managed switches allow the user to segment any number of ports into a VLAN or Virtual Local Area Network. This collection of ports is identified by a static base IP address and Subnet mask and, more importantly, constitutes a discrete Broadcast Domain. Segmenting a network into discrete Broadcast Domains allows you to control which ports send and receive the Multicast audio packets. VLAN's may be segmented across multiple

managed switches connected to the core switch. Most switches that are capable of VLANs come out of the box with a default VLAN configured. You must assign an IP address to the default VLAN. For Sample Configuration Refer to the *"Configuring a Cisco 2960"* section in Appendix 1.

- IGMP – IGMP will need to be enabled on the switches or VLANs designated for the WheatNet-IP system. Settings may vary among switch manufacturers. When configuring Standard and Advanced IP services always refer to the switch documentation for setup specifics. For Sample Configuration Refer to the *"Configuring a Cisco 2960"* section in Appendix 1.
- Spanning-Tree Portfast – It is recommended that Portfast be enabled only on switch ports connecting to a single BLADE-4. This allows the BLADE-4 to join the network immediately on power up, bypassing the listen and learn states.

Note: If you enable Portfast on a port connecting another network device such as a switch, you can create network loops. Use Caution when enabling Portfast.

BLADE-4 Configuration

The Quick Start Guide provides details on quickly setting up a BLADE-4. Note that some of the parameters listed below will automatically be created based on the BLADE-4 ID number you enter.

Important! Before you plug the BLADE-4 into the Network, be sure to set a unique BLADE-4 ID or perform a factory reset on the BLADE.

The following parameters must be configured on a BLADE-4.

- BLADE-4 ID number – This device number must be selected and entered by the user on each BLADE-4 in order to uniquely identify the BLADE-4 in the system.
- IP addressing – All WheatNet-IP devices use dynamic IP addressing based on their BLADE-4 ID number. Each device is given an IP address in the 192.168.87.xxx scheme, starting at .101 for the box with BLADE-4 ID 1 and so on. Default address is 192.168.87.100 so as not to clobber any existing BLADEs when first connected to your system.
- You can override the automatic setup and have full control over IP addressing.
- Subnet Mask – The default 255.255.255.0 will work in most systems. This allows for 254 devices on the audio network.
- Gateways – Gateways may be employed for remote access and routing purposes.
- Ports – The system uses the following TCP/IP Ports - See Table below.

PORT	PURPOSE
23000	Telnet to Play Service
50000	GUI Connect
50100	Metronome Multicast Stream
51000	Web/XML Multicast Stream
52000	Announce Channel Multicast Stream
52001	Logged Channel Multicast Stream
52002	Meter Multicast Stream
55776	Automation Control Interface
60000	Surface Channel

Surface Configuration

Each Wheatstone surface has its own method of configuration. Some surfaces are configured via an attached HDMI monitor and mouse (or touchscreen), others are configured by means of a dedicated Surface Setup GUI program that runs on a PC connected to your Wheatnet network. See the surface's manual or Quickstart Guide for surface setup details.

Network Interface Card (NIC)

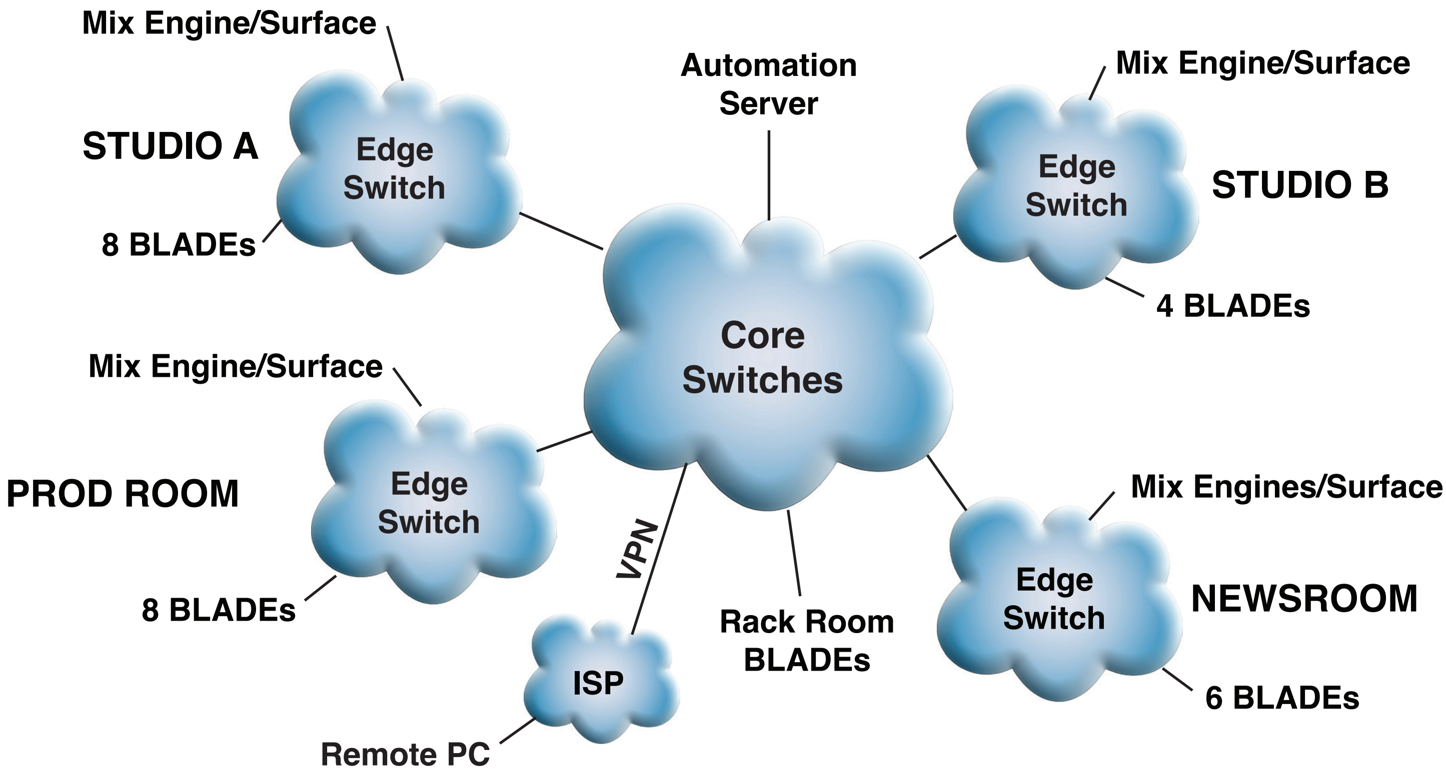
It is recommended that a multi-home connection method be used on PCs that need to be connected to an office LAN while also connecting to the WheatNet-IP network. This will require a second NIC in the PC. There are many types of Network Interface Card on the market. While many of them may work for this application there may be some that do not perform well under such demanding conditions. "Server-grade" cards perform very well in this environment.

There are a few settings that can help improve the performance of many of the available cards:

- Disable Windows Power management on the Interface card.
- Set the Speed and Duplex to Auto negotiate (Default).
- Disable the Windows firewall.

Wheatstone Tech Support can provide an up-to-date document detailing other NIC settings that will help optimize your AOIP driver performance and reliability.

Typical Network Block Diagram



Network Troubleshooting

A variety of free software based tools can be effective in verifying, maintaining and troubleshooting network performance and configuration. Some rudimentary network testing may be done from the Command line in a DOS window using standard Internet Control Message Protocol (ICMP) commands built into Windows shell. A freeware or full blown network analysis program can be valuable when troubleshooting medium to large installations. Many managed switches include built in port traffic analysis using a web interface to the hardware.

Useful ICMP Commands

- **Ping** – Use this command to confirm that a device at a specific IP address is actually "talking" on the network. At the C:\> prompt in a command window type **ping xxx.xxx.xxx.xxx** where the x characters represent the IP address of the device.

- **TraceRoute** – Use this command to find the path a PC takes to get from point a to b. At the C:\> prompt in a command window type **tracert xxx.xxx.xxx.xxx** where the x characters represent the IP address of the destination you are tracing.

- **Ipconfig** – This is actually a console application in Windows that will display the network parameters configured for any network interface card installed on the PC.

Software Tools

- **WheatNet-IP GUI** – This Wheatstone application (called Navigator) accesses configuration, status messaging, and error logging of all connected WheatNet-IP hardware.

- **WireShark** – This freeware (GNU) Network Protocol analyzer offers a comprehensive look at network traffic down to the packet payload level.

- **SNMP** – Third party software can monitor the devices using SNMP. The MIBs created for the BLADE-4 will allow users to monitor things like last boot time, Internal Temperature, Network Traffic, etc.

Simple Network Management Protocol (SNMP)

SNMP forms a 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 BLADE-4s for conditions that may require action by the end user.

SNMP uses a manager/agent model that presents the information to the end user. A software component called the agent runs on the network device and sends the management information to the managing system. The managing system is the application that the end user needs to organize the information. The manager and the agent use a Management Information Base (MIB) and a small command set to exchange information.

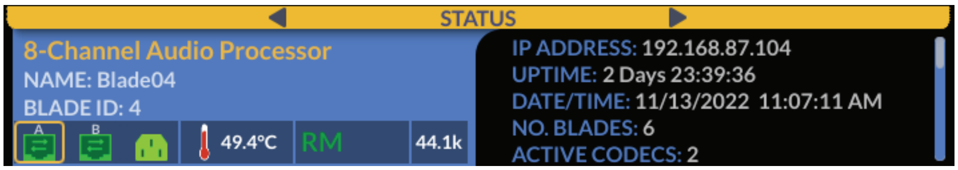
The WheatNet-IP system provides information such as Uptime, Transmit and Receive packets, CPU utilization, and others. This information can be useful in locating potential issues and correcting the issues before they have an impact on the performance of the system.

There are numerous SNMP management systems available for collecting and displaying the SNMP information provided by the WNIP system, ranging from the free to the very expensive depending on the level of functionality provided.

Hardware Status Indicators

Check that your hardware meets the following parameters:

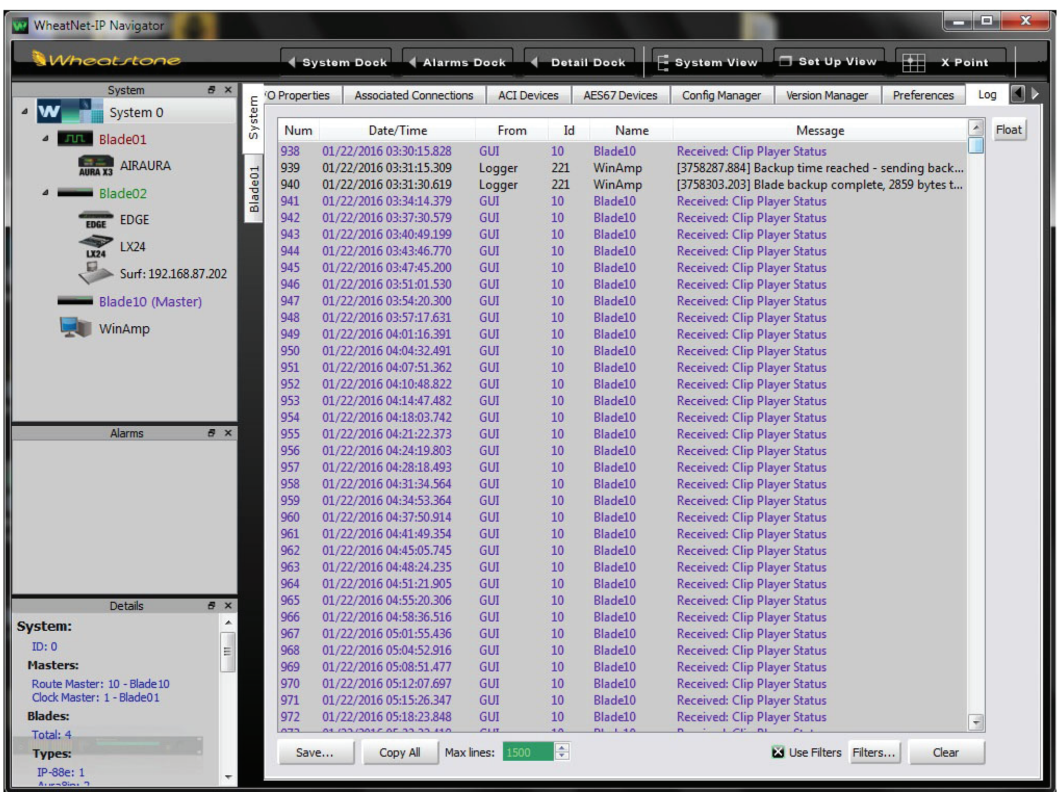
- Switch LED's – No Link LED's: check wiring is CAT5e or better, check switch port configuration is GbE compliant, patch cables, full duplex, certify wiring.
- NIC Issues – Confirm NIC's are GigabitE, check IP config on PC.
- BLADE-4 Front-panel Status indicators



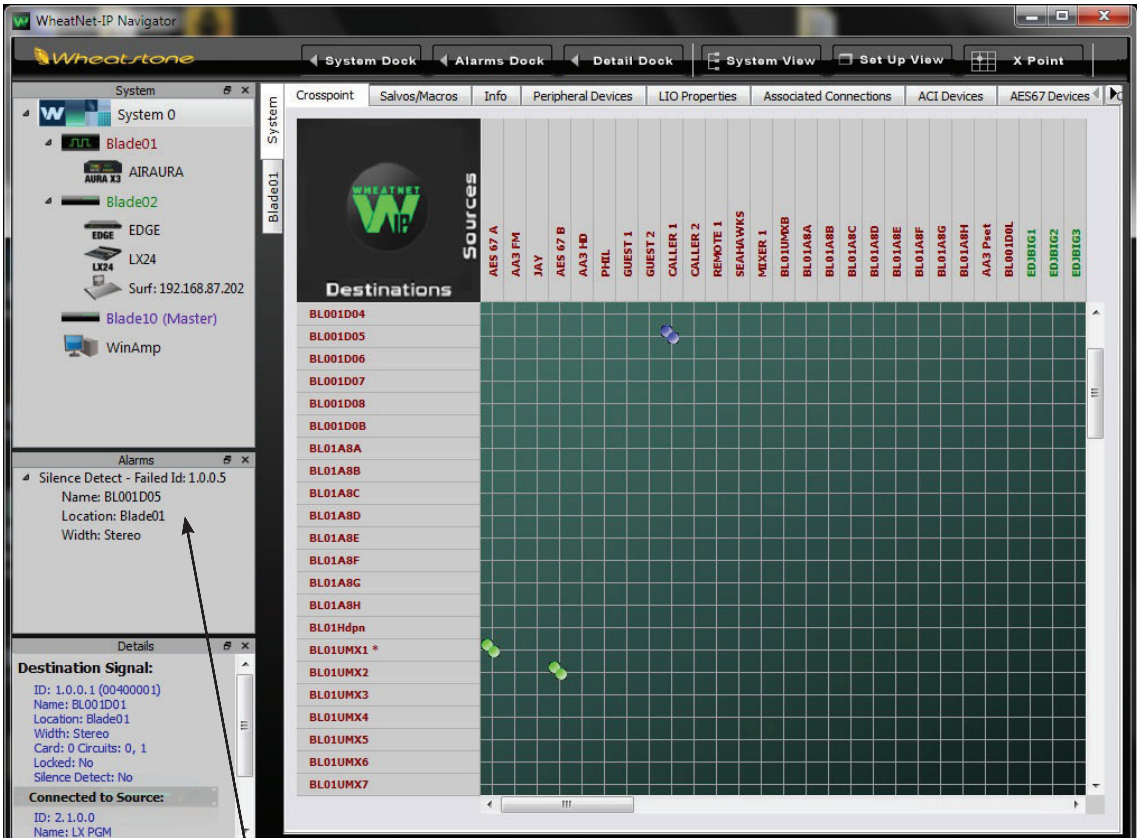
Error Logs

In the WheatNet-IP system there are several places you can view logs to aid in troubleshooting. The PC GUI provides system wide logging to help pinpoint where a problem may exist. The PC GUI also has an "Alarms" section that displays any message that may require user attention such as silence detection notification.

PC GUI Log



Alarms



Silence Detected on Output

WheatNet-IP Navigator

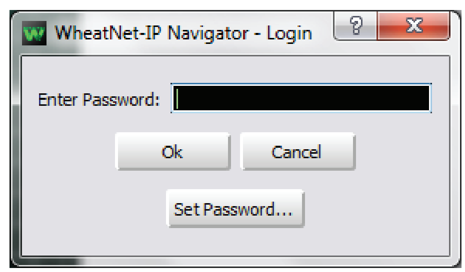
Chapter Contents

WheatNet-IP Navigator GUI

Description

The Navigator GUI is an optional software program designed to administer and manipulate WheatNet-IP-networked audio systems. The use of this program is strictly optional, however we strongly recommend it because it makes many system functions much easier. Anyone who has tried to spell out a name via jog wheel and switch on a video game will appreciate how much easier it is to simply type it — especially if there are hundreds of names.

To use the Navigator GUI, it must first be installed on a PC running Windows. This program uses substantial computing power, especially in a large system, so we recommend using a computer with at least an i5 3rd generation processor and 8G memory. Insert the provided USB flash drive into the PC and run the installer program, or run it from the Downloads folder if you have downloaded it from Wheatstone Corporation. Accept all of the suggested defaults unless you have experience with this program and have specific requirements. After the installation process has completed, you will find that the installer left a Navigator GUI shortcut on your desktop. Double-click on the shortcut to launch the program. Before launching the program, you must make sure that the IP address of the PC is compatible with the WheatNet-IP system (it must have a fixed IP address on the .87 subnet). Having made sure of this, double-click on the shortcut to launch the program.



When Navigator is first launched, the GUI opens a dialog box asking for a password. If the correct password is not entered, then system access is denied. The default is no password.

The first thing the program does after launching is to query the network the PC is connected to for any WheatNet-IP system present. This is an important thing to understand. Because WheatNet-IP networks, by their nature, are dynamic, the Navigator GUI can't know ahead of time what the network will be; it must inquire every time it is launched. This process takes anywhere from a few seconds for a small system up to a minute or so for a larger one. You can actually watch this process take place as the GUI discovers BLADEs and adds them to its list.

At the end of the discovery process you will see one of two things. First if the GUI could not find any BLADEs, it means that there is no WheatNet-IP system on its network. Usually this means that your PC is not actually plugged in to the network, or that your PC is running on a different subnet than the WheatNet-IP system. Remember, the default IP settings for BLADEs are all on the .87 subnet; this means your PC must have a fixed IP address of 192.168.87.xxx where xxx is any number not used by a BLADE or other member of the network. Wheatstone recommends 192.168.87.20 if using the default IP scheme from the factory. Go to the TCP/IP properties under the Network Properties section on the Windows Control Panel and verify/change the settings. Additionally on some PC's you may also need to disable the Windows Firewall.

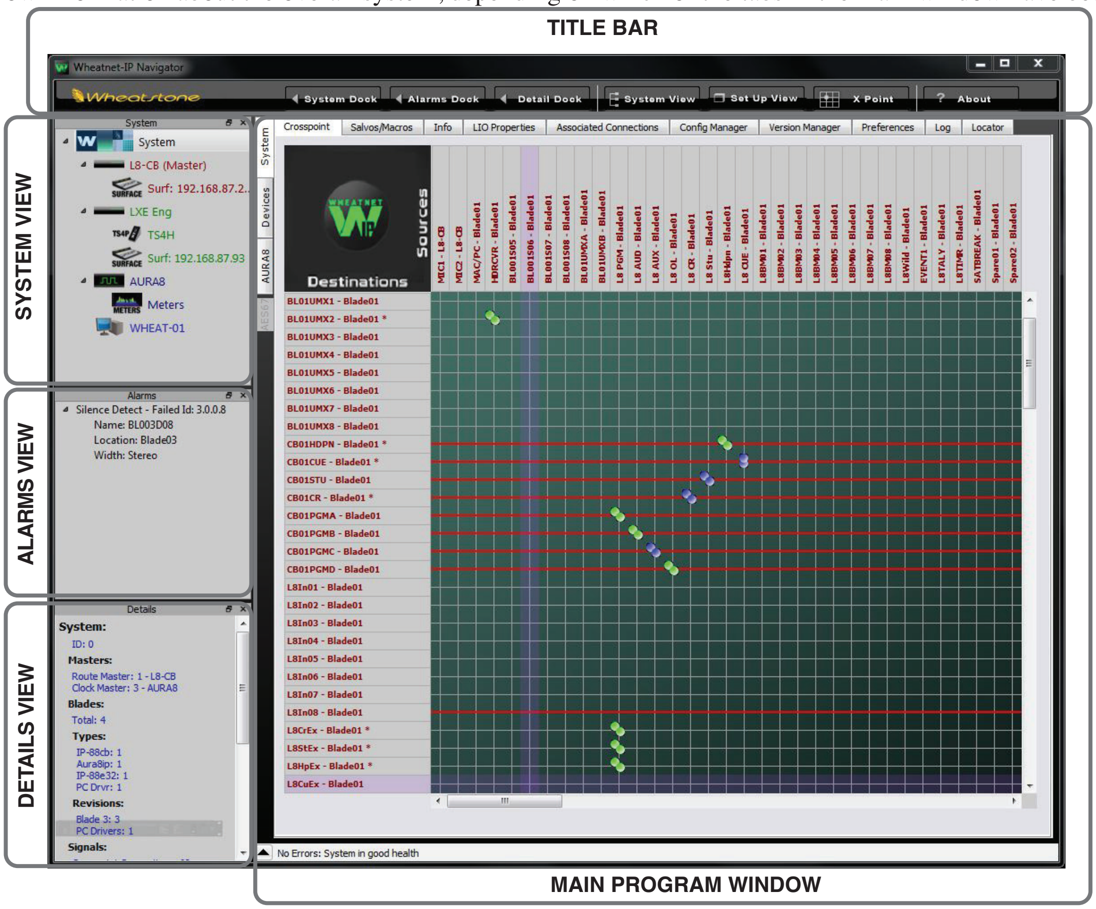
Note: You do not have to use our default IP addressing scheme if your overall facility IP strategy requires you to use something different.

If the PC has been addressed properly, in the left hand pane of the main GUI window, you will see a list of all the BLADEs the GUI was able to discover. In the center of the main window will be a password log-on window. Initially the GUI has no password assigned, so just click OK for now. Later on you can assign a password to prevent unauthorized modifications.

Using the Navigator GUI

The main window of the GUI is divided into several parts. Along the left hand edge are three smaller panes, one above the other. These three panes show the system view, the alarms view, and the details view. Their functions will be described shortly, but for now, just note that they are there, and that you can move and resize them as you would with many Windows programs.

To the right of the three stacked panes is the main program window with two vertical tabs, *System and Devices*, on the top left. Other tabs may be present depending on the devices in your system. Note that the main program window has a number of tabs along its top which, when clicked on, will switch the main window to one of a number of different views dependent on the *System*, *Devices* or other section you are looking at. To familiarize yourself with the action of the various views, first click on the WheatNet-IP *System* icon in the System pane or *System* tab in main window. The main window will show information about the overall system, depending on which of the tabs in the main window have been selected.

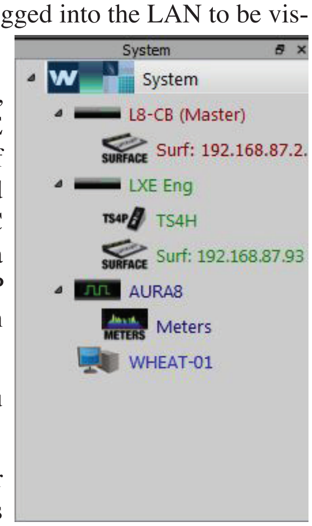


Before we get into the tabs, take a moment to experiment with the system pane. If you've connected properly (remember, because WheatNet-IP networks are dynamic, each BLADE must be powered up and plugged into the LAN to be visible in the system pane) all of the BLADEs in your system will show in the system pane.

Each BLADE is shown with an icon and BLADE ID number. If it is the System Master, the designation *(Master)* will be shown beside the icon. If it is the Clock Master, a BLADE wave image will be overlaid on the icon (more on System Master and Clock Master later). If the BLADE is a mix engine BLADE, then the icon will show a control surface icon attached to it, with the IP address of the corresponding control surface. If the BLADE is a streaming PC BLADE, say one of your Automation Playback machines, the icon will change to represent a PC. Note that for a PC to become a part of a WheatNet-IP system and work with WheatNet-IP audio streams it must first have the WheatNet-IP PC driver software installed on it. Information about this is provided in Appendix 5 of this manual.

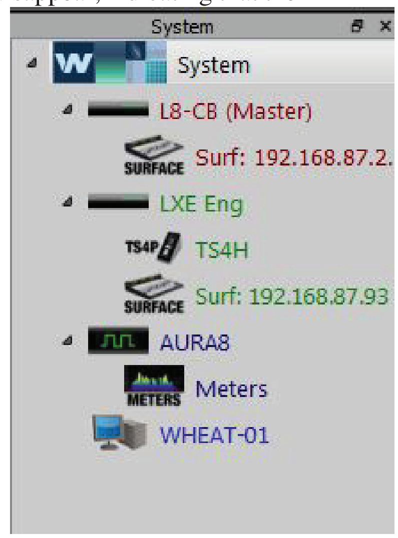
If there are too many BLADEs in your system to all show at once in the system pane, you can use a scroll bar on the right side of the pane to move through the list of BLADEs.

Now take a moment and temporarily unplug the network connection from one of your BLADEs. You'll notice in the system pane window of the GUI, the icon of that BLADE has been overdrawn with a yellow question mark. This is to let you know that a BLADE was a



System Pane

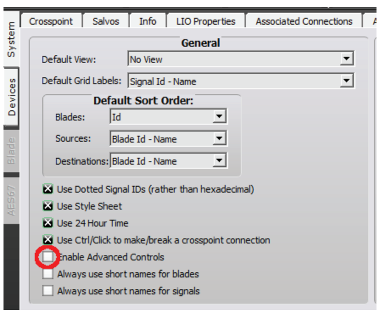
member of your system but has become unavailable. If you ever see this during normal system operation, look for an unplugged network cable, or check to see if the power has been removed from a BLADE or a network switch. A short time after you plug the network cable back into the switch, the yellow question mark will disappear, indicating that the BLADE is available again.



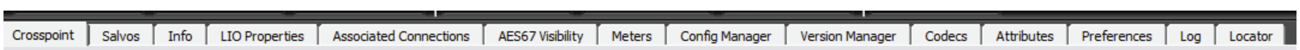
Navigator GUI System Pane

To illustrate the dynamic nature of the WheatNet-IP system, quit the GUI by clicking in the close box at the upper right corner of the GUI window (not the system pane window, please). Unplug one of the BLADEs and relaunch the Navigator GUI. Once the discovery process has been completed, if you check the system pane, the BLADE you unplugged will be missing from the list, as will all of its sources and destinations. Plug the BLADE back in, and after a short while, the BLADE and its sources and destinations will automatically get added back in. You have a dynamic network.

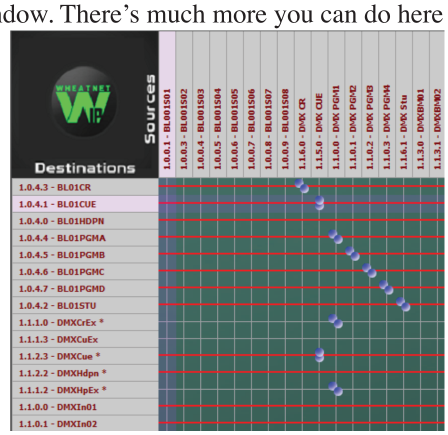
Now let's get back to the tabs. Note that if you do not see all 14 of the tabs shown in the graphic below, you should go to the **System | Preferences** tab and check the box "Enable Advanced Controls." This will require a restart of the Navigator GUI.

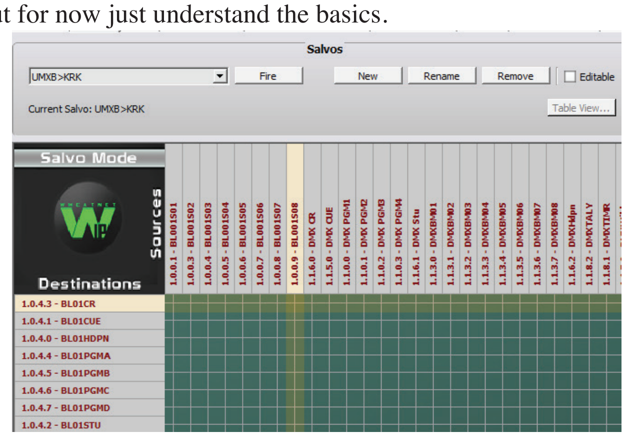


The first tab is labeled *Crosspoint*. It shows a grid with system sources (their eight character names) running horizontally along the top, and the system destinations (again their eight character names) running vertically along the left side. The signal names are shown in different colors, matching the color of their BLADE icon in the system pane. Connections between sources and destinations are shown by a connection icon at the grid intersection of the source and destination. The shape of the connection icon is an indication of the type of signal involved. To make a connection, click on an intersection.

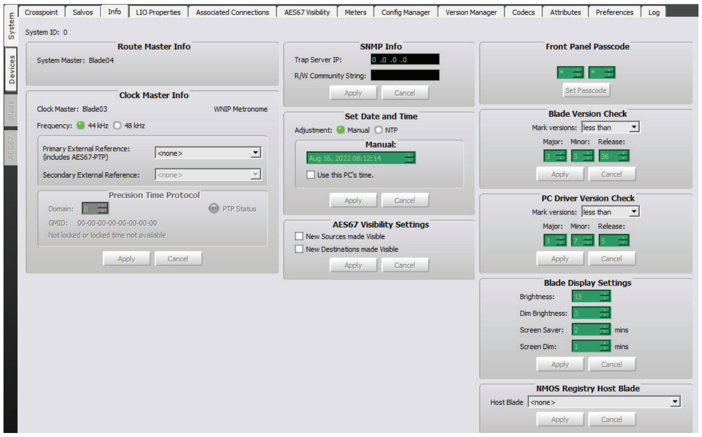


As the connection is made, the appropriate icon will appear. To break a connection, click on the connection icon; the icon will disappear and the connection will be broken. If your system is larger than a couple of BLADEs, then the crosspoint grid will have scroll bars along the bottom and right sides, allowing you to scroll the grid view to see every part of your system window. There's much more you can do here but for now just understand the basics.



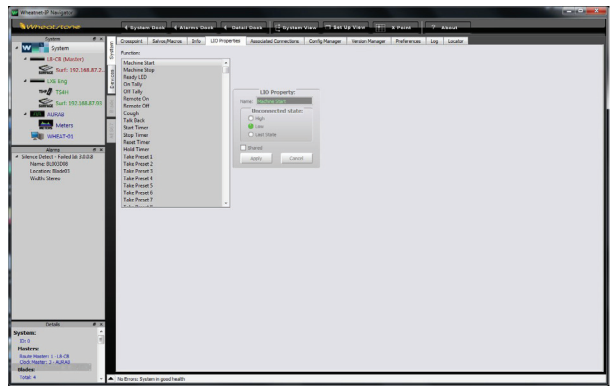


The second tab is labeled *Salvos*. If you click on this tab, you will again see a crosspoint grid except that the words "Salvo Edit Screen" are shown in the background and some buttons have appeared above the grid. This is the screen used to create, edit, and execute Salvos (ganged simultaneous connections). More on this later.

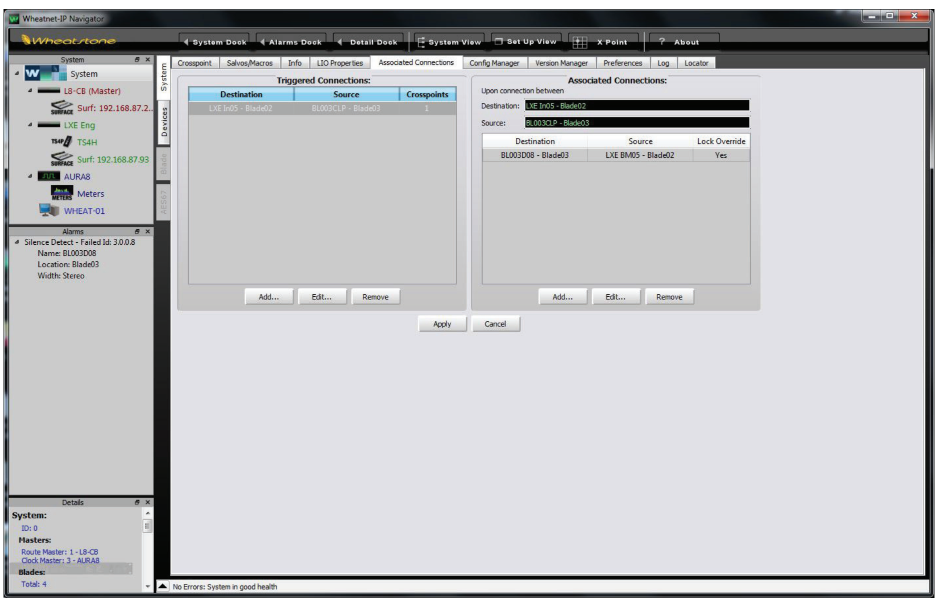


The third tab is labeled *Info*. This is the screen where system clock rate, date and time including NTP server address if you have one, passwords, version checks, SNMP info, BLADE display are set. If you have an external clock reference including a Precision Time Protocol (PTP) clock in your system, this is where you can set it as your primary clock reference. You can also set a secondary clock reference on this tab.

The fourth tab is labeled *LIO Properties*. This screen is where you can define the states of various logic functions. There are over 500 logic functions; many are set for you by default but most that you can define as you wish. Options include the Name of the function, its unconnected state (high, low or last state), and the sharing mode (described later in this manual).



The fifth tab is labeled *Associated Connections*. This screen is where you can define associated connections, to take the hassle out of changing connections between locations, studios or announcers. Simply define the link you need (codec, studio feed, remote, etc.) and BLADE can automatically set up a back link for it. Just trigger the connection and the back feed will follow – a helpful feature for remotes or for when you're changing studios. Each BLADE allows multiple associated connections limited only by the amount of memory available in the system. And BLADE-4 has significantly more memory than earlier BLADE versions.



Next is the *AES67 Visibility* tab. On this tab, you can select which sources and destinations are available to other AES67-compliant devices in your system. AES67 visibility is used to expose Wheatnet-IP source streams to any AES67 devices. It also marks which signals will be exposed to NMOS control so that any NMOS *explorers* that poll the registry will see them and be able to initiate connections.

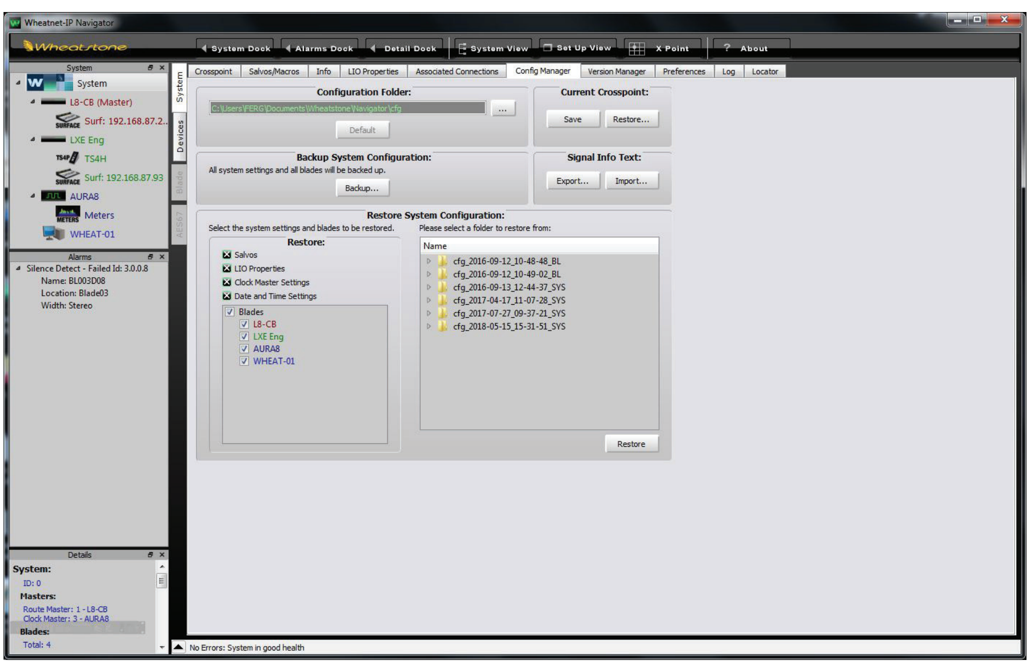
If a source signal is checked on this tab, this has the effect of making the blade always transmit the multicast stream, regardless of whether it is currently connected to another blade signal. Normally, our system only transmits connected streams, this basically indicates "something outside our system may be listening."

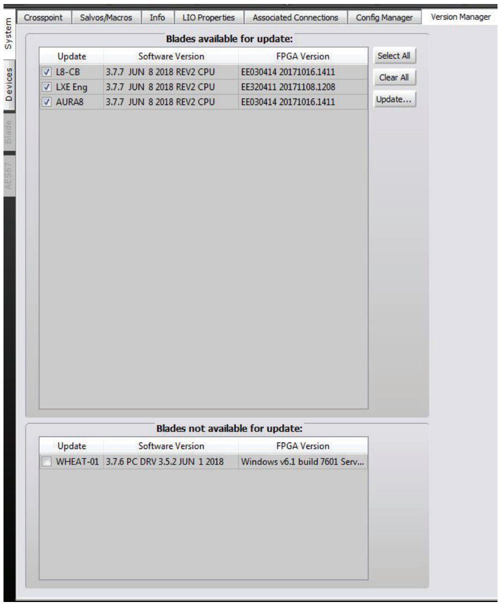
Another thing to note is that when you enable 1ms on a source signal, that automatically sets the AES67 visibility, because it is assumed the user is doing this to have a device consume the 1ms stream.

The next tab is the *Meters* tab. This screen allows you to select all or a subset of your sources and destinations to see

all their audio levels in one spot. This can be extremely helpful when setting up new devices or troubleshooting.

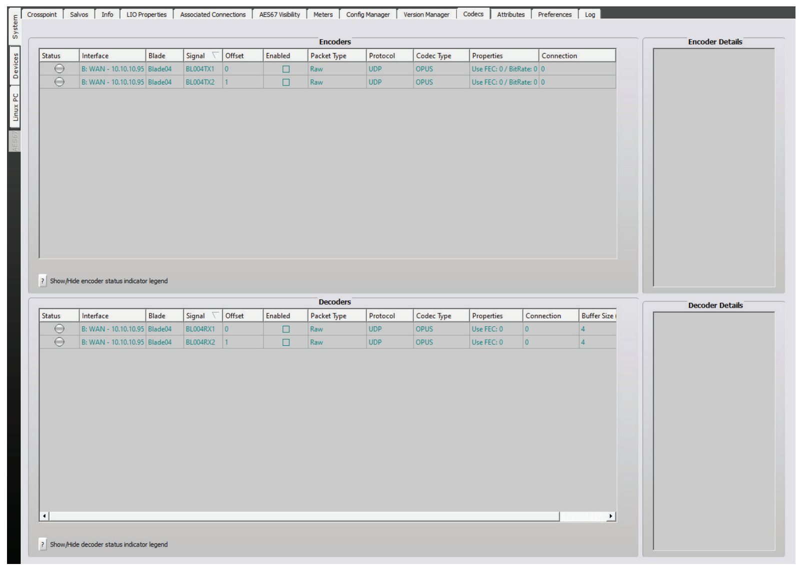
The eighth tab is labeled *Config Manager*. This screen is for archiving and restoring system information.





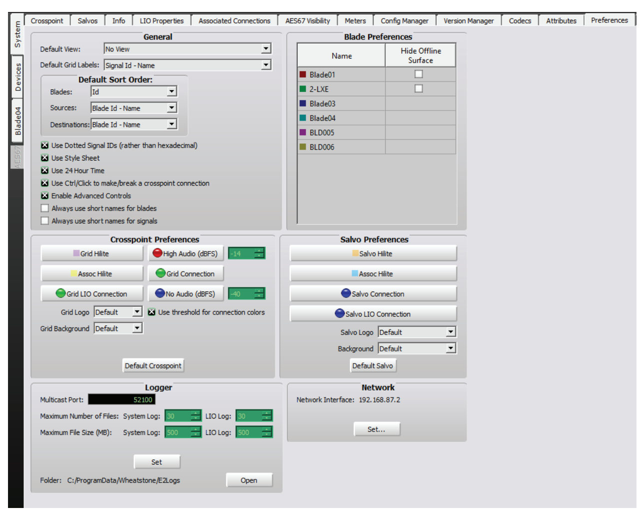
The ninth tab is labeled *Version Manager*. It opens an information window showing at once the current software and firmware versions of all BLADEs in your system. As the WheatNet-IP system evolves over time, there will be updates that increase or improve functionality of the BLADE. This tab is a convenient way to keep track of the current versions on the BLADE. It also can be used to update the BLADE with new versions.

BLADE-4 supports two codecs utilizing the Opus compression algoritm. These codecs are an optional, licensed feature of BLADE-4. To obtain licenses, please contact Wheatstone Sales or your dealer. Connections between BLADE-4 codecs can be made on the Codecs Tab. Details about connections including certain statistics can also be found on this screen on the Encoder and Decoder Details panes.

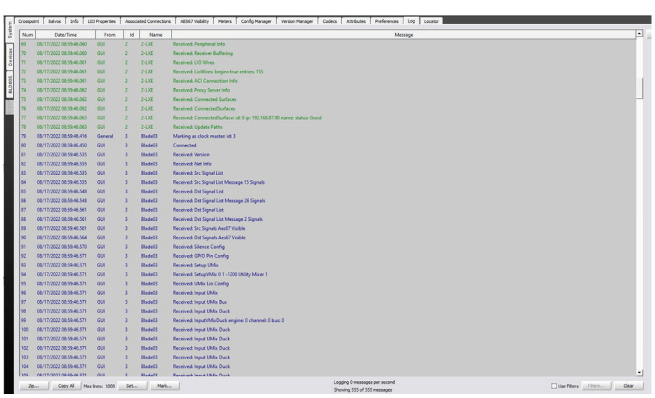


Next is the *Attributes* tab. You can create various "Attributes" which can be asigned to a source and will follow that source around the Wheatnet-IP system. Such attributes might include EQ or gain settings. The attributes are defined on the Attributes tab and can be assigned to a source in the Source Signal Wizard.

The next tab is labeled *Preferences*. This screen is used to control the viewing and colors of various parts of the main Crosspoint window. You can specify colors for the dots and highlights, BLADEs and signal names, salvo indicators, etc. You can also control how blades and signals appear in the various views you have set up, and you can control the number of files and file size for system and LIO logs.



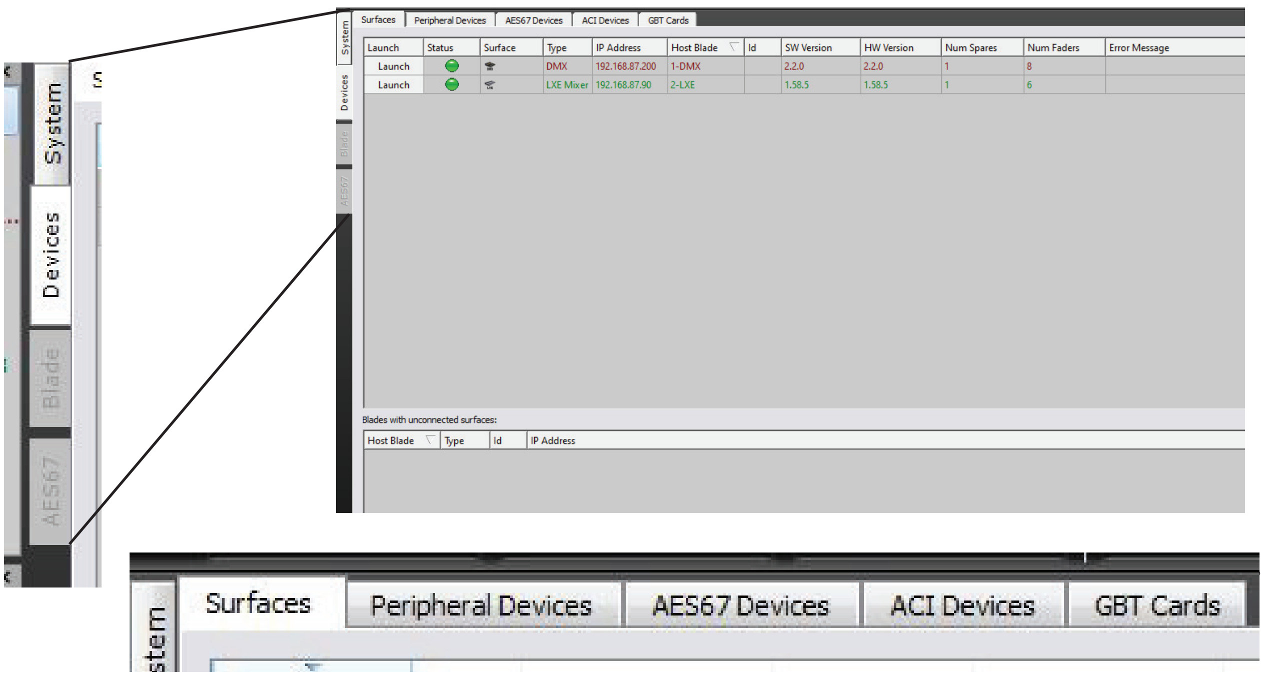
The *Log* tab displays various system messages. The system shows the numer of log lines you determine on this tab, but all logs are saved on your hard drive. They can be accessed in the folder shown when you click the "Zip" button. Here you can also zip up a number of days worth of logs if needed.



The fourteenth and final tab, only visible if the *Enable Advanced Controls* box is checked on the *Preferences* tab, is the *Locator* tab. The Locator tab allows the system to ping the network to get a list of devices that are attached to the network. If you have a particularly large system, filters can be added to pare down the list by device type, in addition to the ability to sort any of the fields in the results.

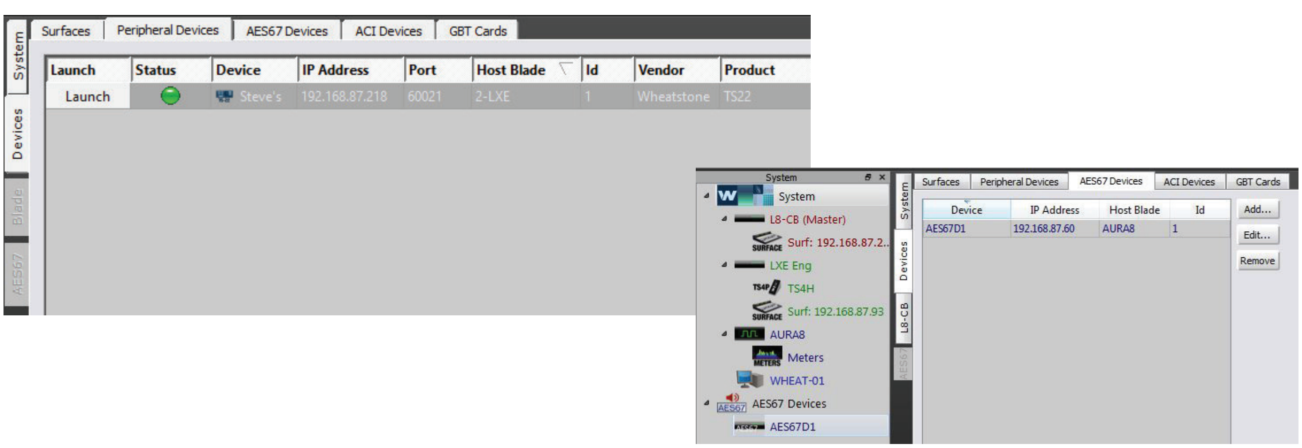
Side Tabs

The Side Tabs are arranged to show System and its tabs covered above plus Devices, Last Selected Blade and AES67 Devices.



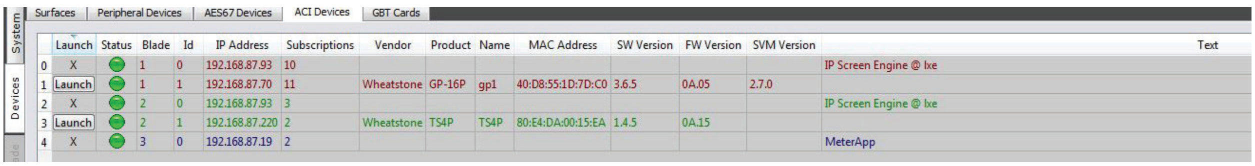
The *Surfaces* tab, when selected, displays the currently connected WNIP Surfaces in the system. Information such as software version, number of faders and spare buttons are also displayed. If there are any console blades in the system that do not have surfaces associated with them, they will be listed at the bottom of the display under *Blades with unconnected surfaces*.

The next tab under the Devices hierarchy is the *Peripheral Devices* Tab. This tab allows for adding Razor Devices and Surfaces where internal cue and headphone mixes need to be added in order to create the Multicast Audio Streams.

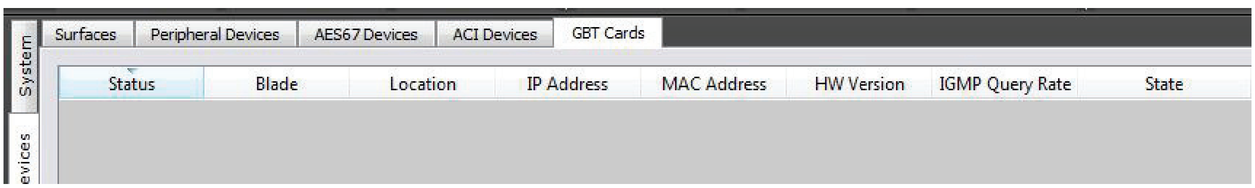


Next is the AES67 screen where you can add or remove AES67-compliant devices and signals into the WheatNet-IP Intelligent Network. The BLADEs support AES67 compliant devices using an IEEE1588 PTP grandmaster clock for synchronizing to and ingesting/streaming AES67 compliant packets. Refer to the "WheatNet-IP and AES 67" Appendix 11 for more information.

The ACI Devices tab is a convenient place that lists all of the various ACI devices that have been defined for your system so you can see them all (and their IP Addresses, BLADE IDs, etc.) at a glance.



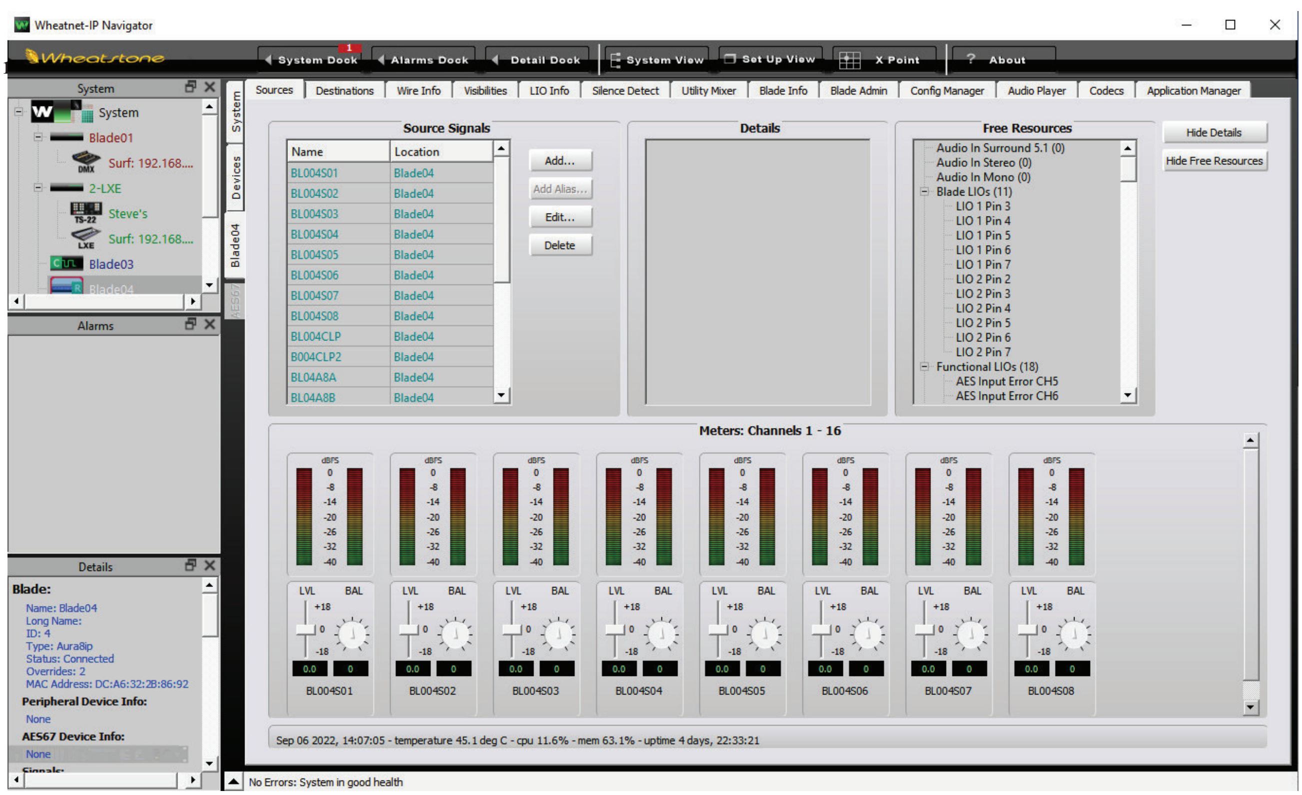
The final Devices tab displays information about connected GBT cards connected to the WNIP System. GBT cards are special cards placed in Gibraltar Cages to interface it to a BLADE 3 System.



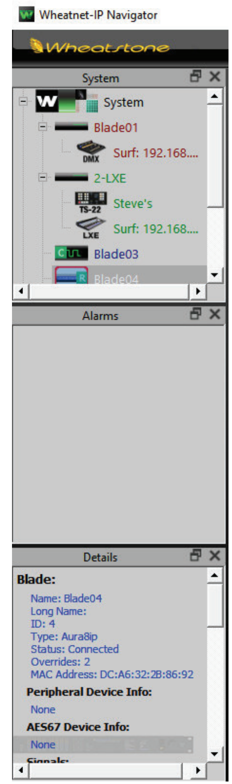
Experiment with clicking on the various tabs until you become familiar with what they contain.

Now comes the good part. Over on the System pane, click on a BLADE icon, or click on *Blades* tab in the main window. The main window changes from a System view to a Blades view, and there are nine new tabs showing information about the particular BLADE you clicked on. The tabs are *Sources, Destinations, Wire Info, Visibilities, LIO Info, Silence Detect, Utility Mixer, Blade Info, Blade Admin, Config Manager, Audio Player, Codecs and Application Manager.*

They provide lots of functions and information about the particular BLADE. Again, more on this later.



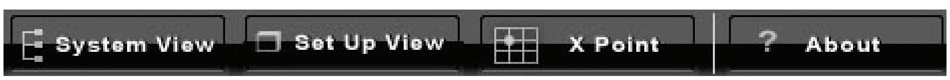
In this manner you can look at/work on each individual BLADE in the system. Now go back and click on the system icon in the system pane and select the System Crosspoint tab. Click on one of the destination signal names along the left side of the grid and notice the information that appears in the "Details" pane. Essentially everything you would like to know about that signal appears in the Details pane: what its name and ID are, what BLADE it's in, what mode it is, which jacks it uses, what source is crosspoint connected to it, and more. Each time you click on a source or destination name, its information is reflected in this Details pane.



Finally note the Alarms pane normally located just below the system pane. The Alarms pane is a text area that shows a message whenever an alarm function, such as Silence Detection on a particular output, happens.

The System pane, Alarms pane, and Details pane are all scrollable and resizeable in typical Windows fashion. You can also drag and relocate them on the screen, or dock them back to their default locations using the dock buttons along the top of the screen. The dock buttons will also show/hide these panes so if you don't see one of them, try clicking the associated dock button at the top of your Navigator GUI screen.

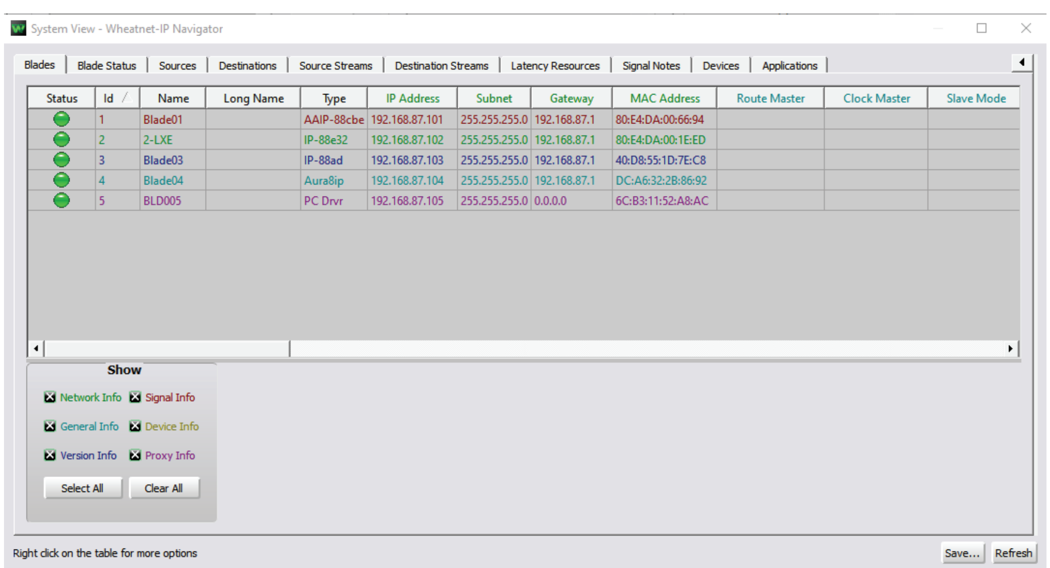
In addition to the System, Alarms, and Detail dock buttons, the top of the screen contains buttons for System View, Set Up View. and X Point.



These buttons activate navigation shortcuts that will take you to some commonly used areas of the Navigator GUI program.

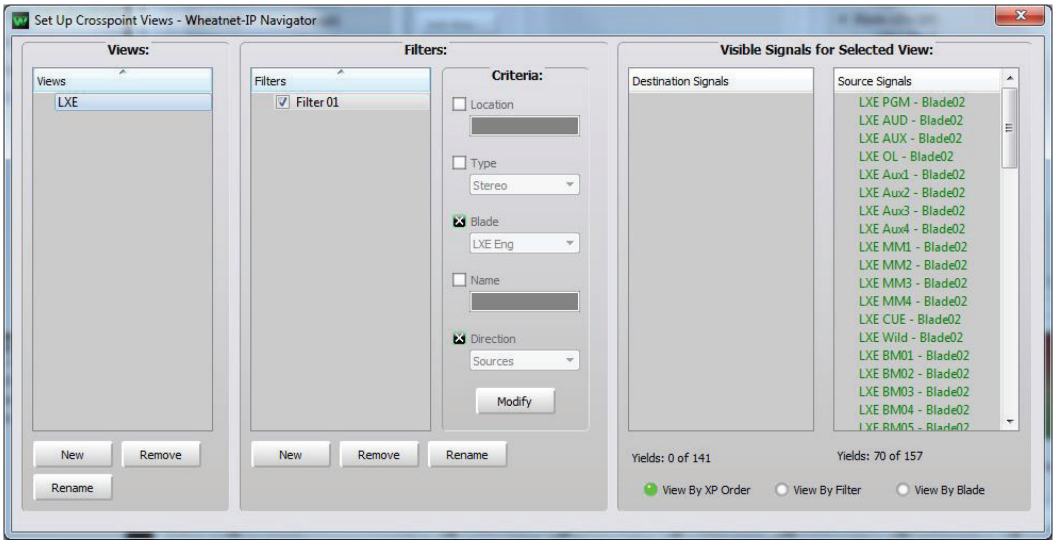
In the WheatNet-IP system, the mechanism for showing a subset of all of the system audio signals is called filtering. You can specify certain search criteria or functions, and the software will restrict the crosspoint grid to show only those signals that fit the criteria. In a large system with hundreds or even thousands of signals, filtering is a way to reduce the amount of scrolling you need to do while navigating on the crosspoint grid. Some common filters might be "show only the signals in BLADEs 2 and 14," or "show me only my mono signals," or "show me only logic signals." As you might expect, you can combine the criteria to create a complex search that significantly reduces the number of signals that meet it.

Open the System View window by clicking on the System View button at the top of the screen.



This screen contains a table with your system information. You can customize the table with the buttons located in the Show area on the left bottom corner of the screen to show or hide the *Network Info*, *Version Info*, *Signal Info*, and *Device Info*.

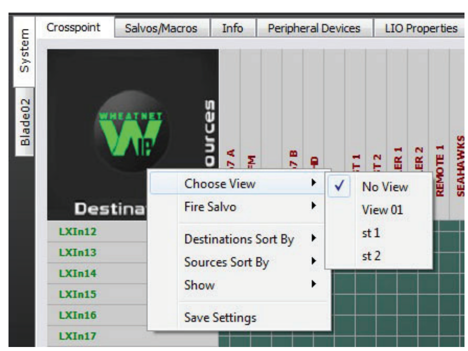
Open the Set Up Crosspoint Views window by clicking on the Set Up View button at the top of the screen.



In the window you will notice a list of the currently defined filters, along with some buttons used to create, rename, or delete them. If the list appears empty, then no filters have yet been defined. Click on the *New* button and a new filter having a default name is added to the list. Click the *Rename* button to open a dialog box that allows you to rename the filter. Type a name that will help you recognize the filter later such as "BLADE 1" or "Morning Show," click *OK*, and the window will change to show you the criteria you can specify for your filter. As you click on various check boxes to specify criteria, notice how the source and destination signal lists change to reflect the filter's effect once you've also created a view (see below). Obviously, if you make your filter too exclusive, the signal count will dwindle to zero and the filter will therefore be useless. After all, what good is a filter that removes all of the signals from view, leaving nothing but a blank screen? Don't hesitate to experiment with defining a few filters and seeing how they work. You can always delete them later.

Once you have created a filter, you need to assign it to a view before you can use it. A "View" is simply a collection of one or more filters, and is useful for combining filters for a more complex set of criteria.

Initially, as in filters, no views will show in the list until you have created them. Click on *New* to create a view; you can use the *Rename* button to give it a special name.

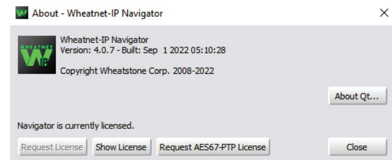


Once you have defined one or more views, click on the view name to highlight it. Then, in the Filters list, click on the check boxes to enable the desired filter function(s). Enabling the view by right clicking on the WheatNet-IP logo on the crosspoint grid will give you a new crosspoint grid view with the signals reduced to only those that meet the criteria.

One final note about filters: If you are having trouble locating a signal on the crosspoint grid, make sure you haven't inadvertently enabled a view that excludes it. Right click on the WheatNet-IP logo and Choose *View* / *No View* to be sure.

Clicking on this button opens a crosspoint grid window on a floating palette. This can be a very handy function when you are working on a part of the system GUI and need a quick look at the grid to check on some signal or connection information. You could close down whatever window you are working on and go to the "System Crosspoint" tab, but that might mean leaving your work unfinished. Instead, try clicking on the "XPoint" button and opening this floating grid window. You can position it where you like on the screen and use it for reference as you continue your work.

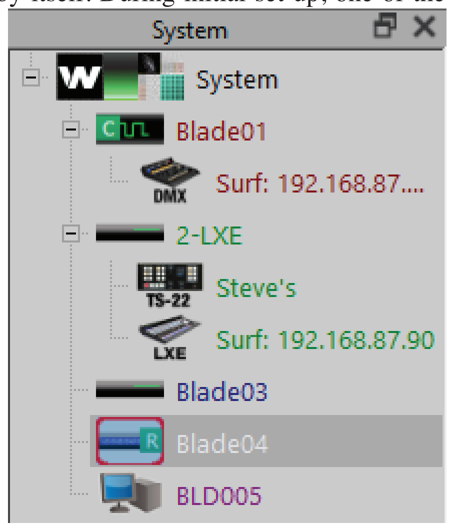
Predictably, this button opens a window displaying the version information for the WheatNet-IP Navigator GUI program.

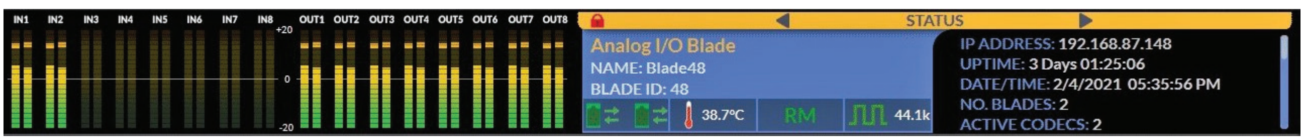


Now you have learned the basics of navigating around the WheatNet-IP Navigator GUI. It makes no difference if your WheatNet-IP system has two BLADEs in it or a hundred, they are all treated the same way.

An Important Point About WheatNet-IP Systems - The Route Master

Because the WheatNet-IP system is dynamic, there needs to be some mechanism to arbitrate and maintain the specifics of the system configuration from moment to moment. “Somebody has to be in charge!” In the WheatNet-IP system, we don’t rely on a PC for this role; the entire system is fully functional without any PCs. Since all BLADEs are electrically identical (except for their specific audio I/O ports) the system has been architected with a distributed intelligence. Each and every BLADE has enough on-board intelligence to control the whole system by itself. During initial set up, one of the BLADEs in the system is automatically selected to be Route Master. It is this Route Master BLADE that gathers all of the information from the BLADEs, control surfaces, and PCs that belong to the system. The Route Master BLADE then redistributes all of this information back to every BLADE. The Route Master BLADE and all of the others keep this information in flash memory so it is not lost when the power is turned off. What this means is that every BLADE is fully capable of running the entire system at any moment. In fact, if the Route Master is lost for any reason, a new BLADE will be elected as Route Master and seamlessly take up running the system. The beauty of this architecture is the depth of backup and redundancy automatically provided. Essentially there are as many backup hosts in the system as you have BLADEs; you can never lose your system because a host controller went down. The need for archiving is also greatly reduced, because there is a system copy residing in every BLADE. It’s like having a RAID array of hosts. If you look carefully at the list of BLADEs in the System Pane, you will see one of them designated as the current Route Master by a small letter “R” superimposed on the BLADE icon. There is also an indication on the BLADE’s front panel Status page (see the green RM on the graphic below).





Similarly, the system will also have a Clock Master, responsible for synchronizing timing throughout the system. If a Clock Master has been designated via the system Info tab (see later in this chapter) by assigning a Primary External Reference, then that BLADE will be indicated in the System Pane by the “wave” icon – see Blade01 in the example shown. If, however, no such assignment is made, the system will self-designate a Clock Master and flag it as such in the System Pane. Once again, a front panel LED lights on the designated BLADE.

Note that in a single BLADE system the one BLADE will serve as both the Route Master and the Clock Master. In the graphic above you can see that the example BLADE is both Route Master and Clock Master.

About the Master Election Process

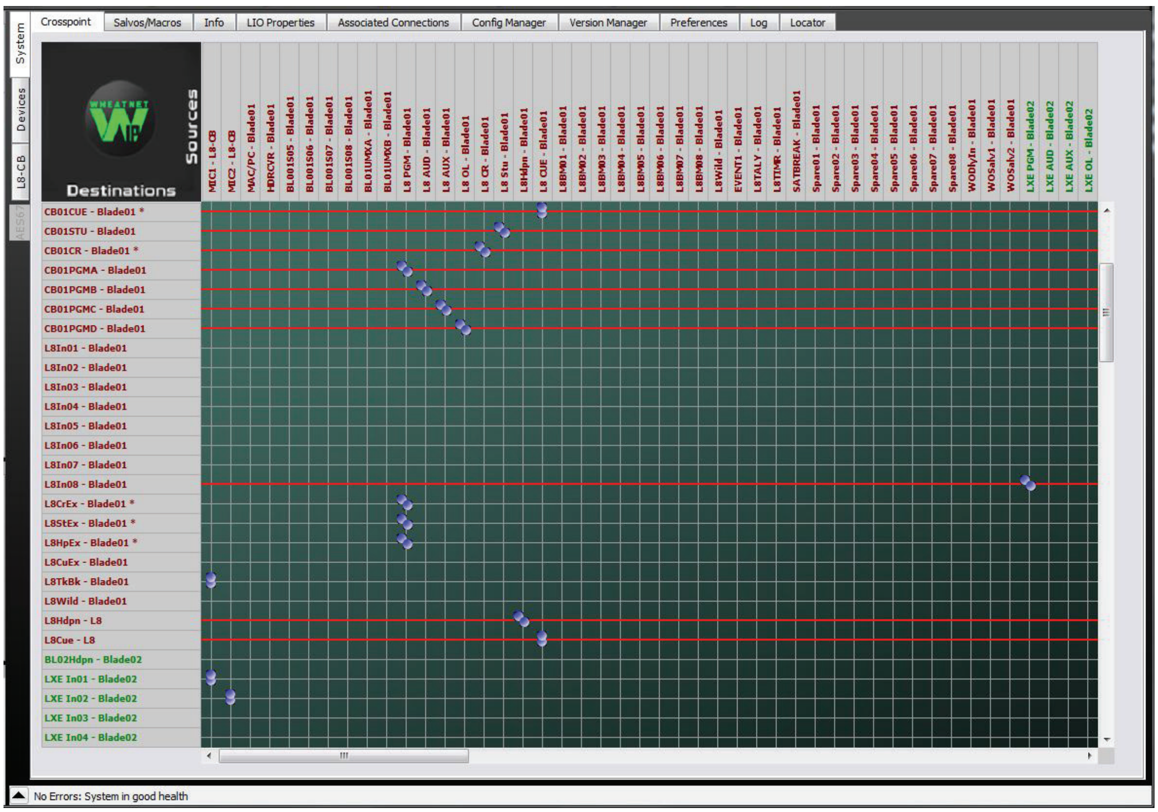
When the system loses its Clock or Route Master, an election occurs amongst all the BLADEs remaining in the system. The winner is determined by the following criteria in the order shown:

- The BLADE with highest software version wins
- If all BLADEs have the same software version (recommended), the BLADE with the the highest PRIORITY setting wins
- If all the BLADES have the same PRIORITY setting (not recommended), the BLADE with the longest uptime wins.

Navigator GUI System Windows in Detail

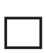
Crosspoint Tab

This window is the main crosspoint window for the GUI. It is used to make/break/view crosspoint connections. In a LAN based audio network, just what is a crosspoint connection? After all, there is no audio router or patch bay to make audio connections. Simply put, a crosspoint connection represents a message that a particular destination



(i.e. network address) wants to subscribe to the multicast packets representing a particular audio stream. The Ethernet switch obliges by forwarding those packets along to the subscribing device. In the Navigator GUI, this is shown by a connection icon at the grid intersection of the source (multicast stream) and destination (subscribing device).

The shape of the connection icon is an indication of the type of signal involved. Signal types are mono audio, stereo audio, logic only, or logic and audio combined. The connection icons you will encounter are:

 – both the source and destination signals are logic only

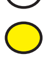
 – both source and destination signals are mono audio

 – the source is mono audio and the destination is stereo audio

 – the source is stereo audio and the destination is mono audio

 – both source and destination signals are stereo audio

 – any source or destination signal is surround audio

 – indicates BLADE's communication issue; this icon always yellow.

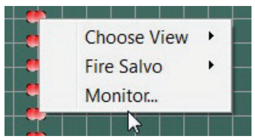
Note that any audio signals may have associated logic signals riding on them, but this will not affect the shape of the connection icon.

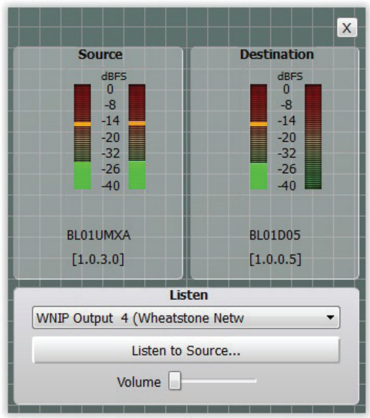
To make a connection, click on an intersection. As the connection is made the appropriate icon will appear. To break a connection, click on the connection icon; the icon will disappear and the connection will be broken.

In BLADE-3 and BLADE-4 the connection icons are animated, with the color of the icon changing in accordance with signal level. Parameters related to connection icon colors and color changes are available on the Preference tab.

By default settings the blue color means no audio (-40dBFS), the green color means normal level audio (a level between the no audio and high audio setting), and red color indicates high level audio (-14dBFS).

Right-clicking on an audio connection icon and choosing *Monitor...* brings up a display where you can see meters showing the source and destination levels. A button and volume slider on this display will allow you to monitor the audio on the Navigator computer.

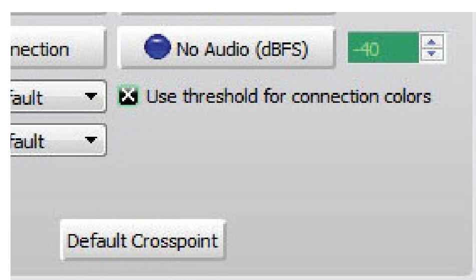




You can configure the colors you want (except for the large yellow dot) for the various route representations on the System *Preference* tab. This is also where you configure the threshold settings for the desired no audio and high audio levels.

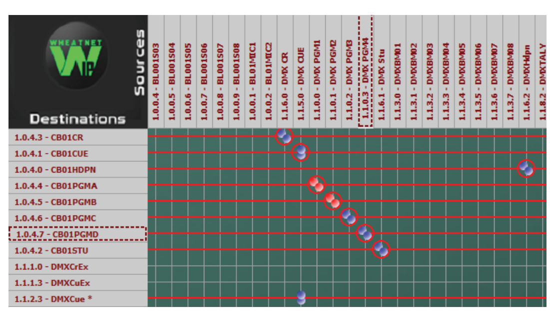
A large gold dot indicates that Navigator is not receiving the confirmation back from the BLADE that the requested connection has been established. This usually indicates a connection problem of some sort.

In the most basic view, the Crosspoint window shows all of the system sources across the top and all of the system destinations vertically on the left. The default view has these signals shown first in numerical order of the BLADEs, and alphabetically by signal name within the BLADE. Furthermore, each BLADE has a color, and the BLADE's signals are shown printed in matching color. This is meant to help identify which signals go with which BLADE.

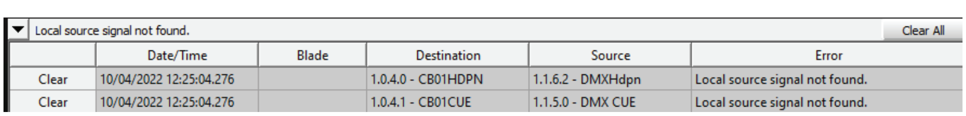


Crosspoint Error

A red circle around a crosspoint connection icon indicates that there has been some kind of error related to the source or destination. In the example at right, the mix engine blade for the DMX console has just been rebooted. The surface is back up but the errors are still showing, indicating that something has happened.



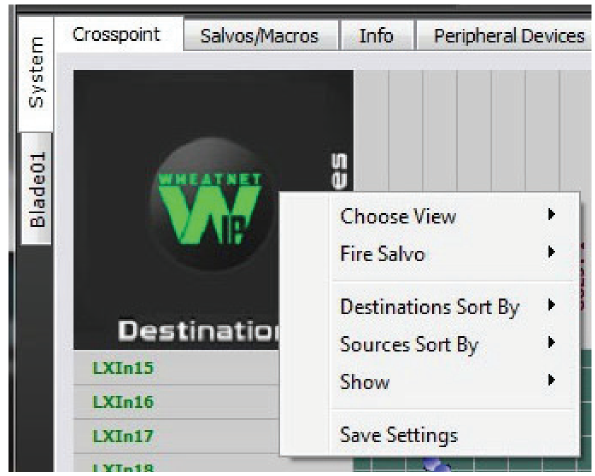
To clear the errors, look at the very bottom of the Navigator GUI window and find the error indication: Local source signal not found. By clicking on the up arrow, you can pop up a window which will show the error detail and allow you to clear each error individually or all of them at once.



Local source signal not found. Clear All

	Date/Time	Blade	Destination	Source	Error
Clear	10/04/2022 12:25:04.276		1.0.4.0 - CB01HDPN	1.1.6.2 - DMXHdpn	Local source signal not found.
Clear	10/04/2022 12:25:04.276		1.0.4.1 - CB01CUE	1.1.5.0 - DMX CUE	Local source signal not found.

CROSSPOINT DETAILS MENU



There are refinements to the basic view that come in very handy. If you right click on the WheatNet-IP logo of the system crosspoint window, a popup window with four sub-menus will appear.

Choose View

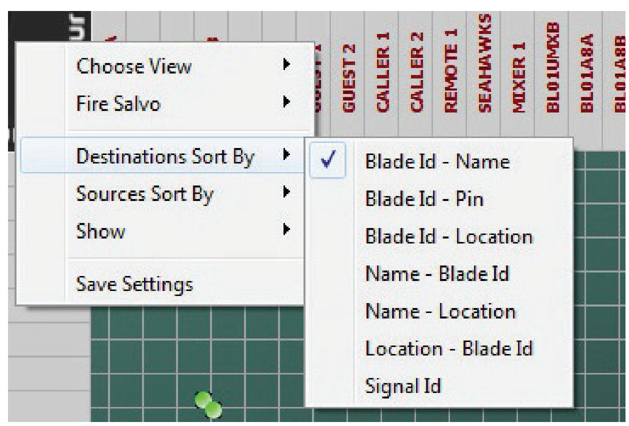
Various filters can be defined to restrict the crosspoint view of the system. This is useful when you have a large system with hundreds of signals and want to work on a small section of it. The filter manager tool of the GUI (see the Set Up View button discussion) allows you to define filters based on BLADE ID, signal type (mono, stereo, logic only), location, sources, or destinations, and assemble them into Views. The Choose View menu allows you to specify any of the views you have defined, and the crosspoint grid will immediately shrink, removing those signals not part of your selected view.

Hint: If you know you have a signal in your system but it is not appearing in the crosspoint grid, right-click on the WheatNet-IP logo and select Choose View / No View. Chances are your signal will now appear in the grid – your filter setting was excluding it.

Fire Salvo

Fire a Salvo is simply a matter of scrolling through the list to highlight the desired Salvo. You will see in Crosspoint window that your connection changes actually happened.

Destinations Sort By



This menu allows you to change the order in the crosspoint grid for the destination signals. The choices are:

BLADE Id - Name – This is the default. The destinations show in order of BLADE ID, then alphabetically by name.

BLADE Id - Pin – The destinations show in order of BLADE ID first, then connector number.

BLADE Id - Location – The destinations show in order of BLADE ID, then alphabetically by location name.

Name - BLADE Id – The destinations show alphabetically by name first, then by BLADE ID Useful for when you use a name like "CD 1" over and over.

Name - Location – The destinations show alphabetically by name first, then by location name.

Location - BLADE Id – The destinations show alphabetically by location name, then by BLADE ID.

Signal Id – The destinations show in order of their system assigned signal ID.

Sources Sort By

This menu allows you to change the order in the crosspoint grid for the source signals. The choices are:

BLADE Id - Name – This is the default. The sources show in order of BLADE ID, then alphabetically by name.

BLADE Id - Pin – The sources show in order of BLADE ID first, then connector number.

BLADE Id - Location – The sources show in order of BLADE ID, then alphabetically by location name.

Name - BLADE Id – The sources show alphabetically by name first, then by BLADE ID. Useful for when you use a name like "CD 1" over and over.

Name - Location – The sources show alphabetically by name first, then by location name.

Location - BLADE Id – The sources show alphabetically by location name, then by BLADE ID.

Signal Id – The sources show in order of their system assigned signal ID.

Show

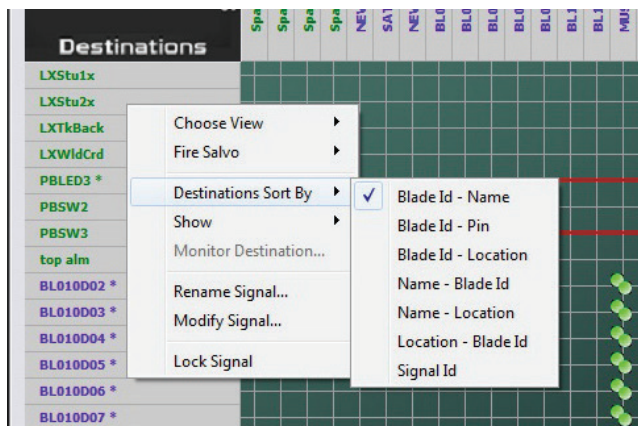
This menu allows you to change the information showing in the grid labels for each signal. The choices are:

Name - This is the default. Only the eight character name is shown on the grid label.

Name - Location – Both the eight character name and eight character destination are shown on the grid label.

Signal Id - Name – Both the system assigned signal ID and the eight character name are shown on the grid label.

DESTINATION DETAILS MENU



You have already learned how to make and break crosspoint connections from the grid. Here are some more things you can do. By right clicking directly over the name of a destination, you can bring up the destination details menu.

This menu allows you to access some very common functions:

Choose View

This is same function as mentioned previously. Various filters can be defined to restrict the crosspoint view of the system. This is useful when you have a large system with hundreds of signals and want to work on a small section of it. The filter manager tool of the GUI allows you to define filters based on BLADE ID, signal type (mono, stereo, logic only), location, sources, or destinations and assemble them into Views. The Choose View menu allows you to specify any of the views you have defined, and the crosspoint grid will immediately shrink, removing those signals not part of your selected view.

Hint: if you know you have a signal in your system but it is not appearing in the crosspoint grid, right click on the WheatNet-IP logo and select Choose View / No View. Chances are your signal will now appear in the grid – your filter setting was excluding it.

Fire Salvo

Fire a Salvo is simply a matter of scrolling through the list to highlight the desired Salvo. You will see in Crosspoint window that your connection changes actually happened.

Destinations Sort By

This menu allows you to change the order in the crosspoint grid for the destination signals. The choices are:

BLADE Id - Name – This is the default. The destinations show in order of BLADE ID, then alphabetically by name.

BLADE Id - Pin – The destinations show in order of BLADE ID first, then connector number.

BLADE Id - Location – The destinations show in order of BLADE ID, then alphabetically by location name.

Name - BLADE Id – The destinations show alphabetically by name first, then by BLADE ID. Useful for when you use a name like "CD 1" over and over.

Name - Location – The destinations show alphabetically by name first, then by location name.

Location - BLADE Id – The destinations show alphabetically by location name, then by BLADE ID.

Signal Id – The destinations show in order of their system assigned signal ID.

Show

This menu allows you to change the information showing in the grid labels for each signal. The choices are:

Name – This is the default. Only the eight character name is shown on the grid label.

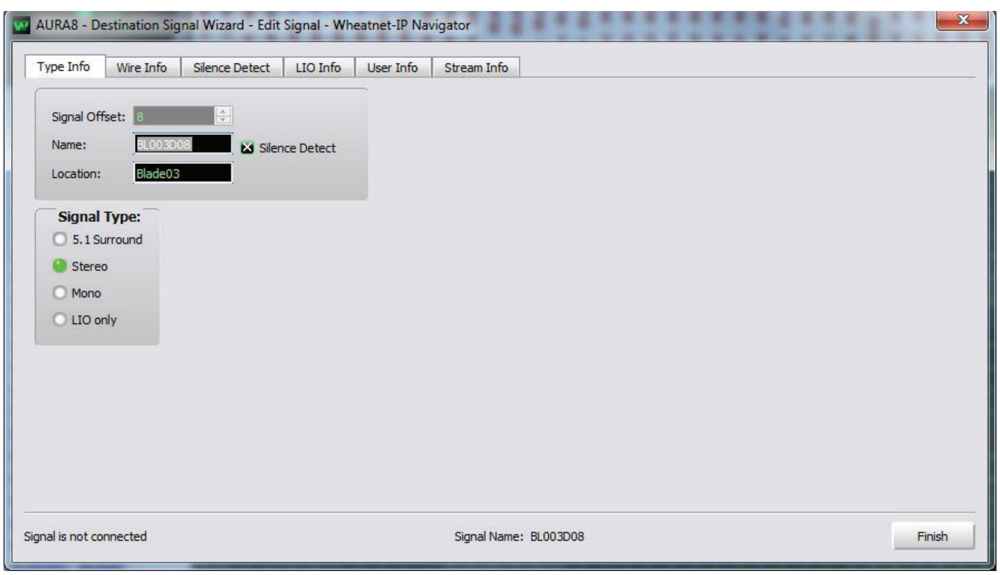
Name - Location – Both the eight character name and eight character location are shown on the grid label.

Signal Id - Name – Both the system assigned signal ID and the eight character name are shown on the grid label.

Rename Signal

Choosing this function will open up a Rename Signal window. You will use this function a lot to replace the system auto-generated signal names with names that have more meaning for you. Here you can type a new name, up to eight characters long, for the signal. As soon as you click on the *OK* button, the new name will be broadcast throughout the system and get updated everywhere.

Modify Signal



Choosing this function will open the Destination Signal Wizard window. You will also use this function frequently, at least in the beginning. This wizard is used to attach logic, map the audio to the connectors, set up silence sensing, and define the signal type (mono, stereo, etc.). During initial configuration of the BLADE, the System Wizard will assign default values for these items:

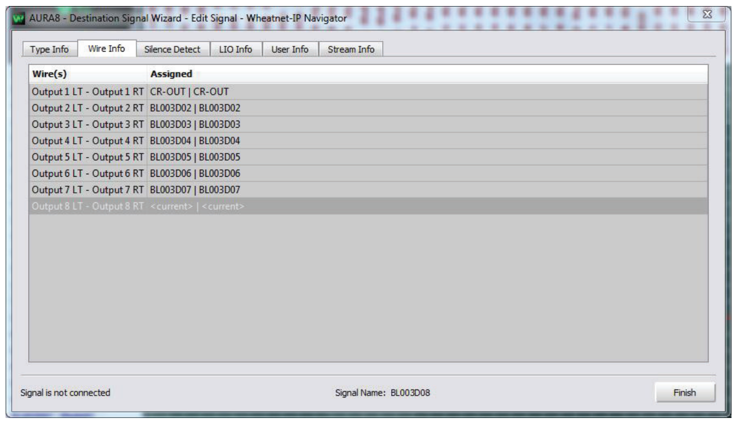
- Type Info = Mono or Stereo, dependant on which signal template you chose,
- Wire Info = in order, i.e. signal 1 will be mapped to connector position 1, signal 2 will be mapped to connector

position 2, etc.

- Silence Detect, if enabled via the checkbox, = -40 dBFS threshold and 20 seconds duration
- LIO Info = none.

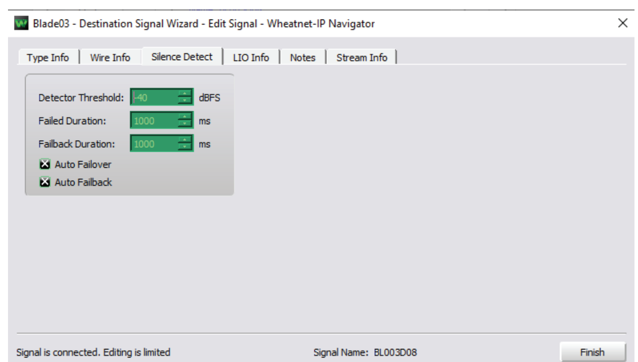
You can navigate between these functions by clicking on the tabs at the top of the window.

Type Info: The choices are 5.1 Surround, Stereo, Mono, or LIO only (LIO stands for Logic Input or Output). The first three choices are for various kinds of audio, while the fourth, LIO only, is for discrete logic signals as described in the logic section. You can also use this window to change the signal name, if desired. Finally, there is a check box that will enable the Silence Detect function for this destination signal.



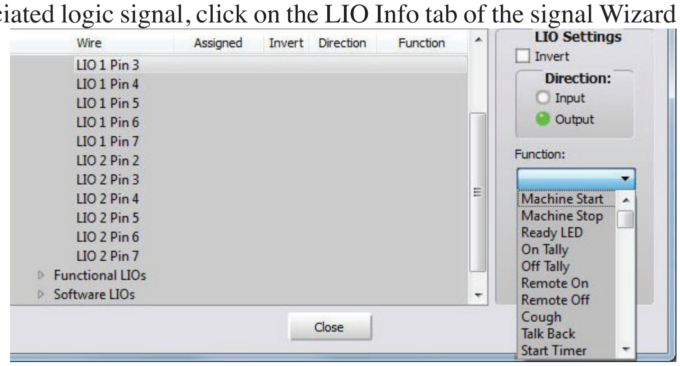
Wire Info: The actual physical connection of the audio destination signal. For an all mono BLADE, the first output connection on a BLADE is called Wire 1 and the last output connection is called Wire 16. If the BLADE is all stereo, the first output connection is called Wire 1 LT and the last output connection is called Wire 8 RT. These wire numbers correspond to the connection numbers on the wiring diagrams, and also the rear panel silk screening on the BLADE-4 chassis, and define the connector you need to plug into to get the signal. The system defaults to the first signal on the first connector, etc., but you can map them any way you like by selecting the wire in this screen. Note that if you try to map a destination to a connector that has already been used, the GUI will alert you to the error.

Silence Detect: This function, when engaged, continuously monitors the destination signal for audio content. If the signal falls below the specified threshold for longer than the specified duration, then various things can happen. First, a silence detect alarm will be issued and shown in the Alarms window of the GUI.



A logic signal can be triggered, and if *Auto Failover* has been selected, a secondary source you have previously defined will be switched to the destination. Finally, if *Auto Failback* has been selected, then the destination will be switched back to the original source if audio has been restored for at least as long as the specified duration. Use this window to define these parameters. Note that for silence detect to work, it must first be enabled in the Type info window by clicking the check box, and the secondary source must be defined using the GUI *Silence Detect* tab for the individual BLADE.

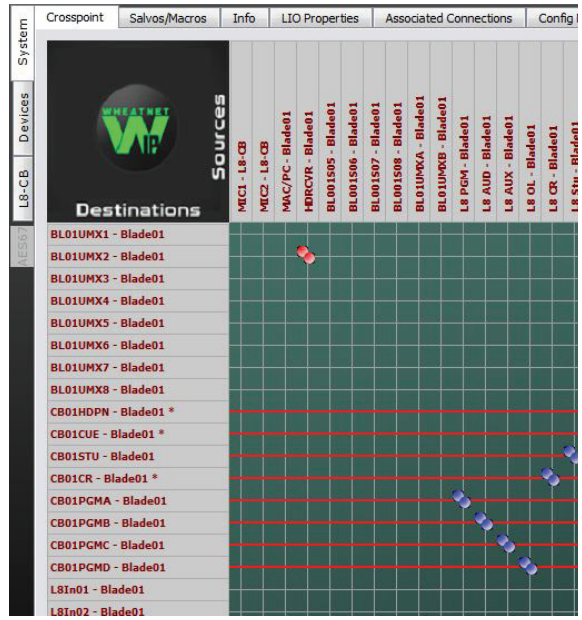
LIO Info: This window shows the parameters for audio associated logic for the signal. Up to 12 functions can be defined and attached to the audio signal. To activate an audio associated logic signal, click on the LIO Info tab of the signal Wizard screen.



Select *Add* from the right side of the window. Now select the logic port you wish to configure by clicking on the appropriate wire. Select the direction (*Input* or *Output*) and assign a function (machine start, on tally, etc.) from the drop down selection. When you are done click *Apply*, then *Close*. Then click *Finish*. If you find that your logic works backwards, you can click on the *Invert* check box to reverse the sense of the logic. You cannot change the settings in a connected signal.

Lock Signal

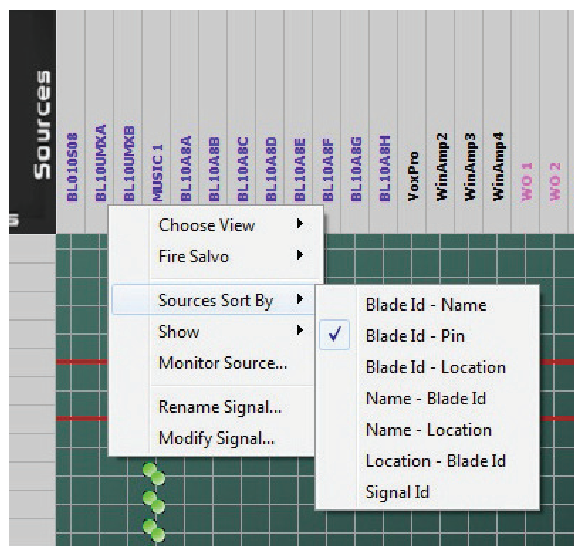
Select this function to "lock" a source connection to this destination. Once locked, a connection cannot be broken without access to the Navigator GUI. A locked connection is shown on the crosspoint grid as a red line from the destination across the grid.



SOURCE DETAILS MENU

In a similar fashion, if you right click over any source name on the crosspoint grid, you will open the source details window.

This menu allows you to access some very common functions:



Choose View

This is same function as mentioned previously. Various filters can be defined to restrict the crosspoint view of the system. This is useful when you have a large system with hundreds of signals and want to work on a small section of it. The filter manager tool of the GUI allows you to define filters based on BLADE ID, signal type (mono, stereo, logic only), location, sources, or destinations, and assemble them into Views. The Choose View menu allows you to specify any of the filters you have defined, and the crosspoint grid will immediately shrink, removing those signals not part of your selected view.

Hint: if you know you have a signal in your system but it is not appearing in the crosspoint grid, right click on the WheatNet-IP logo and select Choose View/No View. Chances are your signal will now appear in the grid – your filter setting was excluding it.

Sources Sort By

This menu allows you to change the order in the crosspoint grid for the source signals. The choices are:

BLADE Id - Name – This is the default. The sources show in order of BLADE ID, then alphabetically by name.

BLADE Id - Pin – The sources show in order of BLADE ID first, then connector number.

BLADE Id - Location – The sources show in order of BLADE ID, then alphabetically by location name.

Name - BLADE ID – The sources show alphabetically by name first, then by BLADE ID. Useful for when you use a name like "CD 1" over and over.

Name - Location – The sources show alphabetically by name first, then by location name.

Location - BLADE ID – The sources show alphabetically by location name, then by BLADE ID.

Signal ID – The sources show in order of their system assigned signal ID.

Show

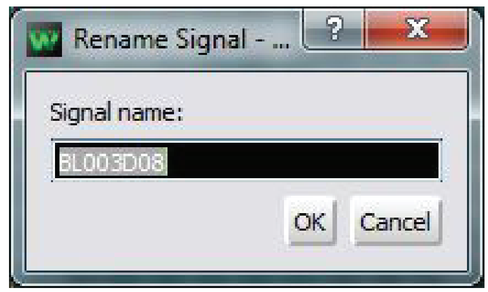
This menu allows you to change the information showing in the grid labels for each signal. The choices are:

Name – This is the default. Only the eight character name is shown on the grid label.

Name - Location – Both the eight character name and eight character location are shown on the grid label.

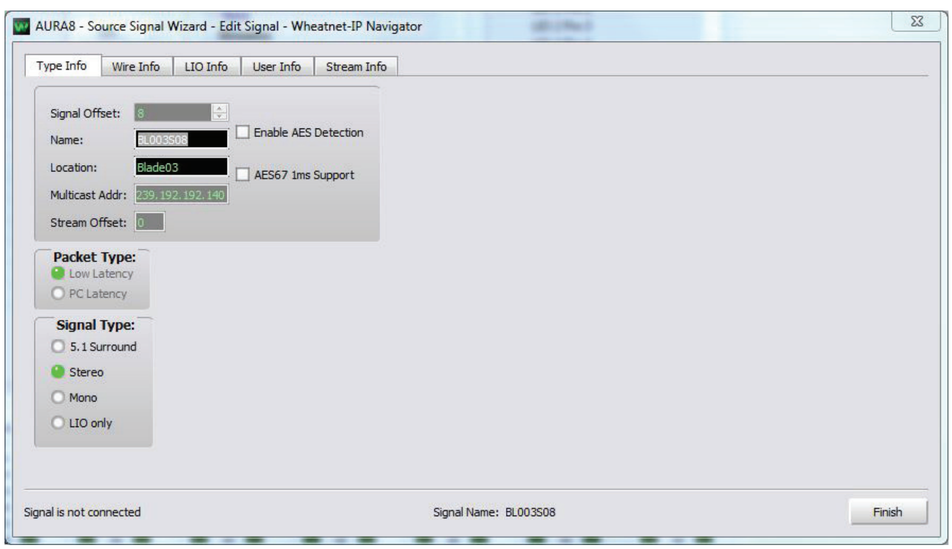
Signal Id - Name – Both the system assigned signal ID and the eight character name are shown on the grid label.

Rename Signal



Choosing this function will open up a Rename Signal window. You will use this function a lot to replace the system auto-generated signal names with names that have more meaning for you. Here you can type a new name, up to eight characters long, for the signal. As soon as you click on the *OK* button, the new name will be broadcast throughout the system and get updated everywhere.

Modify Signal



Choosing this function will open the Sources Signal Wizard window. You will also use this function frequently, at least in the beginning. This wizard is used to attach logic, map the audio to the connectors, and define the signal type (mono, stereo, etc.). During initial configuration of the BLADE, the System Wizard will assign default values for these items:

- Type Info = Mono or Stereo, depending on which signal template you chose.
- Wire Info = in order, i.e. signal 1 will be mapped to connector position 1, signal 2 will be mapped to connector position 2, etc.
- LIO Info = none.

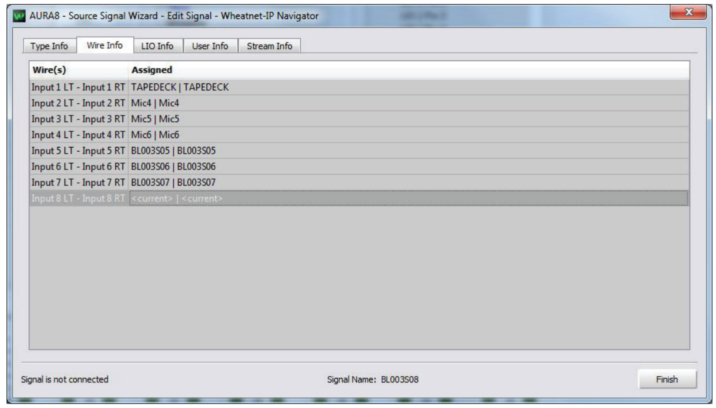
You can navigate between these functions by clicking on the tabs at the top of the window.

Type Info: The choices are 5.1 Surround, Stereo, Mono, or LIO only (LIO stands for Logic Input or Output). The first three choices are for various kinds of audio, while the fourth, LIO only, is for discrete logic signals as described in the logic section. You can also use this window to change the signal name, if desired.

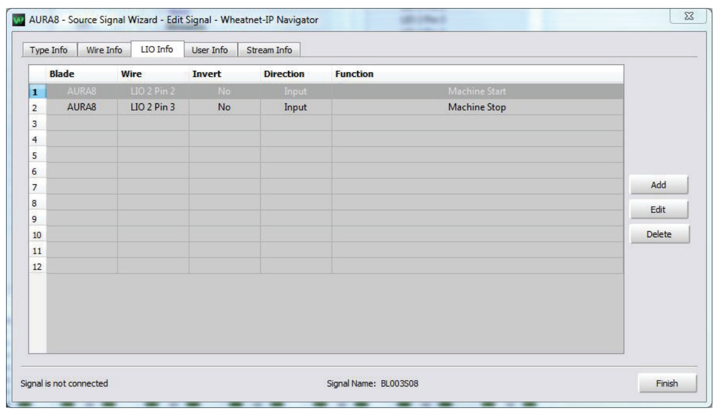
Packet Type – Low Latency is always selected and greyed out so it can't be changed for normal inputs. PC Latency is always selected and greyed out so it can't be changed for PC Blade Drivers.

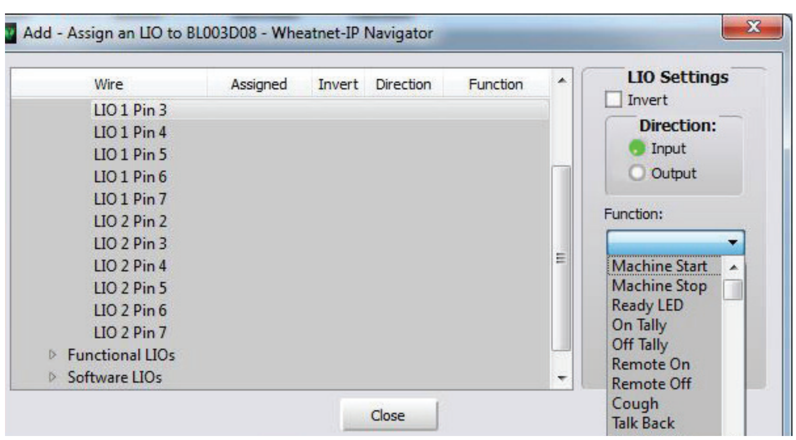
Check the *Enabled AES Detection* box to activate the logic function to detect loss of the source's AES reference.

Wire Info: The actual physical connection of the audio destination signal. For an all mono BLADE, the first input connection on a BLADE is called Wire 1 and the last input connection is called Wire 16. If the BLADE is all stereo, the first input connection is called Wire 1 LT and the last input connection is called Wire 8 RT. These wire numbers correspond to the connection numbers on the wiring diagrams, and also the rear panel silk screening on the BLADE chassis, and define the connector you need to plug into to get the signal. The system defaults to the first signal on the first connector, etc., but you can map them any way you like by selecting the wire in this screen. Note that if you try to map a source to a connector that has already been used, the GUI will alert you to the error.



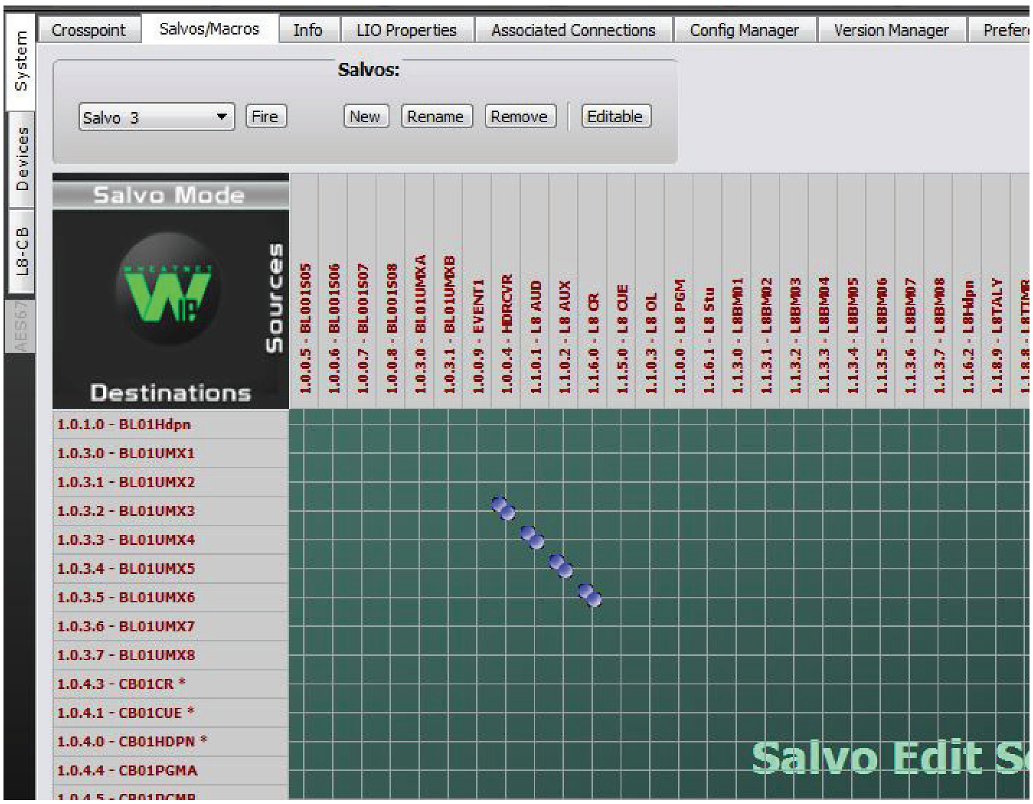
LIO Info: This window shows the parameters for audio associated logic for the signal. Up to 12 functions can be defined and attached to the audio signal. To activate an audio associated logic signal, click on the LIO Info tab of the signal Wizard screen. Select *Add* from the right side of the window. Now select the logic port you wish to configure by clicking on the appropriate wire. Select the direction (*Input* or *Output*) and assign a function (machine start, on tally, etc.) from the drop down selection. When you are done click *Apply*, then *Close*. Then click *Finish*. If you find that your logic works backwards, you can click on the *Invert* check box to reverse the sense of the logic. You cannot change the settings on a connected signal.





Salvos/Macros Tab

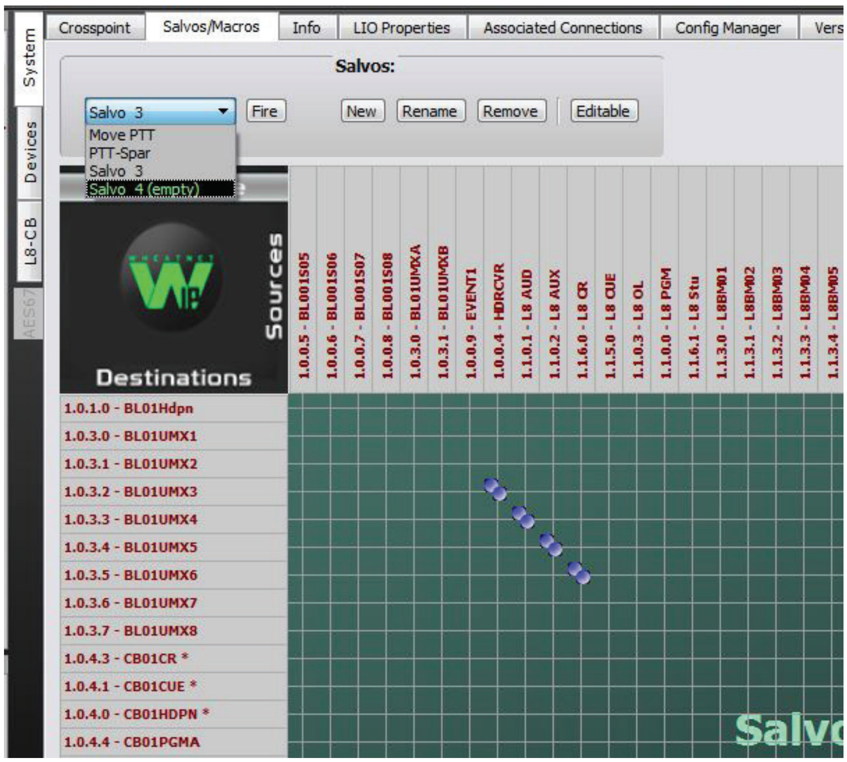
In the WheatNet-IP system, you can group up to 100 connection states into a Salvo and then trigger the one Salvo instead of the 100 individual connections. This capability is especially useful for systematic events involving multiple connection changes. Going from your late night automated set up into your Morning Drive Show is a good example. It may involve switching out automation from your air feed, bringing in a control surface, a bunch of mics, switching headphone feeds, connecting automation playback decks, etc. The good news is that this set up tends to be the same every day. Go ahead and group all of these connections into a Salvo, and instead of all the patching and cross connecting you would have had to do in the old analog days, you can simple click on a menu selection (or press a button if you map the Salvo to an LIO port) and make these wholesale changes quickly and reliably. It's one of the great benefits of having a networked system in the first place.



Here's how to do it. Click on the Salvos/Macros tab, and a new window opens. It shows a crosspoint grid with scroll bars, like you have seen before, but there are differences. A new button area labeled *Salvos:* has appeared on screen between the system tabs and the crosspoint grid itself. Also, the grid background shows the legend *Salvo Edit Screen*, and any dots on the grid representing connections will be in a new color. By the way, the trick you learned earlier about right-clicking on the WheatNet-IP logo on the crosspoint grid also works here. It will bring up some of the same menus that change how the signals are labeled and sorted on the grid (by name, ID, etc.). Any of the filters you've defined for restricting the crosspoint view will also be usable on the salvo grid.

In the left part of the salvo button area is a selection window. Initially it will say *Salvo 1 (empty)*. As you define Salvos, their names will appear in this selection window. Executing a Salvo is simply a matter of scrolling through the list in this selection window to highlight the desired Salvo, and then clicking on the *Fire* button. Don't be alarmed if you don't see any crosspoint changes on the grid; remember this is the Salvo Edit Screen. You can click on the System Crosspoint tab (or use the floating Crosspoint window) to verify that your connection changes actually happened.

Click back on the System Salvos/Macros tab if you aren't already there and click on the *New* button in the *Salvos:* button area. A blank grid will appear, and a new salvo name, "Salvo x" will be added to the salvo selection window where “x” is the next salvo number available. In the case of the first salvo created, the default name will be “Salvo 1” and so forth. Click on the button labeled *Editable* to highlight it. Click on any source - destination connections you want to include in your salvo and a dot will appear on the appropriate grid intersection. If you have any destinations you simply want to disconnect and not use, right click on the destination name and select *Disconnect Destination*; a solid line will be drawn across the grid at the destination, indicating that there are no sources connected to the destination. When you are finished, you can click on the button labeled *Rename* if you would like to overwrite the default salvo name with something more identifiable, say for instance “Morning Show.” A good name for the salvo is very useful in other parts of the Navigator GUI, such as the LIO mapping area where you can assign salvos to buttons. You’ll see a list of salvo names exactly as shown here in the salvo select window.

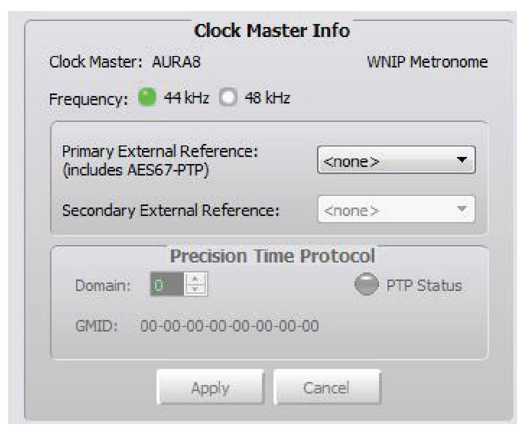


A few final hints about salvos. When you switch to the Salvos/Macros tab, the screen will go to the view from the last time the salvo window was opened. Also, if you find you can’t change connections on the grid, make sure you’ve clicked the *Editable* button first. We’ve chosen to make the salvo edit process take two steps so as to avoid inadvertent changes caused by accidental mouse clicks during casual viewing. Finally, salvos are executed very quickly; however, there is a sequence to them. Connections changes are made in the order they were created in the salvo, so if the order is important to you, keep this in mind while creating the salvo.

Info Tab

Clicking on the Info tab removes the crosspoint grid from the main part of the GUI screen and opens a new window. Within this window are four subwindows used for setting up important system functions.

Clock Master Info



In the WheatNet-IP system, in order to keep all of the audio channels in all of the connected BLADEs and PCs synchronized, one of the BLADEs is designated as "system clock master." This is something that is normally done automatically by the system at start up time, but this window allows you to deliberately specify the clock master. Why would you want to do this? In the case where you are trying to synchronize the entire system to some external AES master clock. By feeding the external clock reference into AES input 8 of one of your digital BLADEs and selecting that BLADE in the *Primary External Reference* window, you will force the system to slave off of the timing reference on input 8 of the designated BLADE. We chose input 8 as the reference input because the external clock reference chews up an audio channel, and input 8 seems less valuable than, say, input 1. Note that you can also specify another BLADE to be a *Secondary External Reference* for back up. In this case if you provide the same AES reference signal to the secondary clock master BLADE, the system will stay locked to the external reference should the primary clock master BLADE loose power or otherwise go down.

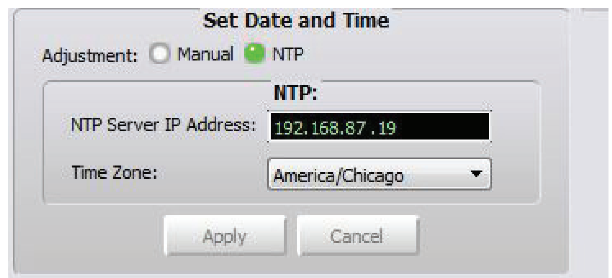
This window also has two buttons to set the system clock rate to be either 44.1K or 48K. While this selection is not so significant for AES digital input signals because all AES inputs in BLADEs are equipped with sample rate converters, it does set the sample rate of all of the system's AES digital outputs. Most modern digital devices can accept various sample rates, but there are still some out there (primarily Automation PCs) that require a specific sample rate.

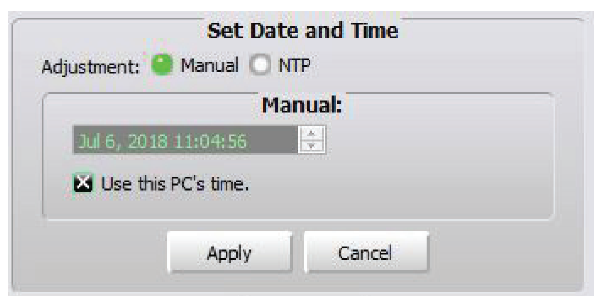
Choose the settings you want in this window and click on the *Apply* button to execute them.

How does this all work? The system will synchronize to the BLADE that is the primary clock master. This will be indicated in the System Pane of the GUI by a BLADE wave signal overdrawn on the appropriate BLADE icon. There is also a front panel LED that will also be lit to show that the BLADE is the primary clock master. That BLADE will use whatever AES signal that is connected to input 8 as the clock reference; if there is nothing connected to input 8, or if the device connected to input 8 goes away, it will use its own internal reference. If the primary clock master BLADE itself should power off, become disconnected, or otherwise cease to function, the secondary clock master will take over so be sure to connect your external AES reference signal to input 8 of the secondary clock master too if you need to keep the system locked to the external reference.

For AES67 and PTP Clock setup please refer to the “WheatNet-IP and AES 67” Appendix 11 of this manual.

Set Date and Time





This window is used to set up the date and time of day for the WheatNet-IP system. There are two modes the system can operate under, manual and NTP. The mode is chosen with the *Adjustment:* buttons.

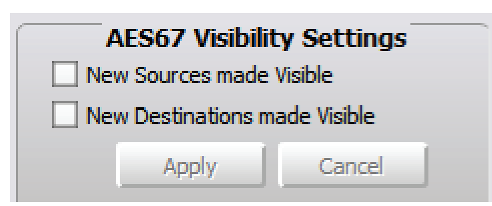
In NTP mode, each BLADE and surface will subscribe to a network time server and maintain date/time synchronization with the network server.

In Manual mode, you have two choices. You can specify the date and time yourself by clicking a section in the window and clicking on the up/down arrows to advance or backtrack the section, or you can take a short cut and simply click on *Use this PC’s time*. In that case the time settings on the GUI PC will be distributed to the BLADEs and control surfaces. It will take a little while after making your selection for everything to get updated.

The system date and time settings aren’t visible in the system during normal operation but you should still take the time to set this carefully. Each BLADE maintains a log which can be useful for checking and troubleshooting problems. This log has a date and time stamp on it that is derived from the system date/time. Also, each control surface has a time of day display that is controlled by the system date/time.

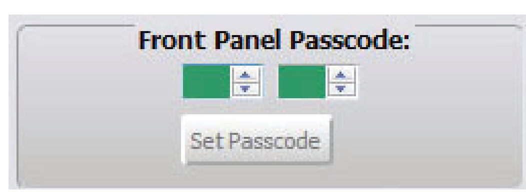
Choose the settings you want in this window and click on the *Apply* button to execute them.

AES67 Visibility Settings



Allows you to determine whether new sources or destinations are automatically made visible to AES67-compliant devices in your system.

Front Panel Passcode



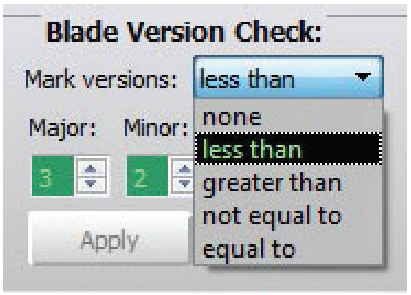
In a similar vein, you can restrict access to all front panel functions of the BLADEs with passwords, such as REBOOT, FACTORY RESET, IP ADDRESS, etc. These are the functions that can significantly alter the functionality of a BLADE, so their access can be controlled with passwords. The passwords are all numbers because users will use the front panel encoder to enter them. Use the up/down arrows or else type the numbers in directly to specify the password. Useable values are in the range 0 - 255.

Once you have completed the settings you want in this window, click on the *Set Passcode* button to execute them.

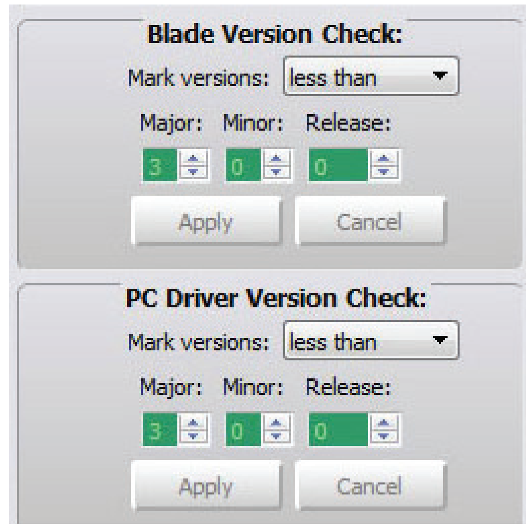
Users attempting to log into the sensitive areas of a BLADE via the front panel will be prompted for a password which will prevent their access unless entered correctly.

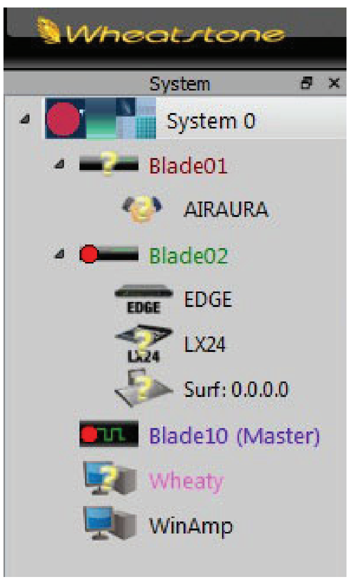
Version Check

Gives you visual notification for the choosen range of the BLADEs or PC Drivers versions in your system.



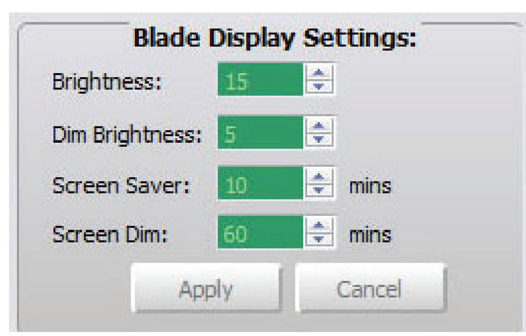
Choose a range of the versions from the Mark Versions: drop box. Enter desired version in the Major:, Minor:, and Release: boxes, then click the Apply button.





A red dot indicator is displayed next to any BLADEs in the System Pane that fall within the selected range. This makes it easy to see at a glance any blades or PC Drivers that need to be updated.

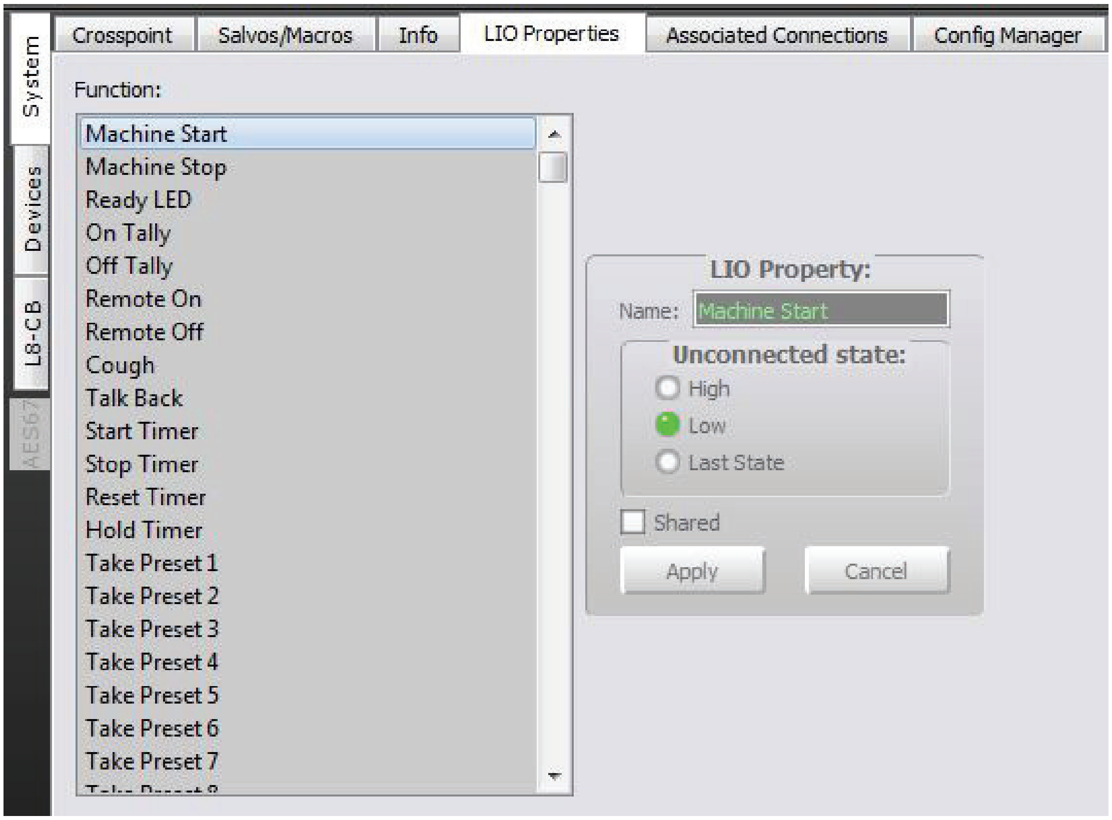
Blade Display Settings



The brightness of the displays can be controlled globally by the settings in this region. The displays brightness varies from a setting of OFF to a maximum of 15. The displays also have a screen-saver mode. After a specified time, the display brightness will be automatically dimmed to an alternate brightness setting. When a button is pressed or an encoder is turned, the brightness returns to the normal level.

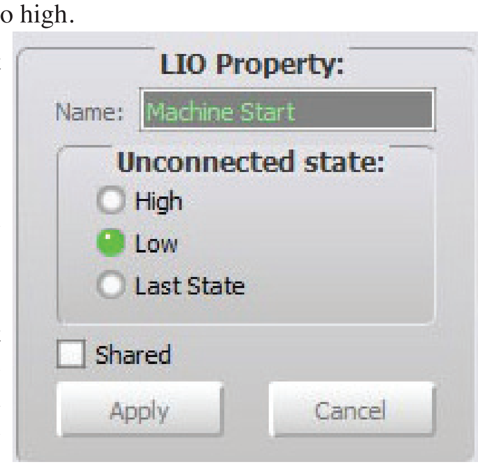
- **Brightness** – This control specifies the normal brightness level of the display. The possible values vary from a low of OFF to a high of 15.
- **Dim Brightness** – This control specifies the brightness level to be used when the displays are in dim mode. The possible values vary from a low of OFF to a high of 15.
- **Screen Saver** – This control specifies how long (in minutes) to wait before entering screen-saver mode. The allowed values range from Disabled to 240 minutes.
- **Screen Dim** – This control specifies how long (in minutes) to wait before display is automatically dimmed. The allowed values range from Disabled to 240 minutes.

LIO Properties Tab



This screen is used to set certain logic output function properties. The logic system in WheatNet-IP works by using crosspoint connections between logic inputs and logic outputs to establish a logic path. If a logic source, for instance a switch, is crosspoint connected to a logic destination, say relay #1, and they both have been defined with the same function (start, remote on, user 23, etc), then the switch will trigger relay #1 as long as the crosspoint connection is maintained. If that connection is broken and, instead, a connection is made to a different logic destination, say relay #2, then the switch will trigger relay #2. The question then becomes "How should a logic output behave when it is disconnected from a logic input?" The Navigator GUI allows you to specify this behavior separately for each logic function (starting with function User 1). This capability can be very useful with some types of machines that also have front panel controls. These controls may not function if the remote control logic ports of the machine are held in the wrong state. The choices for the disconnected state of a logic output are:

- **High** – When the output is disconnected from a logic input it will go high.
- **Low** – When the logic output is disconnected from a logic input it will go low. This is the default.
- **Last State** – When the logic output is disconnected from a logic input, it will stay in whatever state it was last in.



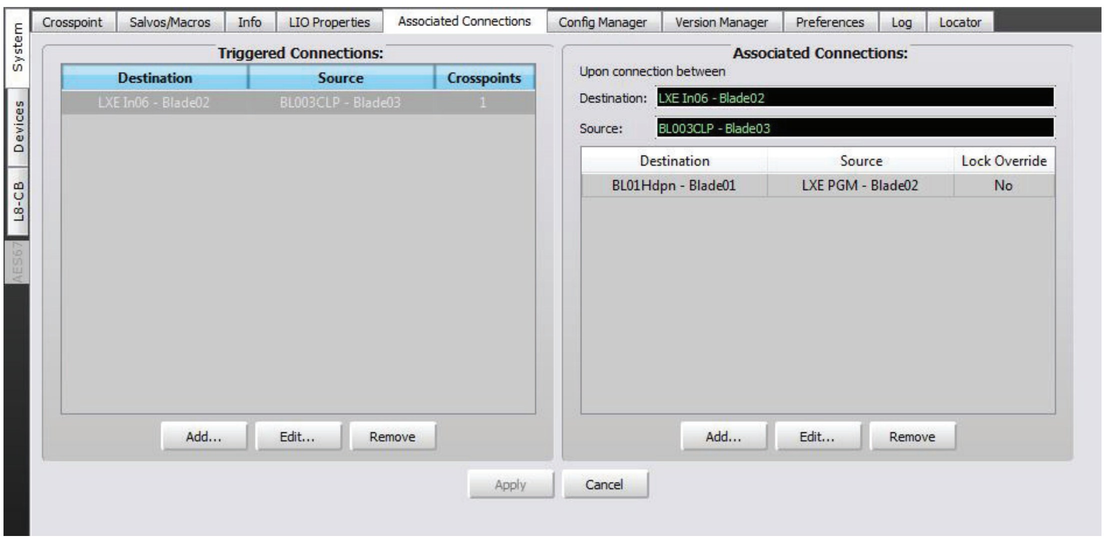
To change from the default, select the logic function desired from the scrolling list. Its disconnect state will appear in the "Unconnected state:" window. Click on the button to make your choice, then click on *Apply*.

The LIO Property: section of the window also has a *Shared* check box. It is rather easier to explain the use of this check box by first explaining what we mean by the opposite term, "not shared." The factory defined logic functions all work in a "not shared" mode. This is best described using a specific example from a system that includes one or more surfaces.

Let's say that you have a CD player signal with an associated "Machine Start" logic output. This would typically be the case when you want the CD player to begin playing a cut when a surface fader's ON button is pressed. But what happens when that same CD player also gets assigned to a different fader, say on another surface in a different studio? We normally would not want an ON button press on this second fader to fire the Machine Start logic while the cut is playing, possibly on air, on the first surface, since it might restart the cut, or switch to a new cut. In fact, using the factory defined functions, like "Machine Start," we lock out control from additional faders when the first fader is turned on, rather than "share" the logic signal.

Having said that, checking the "Shared" check box for a user defined logic signal allows the signal to be shared among users of the signal. In the above example, with both faders on, either fader's ON button could fire a shared user defined function at any time.

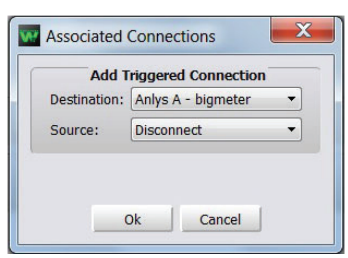
Associated Connections Tab

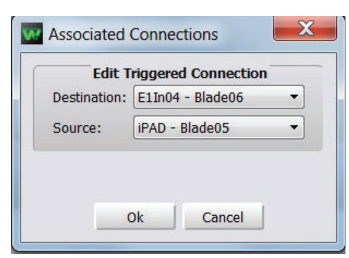


Associated Connections feature is useful for callers, codecs, networks, remote broadcasts and live talk shows that require a mix-minus. With this, operators can create a predetermined back haul, IFB feed or mix-minus to each device based on its location in the system and the fader to which it is connected. 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.

Triggered Connections

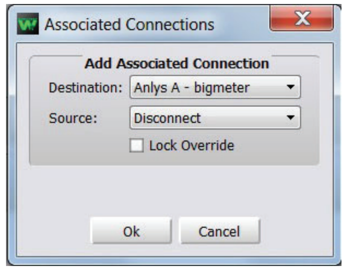
Here is where the main connection is specified. Anytime this connection is made, all of the specified associated connections will also be made. The trigger can also be a Disconnect.

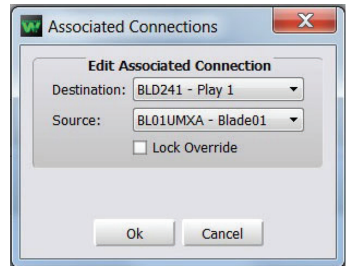




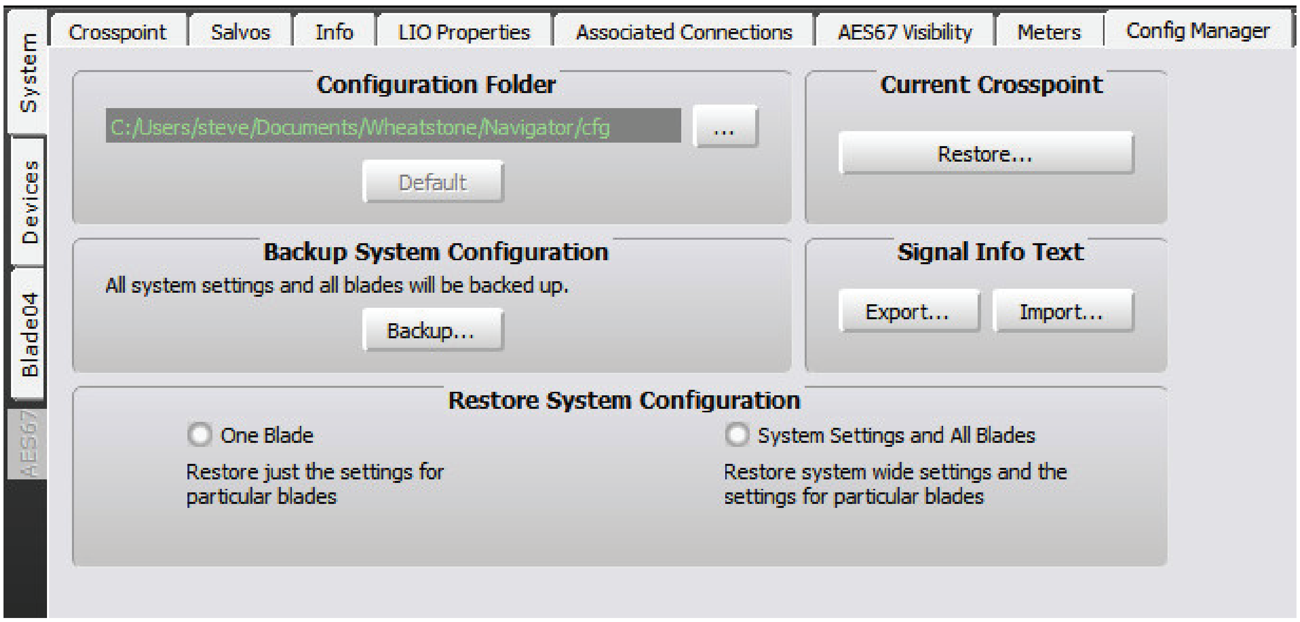
Associated Connections

Here is where the associated connections are specified. Note there is a "Lock Override" check box. If a specified destination is connected to some other source and that connection has previously been locked, an associated connection event will not change the locked connection unless this box has been checked.





Config Manager Tab

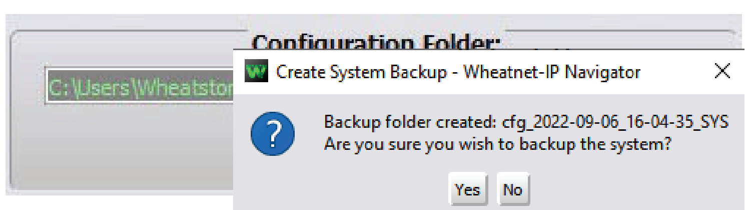


This screen allows you to specify a directory on the GUI PC to be used to archive system information, to back up data to the directory, or restore data to the system from the directory. As in any digital system, it's a good idea to back up critical information regularly.

In the WheatNet-IP system, there are two classes of data for archiving, system data such as salvos, clock, date, and password information, LIO properties, and so forth, and BLADE data such as signals, names, silence detect parameters, logic port mapping, etc. The System Config Manager window has several sub windows.

Configuration Folder

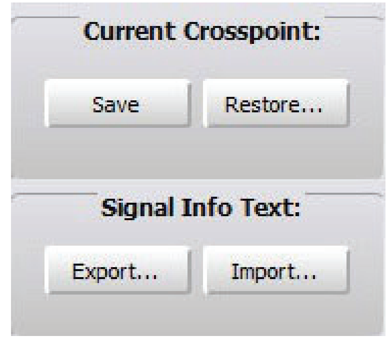
In this window you choose the specific directory for the Archive. The default directory is shown in the box, or you can click on the "..." button to open another window to browse for a different directory. If you decide to change the default directory, browse for and highlight the new one in the box and then click the *Default* button.



Backup System Configuration

This window is quite simple. Click on the *Backup*... button and the system information will be sent to a new, automatically named, directory created in the directory specified in the "Configuration Folder" window.

Current Crosspoint

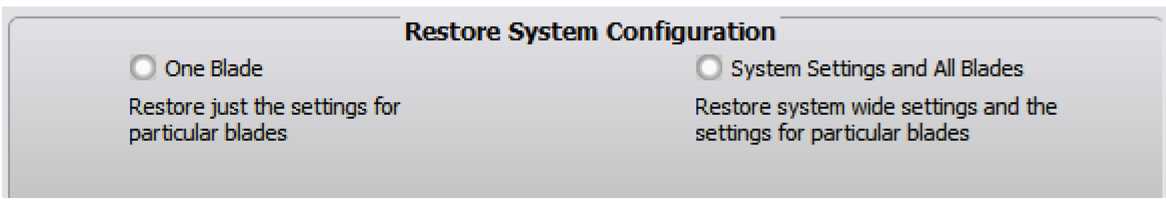


This window is used to save the Current Crosspoints to a file stored locally on the PC or restore Crosspoints from one of the saved files.

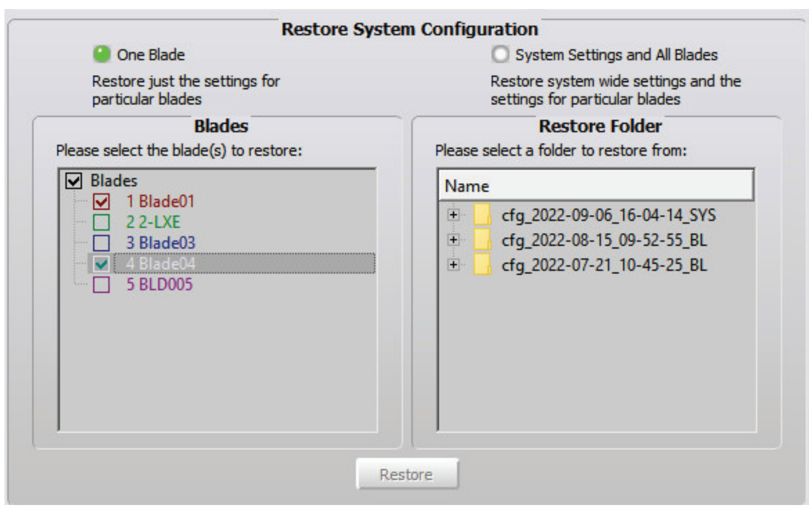
Signal Info Text

This window is used for exporting the Signal Info data to the archive or importing it from the archive back to the WheatNet-IP system.

Restore System Configuration

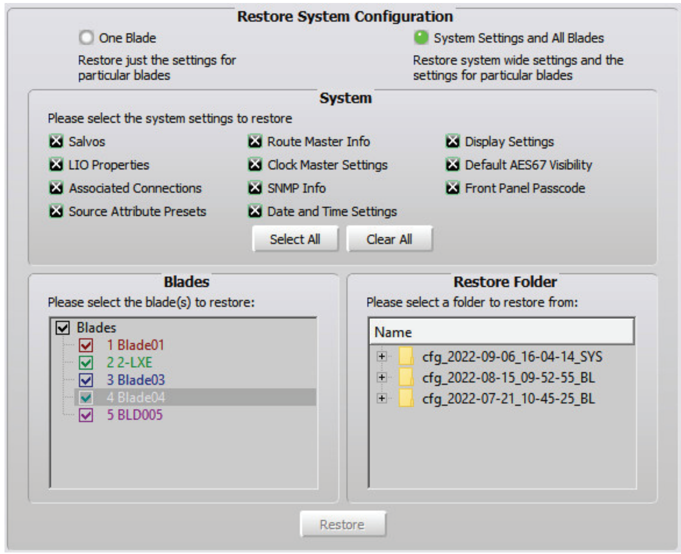


This pane is used for restoring data from the archive back to the WheatNet-IP system. You can restore just one or more selected blades, or all blades in the system. If you choose the **One Blade** option, you will see the following window appear:

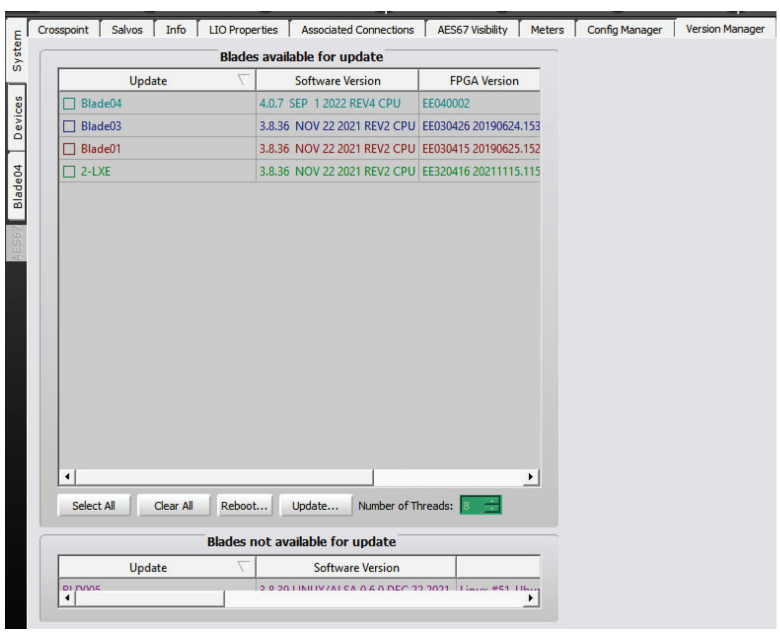


In the right hand pane you select a directory to restore from. If restoring just one or more selected blades, you will be asked to confirm and then the system will request you to reboot all restored blades.

If you select the **System Settings and All Blades** option, you are given several choices of data that can be restored, including Salvos, LIO Properties, Clock Master Settings, Display Settings, Date and Time Settings and others. Click on the check boxes to select any or all of these. In the Blades section you can click any or all BLADEs to be restored.



Version Manager Tab



The Version Manager tab opens an information window showing at once the current software and firmware versions of all BLADEs in your system. As the WheatNet-IP system evolves over time, there will no doubt be future updates that increase or improve functionality of the BLADE. This tab is a convenient way to keep track of the current versions on the BLADE. It also can be used to update the BLADE with new versions.

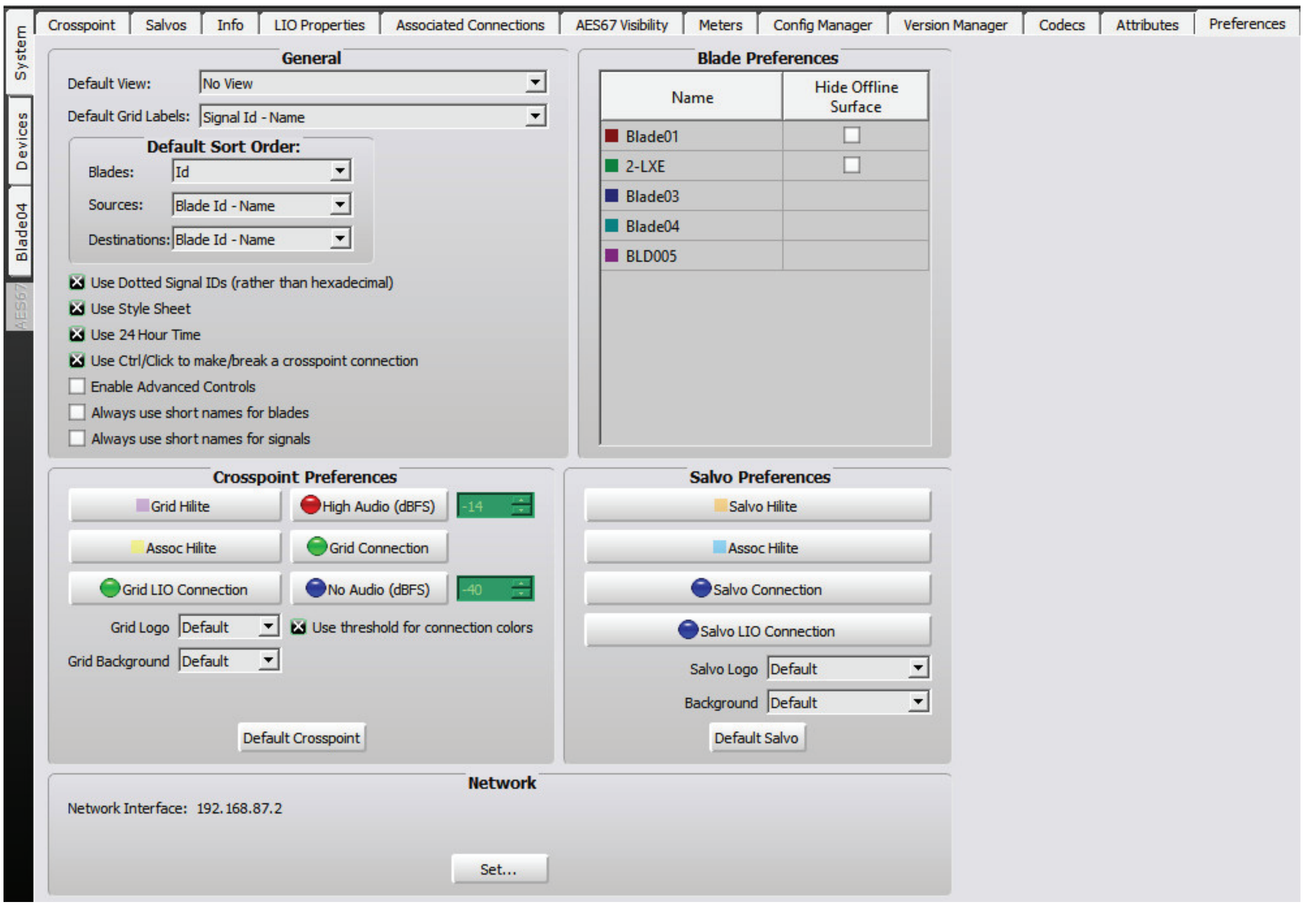
Choose the BLADE you wish to update from the “Blades available for update” section or press the *Select All* button to select all BLADEs at once, then press the *Update...* button to browse to the directory on your PC that contains the version you wish to upload to the BLADE(s).

Click on a file name to highlight it and then click on the *Open* button. The file will be uploaded to the BLADE(s). Note that the BLADE(s) must be rebooted in order for the new software file to actually run on the BLADE(s). Either power cycle the BLADE(s), or chose "Reboot" from the front panel menu, or use the individual Reboot Blade option in Navigator for each BLADE, or use the System > Reboot All Blades option in Navigator.

After uploading and rebooting, check the Version Manager tab to make sure the desired software version is running.

The "Version Manager" form also display a list of "Blades not available for update." This includes items that cannot be updated from Navigator, such as PC Driver Blades.

Preferences Tab



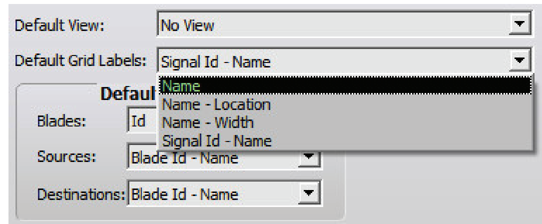
This window is used to change the look and feel of the Navigator GUI. Within it are several sections that control a number of default settings of the program.

General Section

Default View

Clicking in this box opens a drop down window listing all of your defined views. Chose one of them to be the default and this view will automatically be applied every time you open the GUI, showing the subset of the system as specified by the view. This function can be useful if you regularly run the system in a partial state. Some examples might be if you have a TV - Radio combined system and don't want your radio staff distracted by the TV half and vice versa. Or perhaps you are in a total rebuild situation with some studios active and on-air while others are still under construction; a situation all too common these days. Be cautious about applying a default view as you can easily overlook the parts of the system masked by the view. The normal default view setting is "No View."

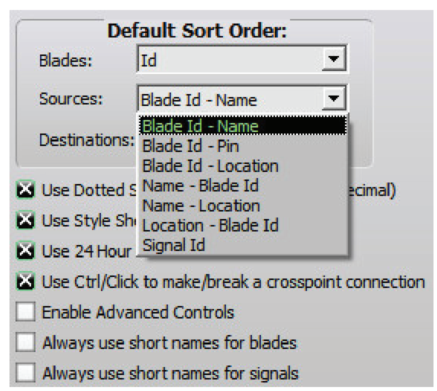
Default Grid Labels



Clicking in this box will open a drop down window with choices to set the information displayed as the crosspoint grid labels. The four choices are:

- **Name** – The signals are identified on the crosspoint grid by their eight character user defined name.
- **Name - Location** – The signals are identified on the crosspoint grid by both their eight character name and the eight character user defined location. Including the location information helps keep track of the signals, especially if you have chosen to use the same name for different signals.
- **Name - Width** – The signals are identified by both their eight character name and audio width as defined for each signal – stereo, mono, lio.
- **Signal ID - Name** – The signals are identified on the crosspoint grid by both their signal ID and their eight character name. This mode is especially useful during set up as each signal is clearly identified by its ID. These are set by the system and absolutely unique. This setting is automatically selected when the GUI is installed.

Default Sort Order

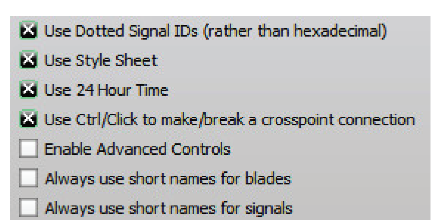


This section allows you to specify a default sort order for the way sources and destinations are displayed. The choices are:

- **BLADE Id - Name** – This is the default. The signals show in order of BLADE ID then alphabetically by name.
- **BLADE Id - Pin** – The signals show in order of BLADE ID first, then connector number.
- **BLADE Id - Location** – The signals show in order of BLADE ID, then alphabetically by location name.
- **Name - Blade Id** – The signals show alphabetically by name first, then by BLADE ID. Useful for when you use a name like "CD 1" over and over.
- **Name - Location** – The signals show alphabetically by name first, then by location name.
- **Location - Blade Id** – The signals show alphabetically by location name, then by BLADE ID.
- **Signal Id** – The signals show in order of their system assigned signal ID.

Check Boxes

The functions are:



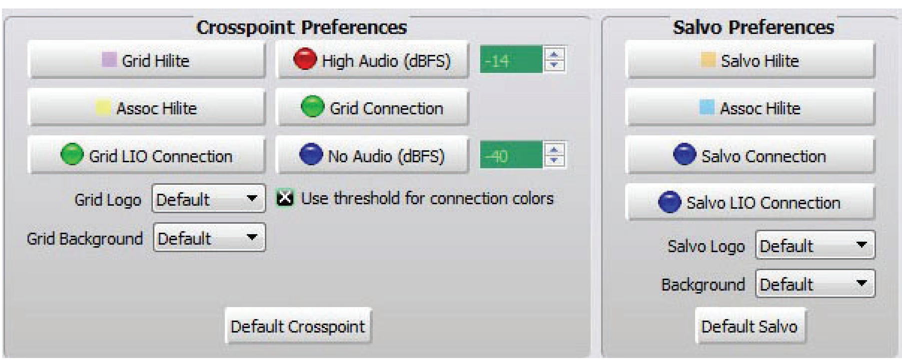
- **Use Dotted Signal IDs** – Changes how the Signal IDs are displayed between hexadecimal and standard decimal forms.
- **Use Style Sheet** – Changes background color from grey to white for highest contrast.
- **Use 24 Hour Time** – Changes between 12 and 24 hour time format.

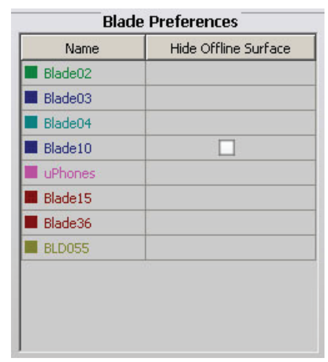
- **Use Ctrl/Click to make/break a crosspoint connection** – Enables having to hold Ctrl down to change a crosspoint on the grid.
- **Enable Advanced Controls** – Enables the Locator tab, Logger options on the System *Preferences* tab, Master Preference options on each Blade's *Blade Info* tab and a few other options.
- **Always use short names for blades** – Causes Navigator to always show the short name for BLADEs, even if a "long name" is specified (applies to Blade-4 only)
- **Always use short names for signals** – Causes Navigator to always show the short name for signals, even if a "long name" is specified. Long signal names are supported on all BLADEs.

Colors

There are three section in the Preferences window that have to do with customizing the visual presentation of the Blades and crosspoint grid:

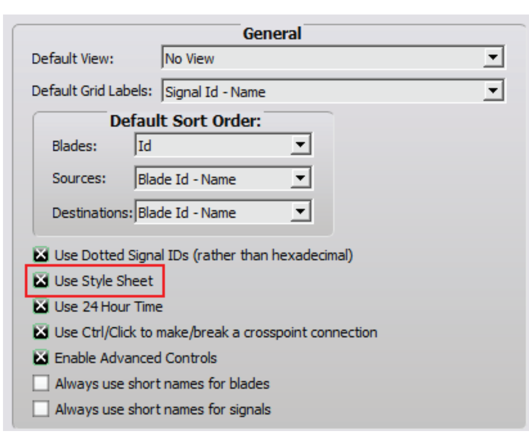
- Blade Preferences
- Crosspoint Preferences
- Salvo Preferences

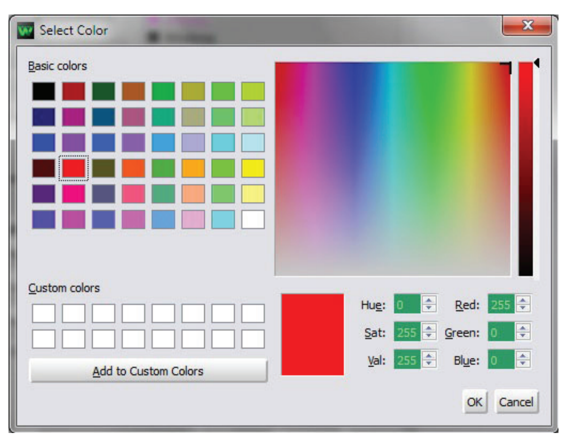




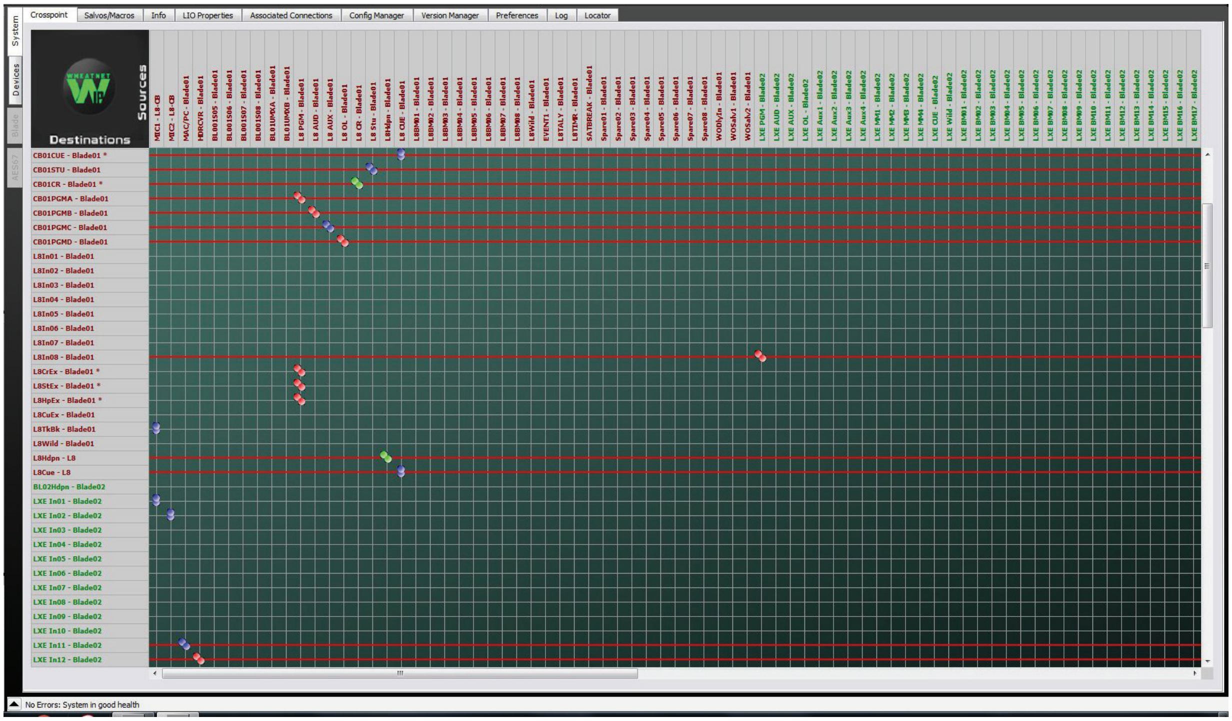
Begin by making sure that the "Use Style Sheet" check box in the General pane has been checked. This tells the software to use richer, more colorful graphics for the grid at the penalty of slightly slower performance. If this check box had not been checked, you will have to restart the Navigator GUI software after you change it. Most of the color functions are disabled when the "Use Style Sheet" box is unchecked. If you find that your GUI doesn't display colored windows as have been shown in this manual, chances are the "Use Style Sheet" box is unchecked.

Clicking on any of the feature boxes opens up a Select Color window, giving you the opportunity to customize the feature color as you see fit. You have millions of colors to choose from.

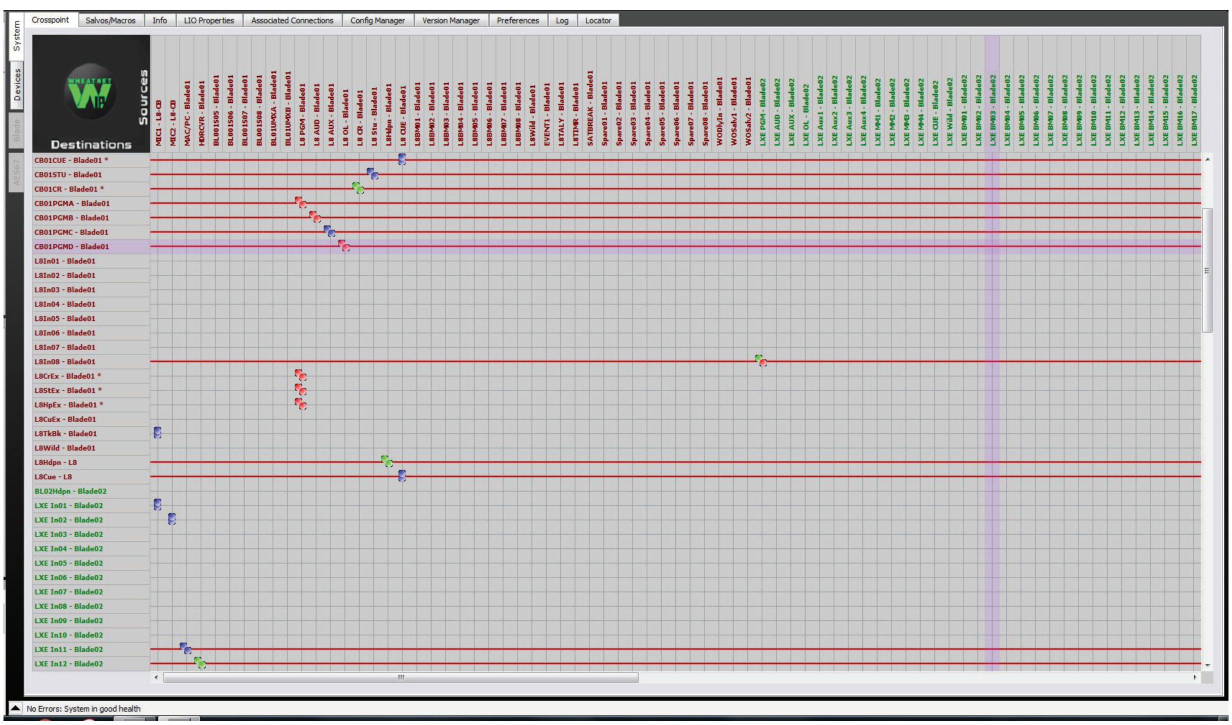




By manipulating the colors of the crosspoint grid you can radically change the look of the GUI, from a bright, bold, hard to miss look:

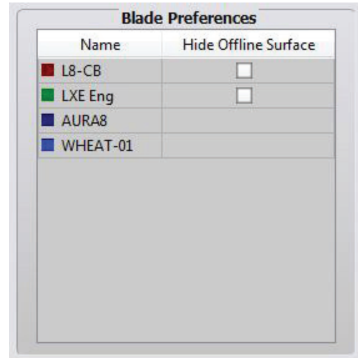


to a soft, subtle, easy on the eyes look:



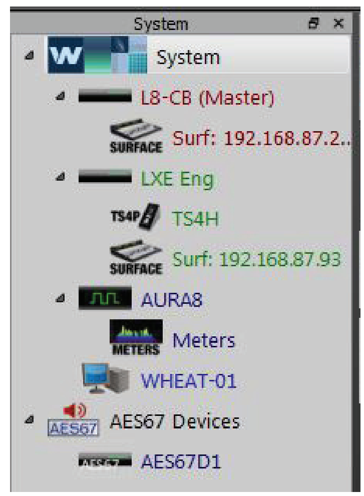
There are lots of possibilities, its all up to you.

Blade Preferences



The Navigator GUI has been designed to simplify the organization of large complex systems. To that end, the system will automatically assign a different color for each BLADE and its associated signals. That is to say, as soon as a BLADE is brought into the system, it is given a color and the BLADE's name will be listed in the System Pane printed in this color. Additionally, the BLADE's source and destination names will appear in the crosspoint grid in this same color. This color coding makes it easy to quickly identify visually which signals go with which BLADE.

Now comes the good part. Because the System *Preferences* window allows you to customize these colors, you can set up your own color schemes for identifying the signals. Because a WheatNet-IP system can be brought up so quickly, you might have a little extra time for organizing the GUI with colors. Here are some suggestions:

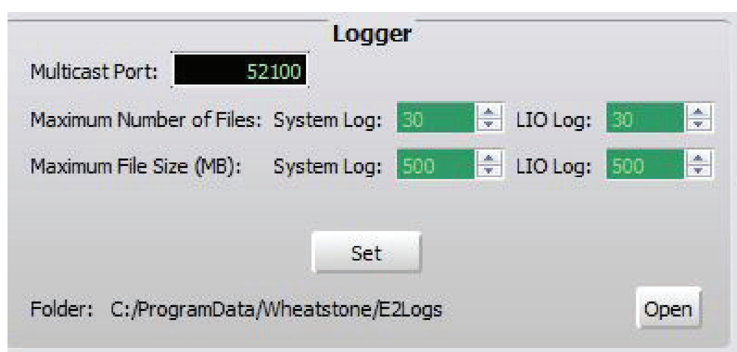


Make each station's part of your complex a different color as in WXXX air, production, and talk studios are all red, WYYY's are all blue, WZZZ's are all green, and the common signals in your rack room are all teal. You can further enhance the presentation by making the different studios in the station different shades of the same color, with the Air studio brightest.

You can key your color scheme to physical location, such as all the BLADEs on the first floor are one color, all the BLADEs on the second floor a second color, and all the BLADEs in the rack room a third color. Again you can use degrees of these colors to further distinguish them.

Another possibility is to use colors to designate functions, say, all analog BLADEs are blue, all digital BLADEs are red, all analog/digital BLADEs are purple, and all engine BLADEs are green.

Logger

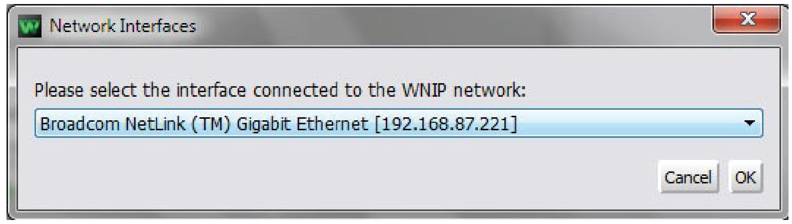


This portion is only visible if the check box *Enable Advanced Controls* is checked. This controls the System and LIO log options. The *Multicast Port* is already set for you. System and LIO logs are saved separately but in the same fashion. A new log file is created when either the date changes or the maximum file size is reached. You can choose the *Maximum Number of Files* for each log type to be saved by adjusting the associated numeral value. You are also able to set the *Number File Size* for each log type by adjusting the associated numeral value.

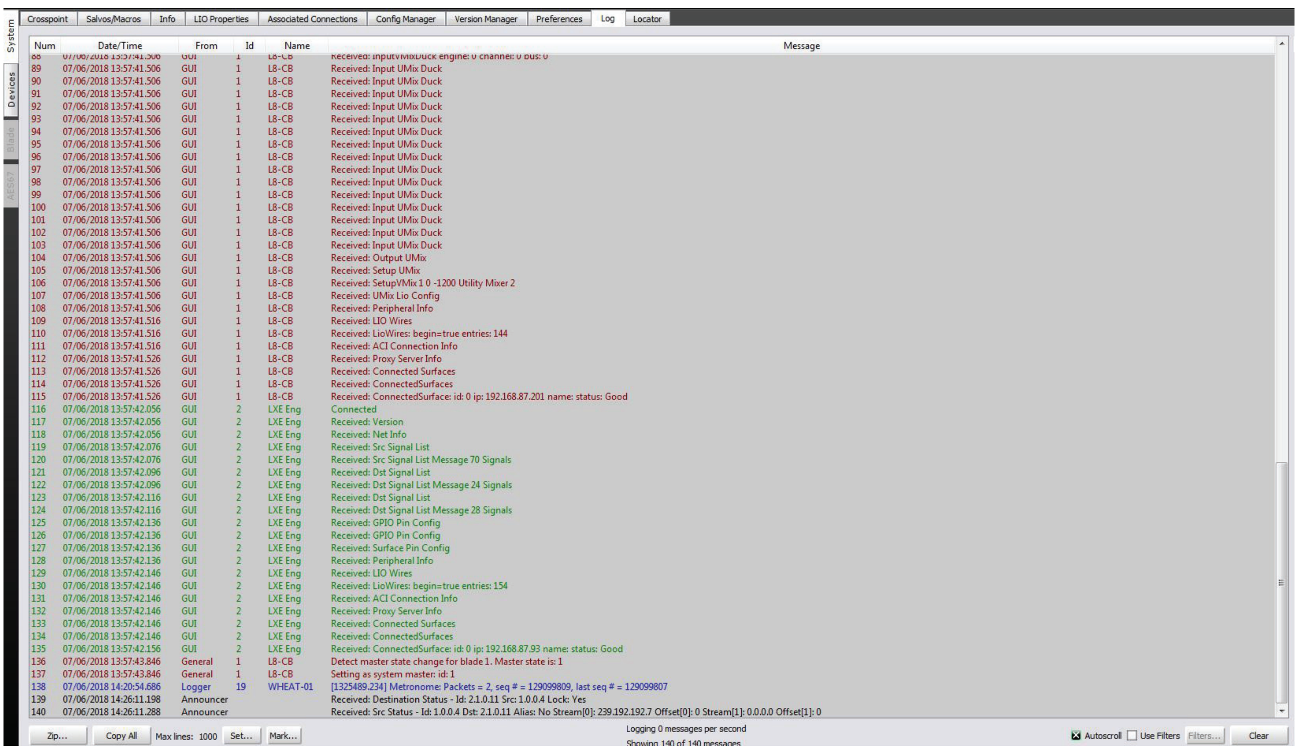
Any changes made in this area require you to click the *Set*... button before they take effect. Once you reach your maximum number of saved files the oldest one will be deleted to maintain the maximum number of files. If the file size reaches its maximum size then a subsequent file is created with an index number to differentiate between them. The *Folder* path at the bottom is the location of the saved files, along with an *Open* button to open that folder.

Network

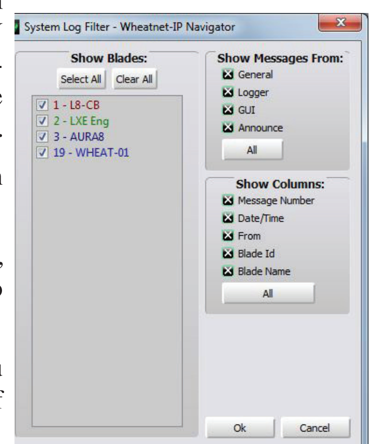
If your PC has multiple Network Interface Connections (NIC) then you choose which NIC you want Navigator to use.



Log Tab

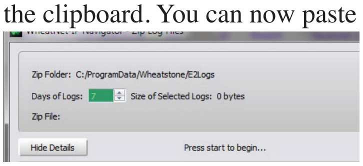


In a large complex system, it is always a good idea to have some method of viewing the sequence of recent system events. It can be very helpful for reviewing and troubleshooting, especially during system installation and set up when the system is unfamiliar and you're not sure if your LAN set up is correct, etc. The Navigator GUI provides a log window for viewing this information. This log is accumulated until the number of entries matches the setting in the *Max lines* window, after which the earliest entries are discarded as new ones are received.



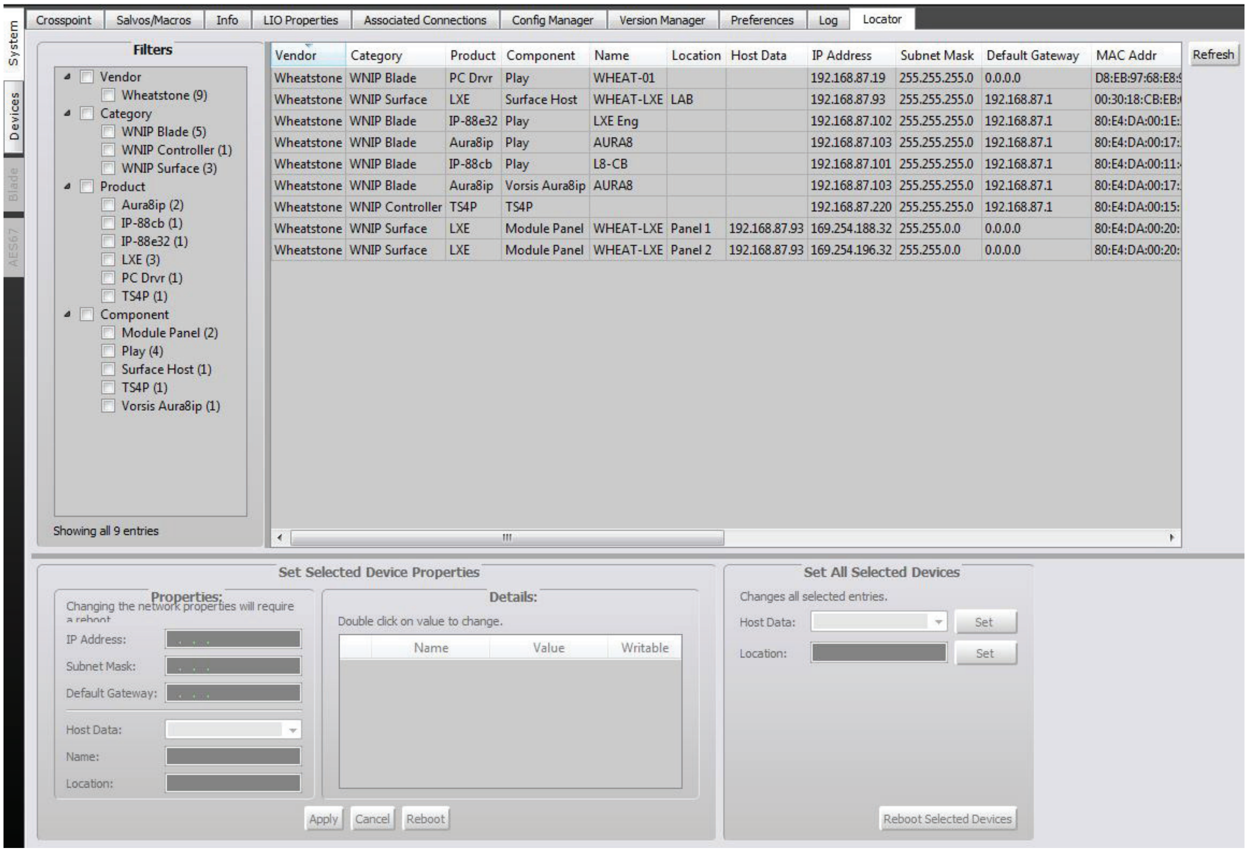
Using filters you can choose which messages are visible in the log, as well as which columns are displayed.

Because this log is continually being updated, it can be difficult to read. In that case, click on the *Copy All* button which will copy the entire log including filtered entries to the clipboard. You can now paste it into a text editor for easier viewing.



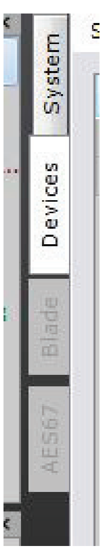
For easier transportation of the saved logs you can click the *Zip...* button and choose the number of days logs to put into one zip file.

Locator Tab



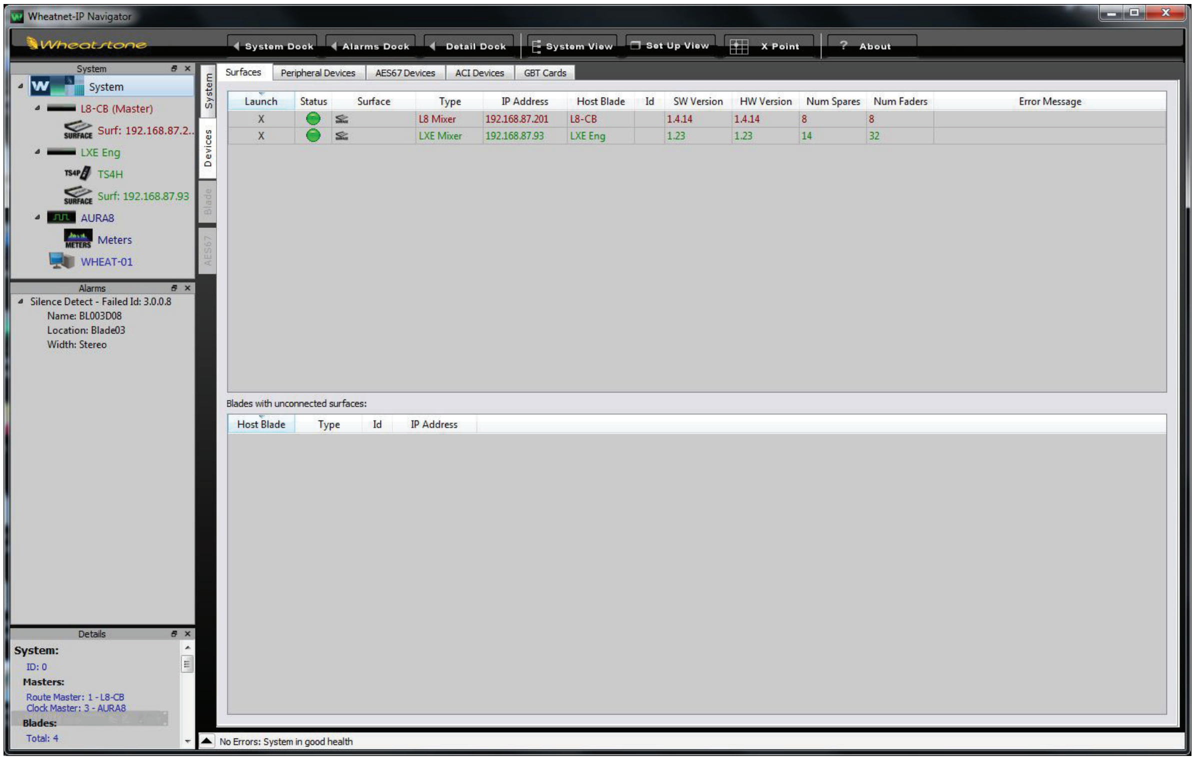
The Locator tab allows the user to ping the network to get a list of devices that are attached to the network. The Locator tab is a good place to see exactly what is in your WNIP network, the IP settings, MAC addresses and software/hardware version numbers. Additionally, filters (on the left side of the Locator tab screen) can be added to pare down the list by device type. You can also sort the results by any field. If you don't see all your devices, use the Refresh button on the right-hand side of the Locator tab screen.

Navigator GUI Devices Windows in Detail



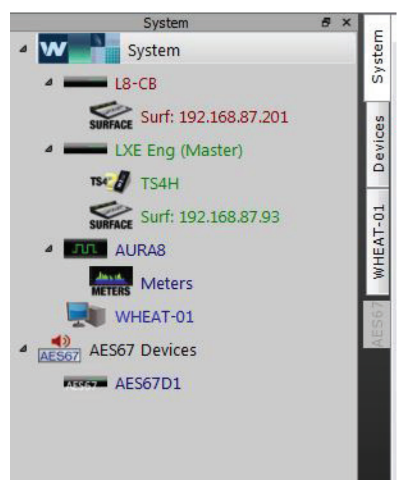
With the Devices Tab on the left, Select the desired Top Row Tab to change the Device tab that is displayed. There are tabs for Surfaces, Peripheral Devices, AES67 Devices, ACI Devices and GBT Cards. You may not have devices on all of these tabs. We will explain each tab in detail in the following sections.

Surfaces Tab



The Surfaces Tab when selected displays the currently connected WNIP Surfaces in the system. Information such as software version, number of faders and spare buttons are also displayed.

Peripheral Devices Tab

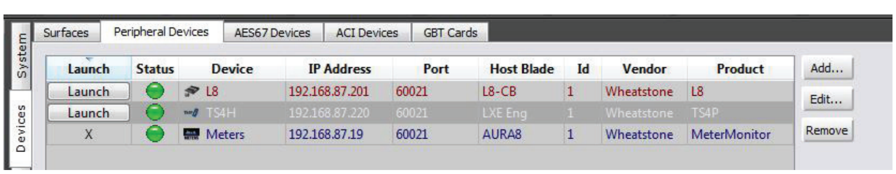


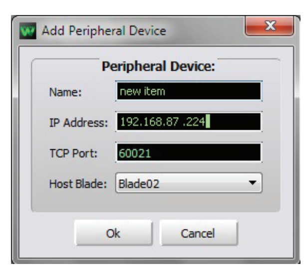
There are a number of products in the WheatNet-IP system that must be added to the System *Peripheral Devices* tab to utilize their complete set of features. Such devices include certain Control Surfaces, Audio Processors, and some other control devices and system components.

You will need to know the IP address of the device being added, so you will want to find that out before you start.

With the Navigator GUI and with the System selected in the System pane you will see something like the figure at the right:

Now select the *Peripheral Devices* tab.



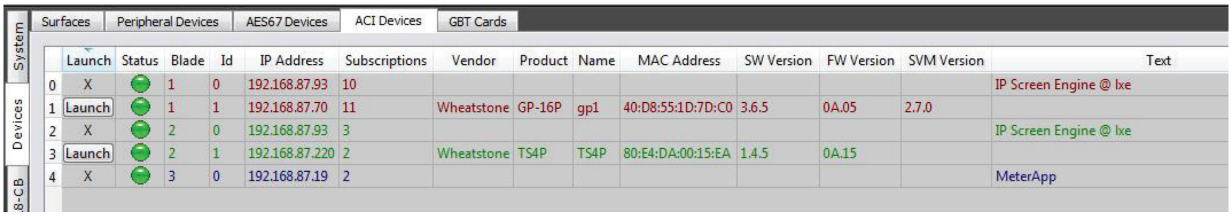


Click the *Add* button to bring up the *Add Peripheral Device* dialog:

Type in a convenient *Name* and insert the *IP Address* of the device being added. Leave the *TCP Port* at the default setting of **60021**. From the *Host BLADE* drop down select the BLADE that you want to associate the 3rd Party device with. Click *Ok*.

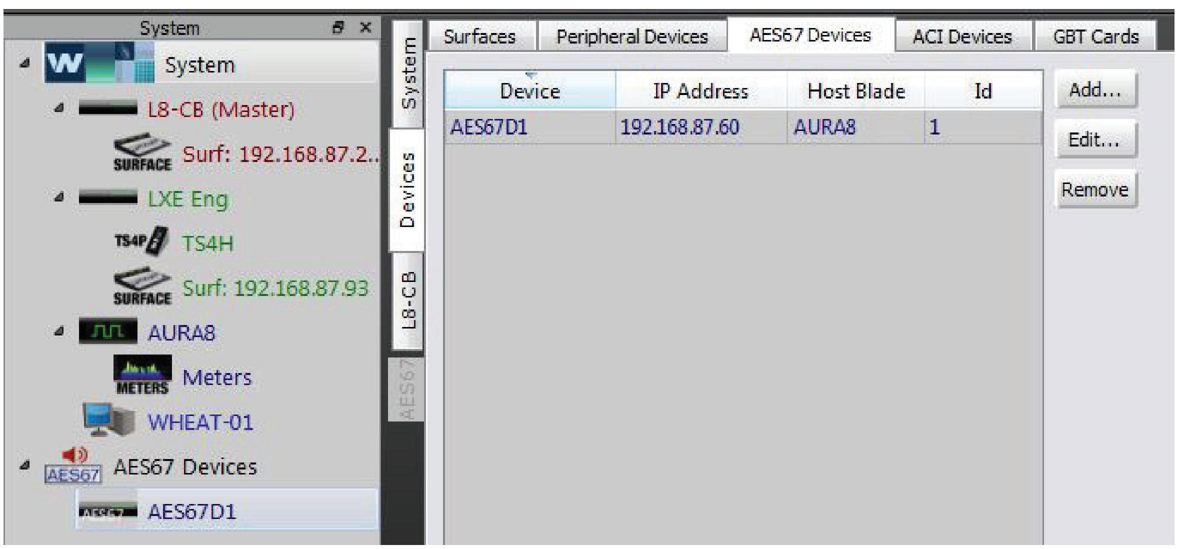
This completes the process of adding the device to the *Peripheral Devices* tab. The added device should show up in the *System* pane under the BLADE you added it to. If it does not show up, or if it shows up but has a yellow question mark on it, then there is either a network issue that needs attention, or the device is not connected to the network at all, or one or more steps have been omitted or done incorrectly in the configuration process.

ACI Devices Tab



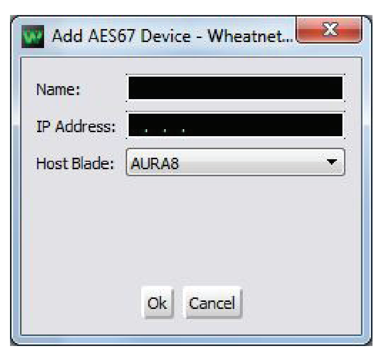
The ACI (Automation Control Interface) Devices tab is a convenient place that lists all of the various ACI devices and applications that have been defined for your system so you can see them all (and their IP Addresses and Host BLADE IDs, etc.) at a glance.

AES67 Devices Tab



The BLADEs support AES67 compliant devices using an IEEE1588 PTP grandmaster clock for synchronizing to and ingesting/streaming AES67 compliant packets. Refer to the "WheatNet-IP and AES 67" Addendum at the beginning of this manual for more information.

Devices

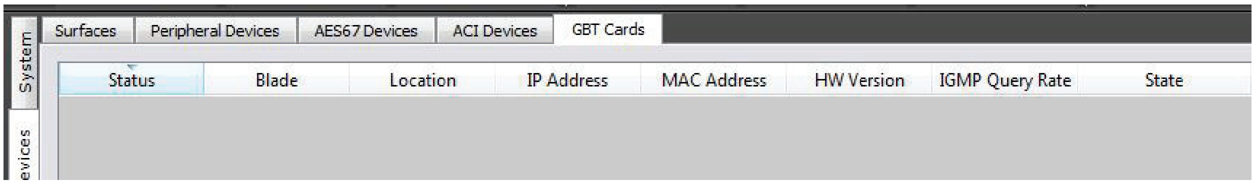


Press *Add...* button to add an AES67 device to the system. Enter the device name and IP address, specify a Host BLADE.

Device Info

For details on futher setup of AES67 Devices, please refer to the "WheatNet-IP and AES 67" Appendix 11 of this manual.

GBT Cards Tab



This tab displays information about connected GBT cards connected to the WNIP System. GBT cards are special cards placed in Gibraltar Cages to interface it to a BLADE System.

Navigator GUI Blade Windows in Detail

Earlier, when we were looking at the System pane, we noted that we could see an icon for each BLADE connected in the system. If we left click on one of these icons to select it, the GUI switches to the BLADE view and a whole new set of tabs appear in the main window. These tabs are for functions and settings not at the system level, but localized to the individual BLADEs. If you click on several different BLADE icons you will see the same set of tabs appearing over and over, but the detailed information within each tab changes from BLADE to BLADE. So the process becomes one of clicking on a BLADE icon, verifying or modifying the settings for that BLADE, clicking on the next BLADE icon, verifying its settings, and so forth until you've looked at every BLADE.

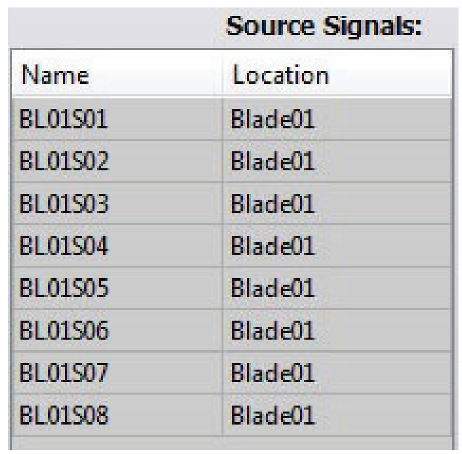
Sources Tab

The first tab is the BLADE “Sources” tab. It is used for viewing and modifying settings for the local audio inputs in the BLADE. The Sources window has four main parts. Along the bottom of the window is an array of 16 bargraph meters and individual level and balance controls for each source (Mono sources do not have balance controls). These meters and controls are used to monitor the level and set gain on the 16 inputs (or eight stereo pairs, etc.) coming into the BLADE. In the upper left area of the main window is a section labeled “Source Signals:” and to the right is the “Free Resources:” section. The “Source Signals:” section is where the eight character input signal name and eight character input location names can be seen and modified from their defaults. The “Free Resources:” section is where the input signal characteristics (mono, stereo, logic, etc.) can be seen. The “User Info” section will display any entries into the selected signals User Info tab. To add info to a signal click on the signal name to select it, then click the *Edit...* button and the User Info tab. Now simply add any notes here about the signal you want displayed.

Source Signals

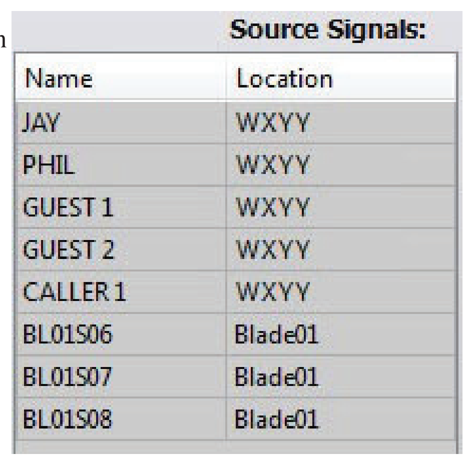
In this section you can see two columns; the first column, labeled “Name” is the source name and the second matching column, labeled “Location,” is the source location. Depending on whether the BLADE has been designated as a stereo or mono BLADE at initial set up, there will be eight or 16 names in the columns. (If the BLADE was originally set up as a custom BLADE, there will actually be no source or location names showing until you first define the mono and stereo signals you want – more on that later). If the BLADE is an engine BLADE, there will be names for every available control surface input and monitor channel (depending on the size of the associated control surface this can be as many as 32 or more).

Assuming you are looking at BLADE #1 and you’ve chosen the stereo signal template, the Source Signals section will look as shown in the first figure at right:


Source Signals:

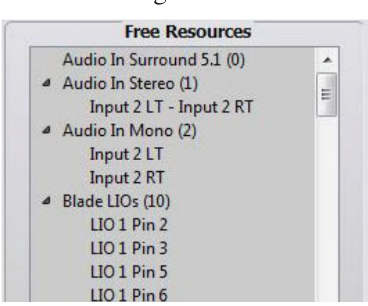
Name	Location
BL01S01	Blade01
BL01S02	Blade01
BL01S03	Blade01
BL01S04	Blade01
BL01S05	Blade01
BL01S06	Blade01
BL01S07	Blade01
BL01S08	Blade01

The first signal in the list (representing input #1) is named “BL01S01” and its location is named “Blade01.” These are the system default names and they can be simply decoded. The “BL01” part of the name is just shorthand for “BLADE 1,” and the “S01” is shorthand for “Source 1.” Thus the auto generated system name means “the first input in BLADE 1.” Likewise, “BL01S02” means “the second input in BLADE 1,” and “BL23S07” means “the seventh input in BLADE 23.” It’s not exactly Rocket Science and, in fact, you can just leave things as they are and go with the system default names if you like. But you can do better. If you double click on a signal name, the name becomes highlighted and you can retype it to be anything you like. “BL01S01” becomes “JAY,” or “PHIL,” or “GUEST1,” or “GUEST2” or CALLER1 – you get the idea. As soon as you type a new name for the signal, it appears everywhere in BLADEs, on the crosspoint grid, on control surface displays, everywhere.


Source Signals:

Name	Location
JAY	WXYY
PHIL	WXYY
GUEST 1	WXYY
GUEST 2	WXYY
CALLER 1	WXYY
BL01S06	Blade01
BL01S07	Blade01
BL01S08	Blade01

Likewise, the “Location” column has default location names which are even more easily decoded; “Blade01” obviously means “BLADE 1.” You can leave these as they are because that pretty much tells you the location of the signal, but if you want, you can change the location to “ WXYY” or “rackroom” or whatever suits your fancy. Edit the Location just as you did the Name, by double clicking on it.

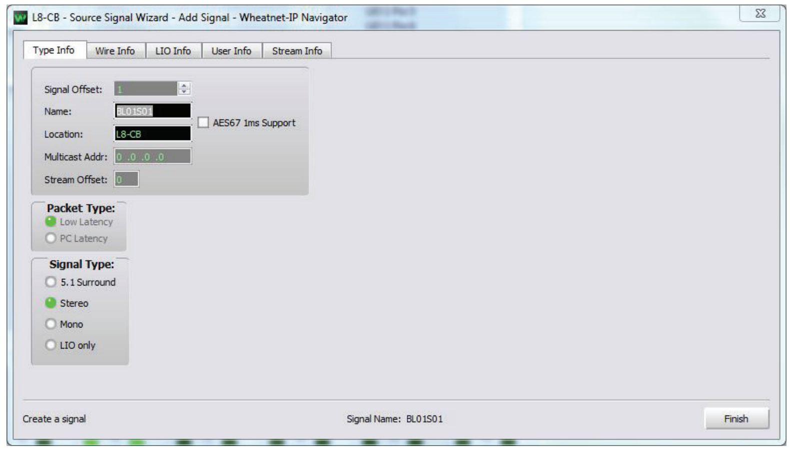


Resources to a BLADE mean audio and logic signals. This section of the Sources window shows the remaining available resources within the BLADE. The first three line entries in this section indicate the number of surround 5.1, stereo, and mono signals sources, respectively, that have not yet been allocated to the system, and are hence available for allocation. Remember, each

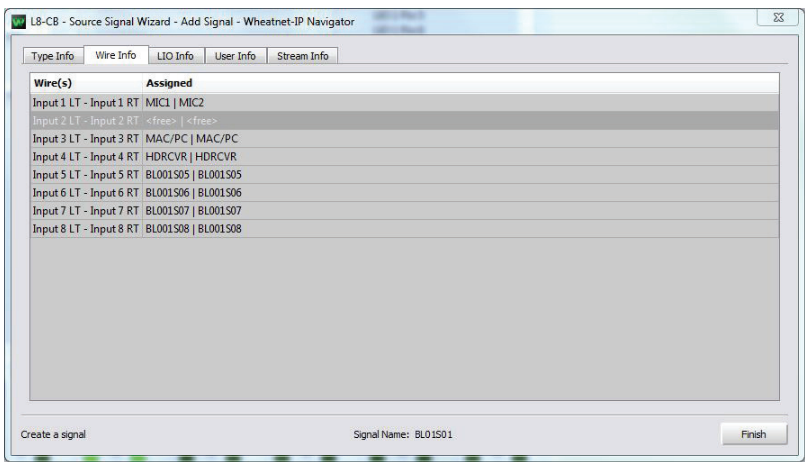
BLADE has a maximum total of 16 mono audio (or eight stereo, or two 5.1 Surround) channels plus 12 logic ports available.

Add Button

Defining a new signal is easy. Click the *Add* button and the "Source Signal Wizard - Add Signal" screen pops up. On the Type Info tab enter the Name, and optionally the Location. Select the Signal Type and accept the Packet Type as automatically selected. Next, switch to the Wire Info tab. Highlight the desired wire number (you must pick one that is not already assigned), then click *Finish*. The new signal name will now appear throughout the system.



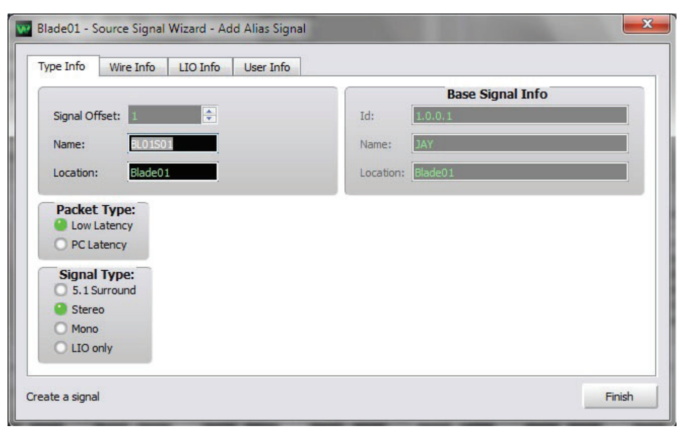
The same is true for the logic ports. The default configuration makes no automatic assignment of logic ports, so all 12 are initially available and show as LIOs. As you allocate logic ports for functions, the resources decrease correspondingly. The "available resources" list, then, allows you to see at a glance how many ports you've used.



Add Alias Button

The BLADE's Alias feature allows the same source to be identified by different names. The Sources and Destinations windows now have an "Add Alias..." button.

The alias is a special class of signals. It may be that the need for an alias arises when you have a signal that you sometimes want to treat as a stereo signal and sometimes want to treat as a pair of mono signals.



As an example, let's say you have a BLADE analog output wired to the stereo input of a computer sound card. Sometimes you are recording the air signal from a stereo program bus, but other times you want to feed the left side of the sound card with a mono signal such as a talent mic and the right side with a mix-minus bus like you might get from a caller. With the output defined as a stereo signal, you can't feed it from two mono sources. But with the output defined as two mono signals, you can't feed it the left and right sides of a stereo source.

Enter the alias. Let's say, to use actual numbers, that you have defined a stereo destination named **Comp1** that maps to circuits 1 and 2 of the analog output. The circuit 1 and 2 outputs are wired to a computer sound card stereo input. In addition you define a mono destination **Comp1LT** that maps only to circuit 1, and a second mono destination **Comp1RT** that maps only to circuit 2.

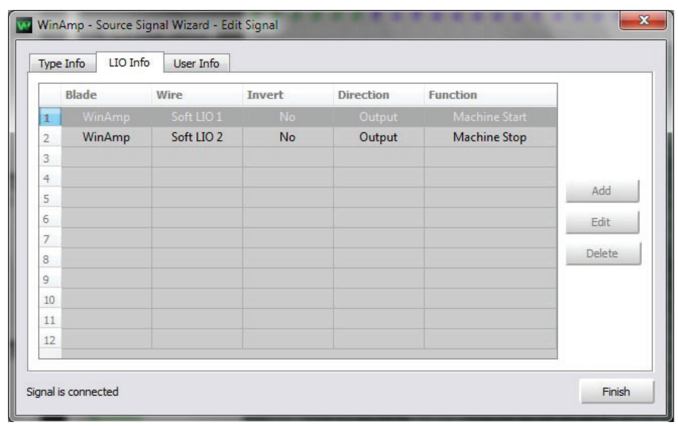
Now if you make a crosspoint between a stereo source and **Comp1** (the original stereo destination) the left side of the stereo source will be routed to circuit 1 of the output and the right side of the stereo source will be routed to circuit 2 of the output. On the other hand, if you make a crosspoint between one mono source and **Comp1LT**, and a second mono source and **Comp1RT**, then the first source will show up on circuit 1 and the second source will show up on circuit 2.

Another use of aliases would be to allow a signal to have one name for use by one operator (or talent) and a different name for use by another operator. For example, let's say a mic source has been named "Joe" because it is used by the host Joe on a morning talk show. But maybe the the same mic is used later in the day by Fred on his show. Now that mic can appear as both "Joe" and "Fred" through the use of aliases.

To add an Alias first select the signal you want to copy by clicking on the signal name. Now click the *Add Alias* button and the "Source Signal Wizard - Add Alias Signal" screen pops up. On the Type Info tab enter the Name, and optionally the Location. Select the Signal Type and accept the Packet Type as automatically selected. Next, if you are creating a mono alias from a stereo signal, select the Wire Info tab and highlight the desired wire number. Then click *Finish*.

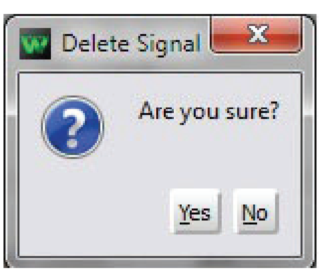
Base Signal Info – This section will show you the Id, Name, and Location of the signal you are creating alias from.

Edit Button



OK, so how do you modify the logic resources? Click on a signal name or location in the Source Signals: area, then click on the *Edit* button. This opens a "Source Signal Wizard - Edit Signal" window where you can redefine the audio signal type or, in this case, add or change logic signals associated with the audio. Use of this form has already been covered in the Source Details Menu section of this chapter under the topic "Modify Signal", page 5-29. The "LIO Info" tab of this form is where you define the logic associated with the audio signal.

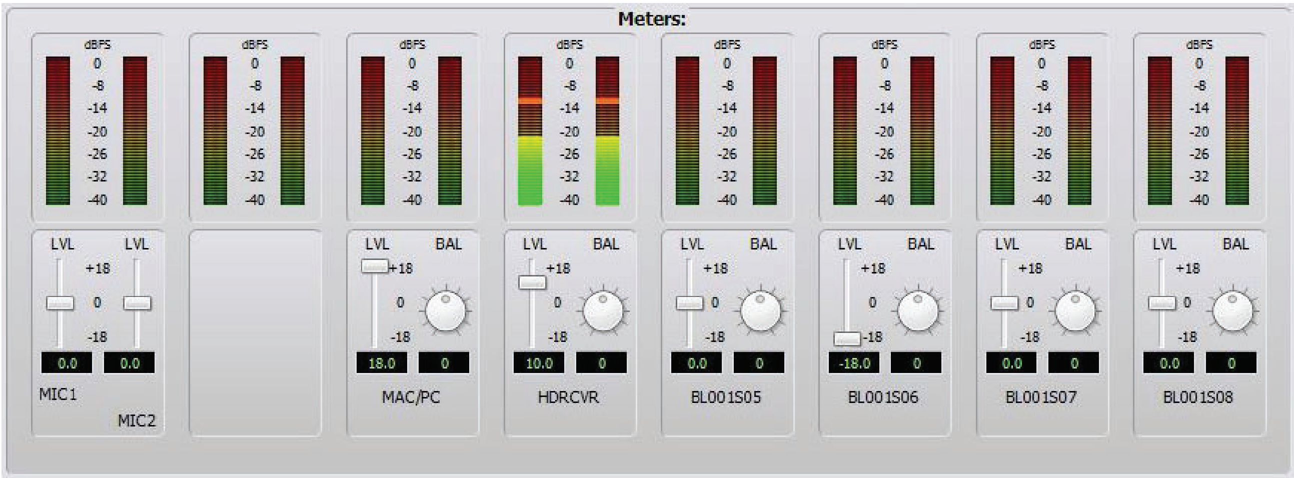
Delete Button



The *Delete* button completes the signal modification tools. Highlight a signal and choose "Delete" and the"Delete Signal" window with a question "Are you sure?" opens. If you click on *Yes*, then the selected signal is removed from the system, adding those resources back to the Free Resources: list.

It all sounds more complicated than it is, but most folks will just use the automatic system defaults and not bother with any of this initially, at least until they need to define some logic signals. Don't be afraid to experiment with defining signals. You can always edit back any changes you make, and if you really get things out of whack, you can just rerun the System Startup Wizard for the BLADE and start over.

Meters



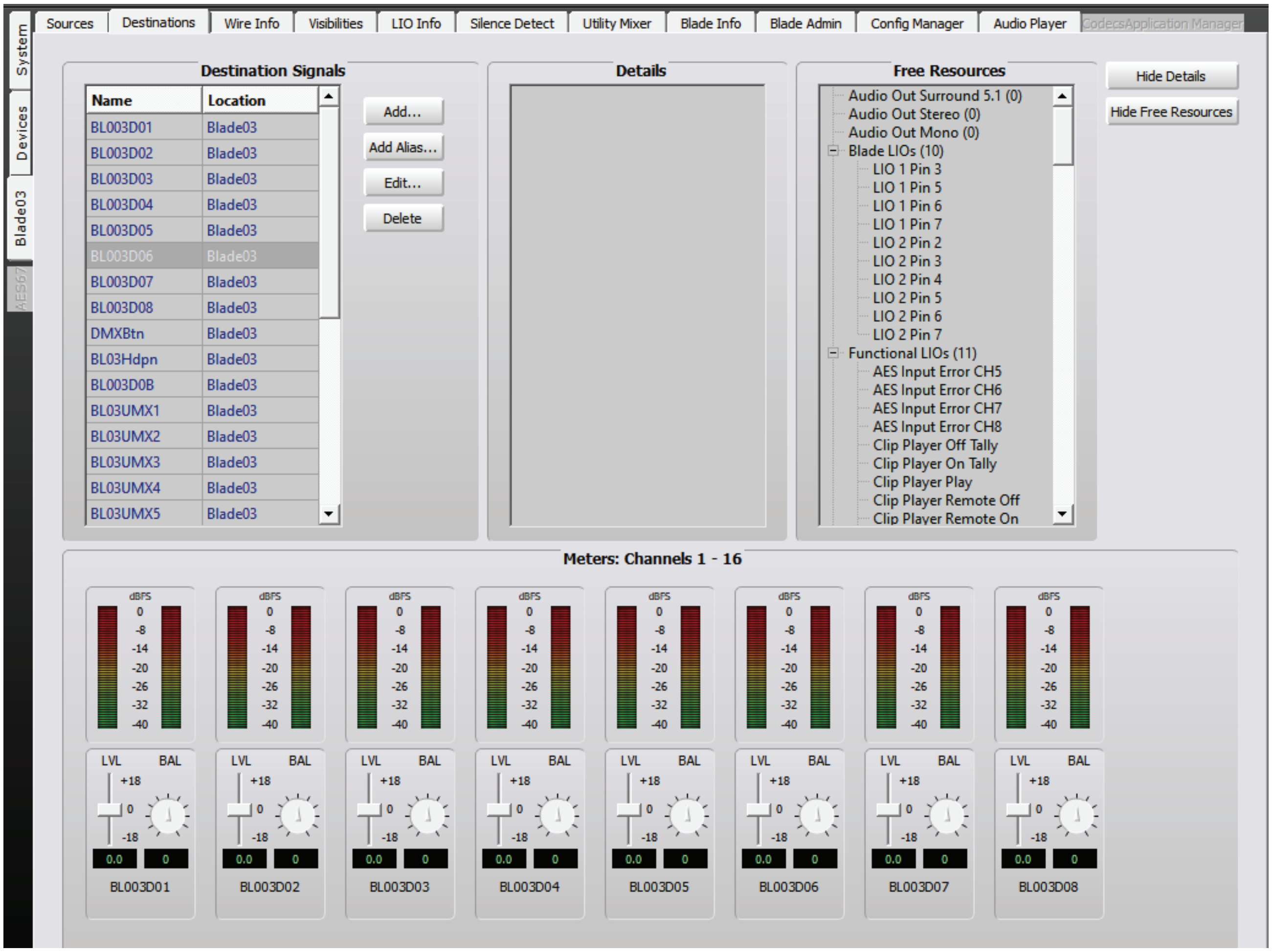
The bottom portion of the Sources tab window, as mentioned before, shows the input channel meters and gain settings. The 16 individual baragraph meters show audio levels for the individual channels color coded over a 40dB range, with the highest level being "+20" VU, corresponding to +24dBu, 0dBFS, and 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.

Below the baragraph meters are individual slider controls for adjusting each channel's gain or loss over a range of +/- 18dB. The slider handle, or knob, moves to indicate a relative gain setting as you drag it with your mouse, and the text box below the slider updates with the specific gain value. If you prefer, you can drag your cursor over the number in the text box to highlight it and type in the gain value you want. The gain adjustment is made in real time and will reflect instantly on the bargraph meters. The system rounds off gain settings to the nearest 1/10th dB.

If the signal is defined as stereo a balance control will be displayed to the right of the level control. This control allows you to adjust the balance of the left and right stereo signal. The adjustments can be made by left clicking and holding the control while moving the cursor in a circular motion. If you prefer, the arrow keys can also be used to make this adjustment. Like the level control, you can highlight the number in the text box and set the balance level with "0" being center. The balance adjustments are also made in real time and will reflect instantly on the bargraph meters.

Please note that any gain modifications you make to a source signal will affect the level of that signal everywhere in the system it appears. If you are making a gain adjustment to compensate for one particular destination only, it might be better to make a destination gain adjustment (more on this in the next section) and leave the source gain alone for correct use in other parts of the system. Source gain adjustments are best used for input signals known to be too hot or too low, to bring them to the nominal system signal level of 0VU, +4dBu, -20dBFS.

Destinations Tab

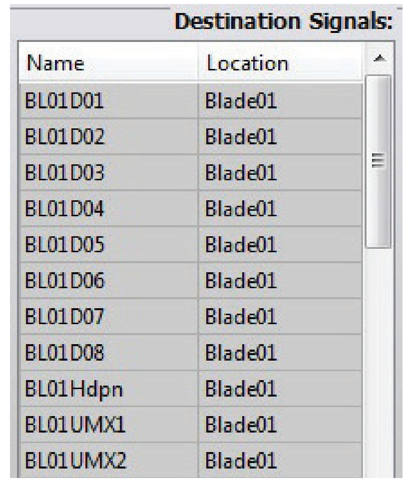


The second tab is the BLADE "Destinations" tab. It is used for viewing and modifying settings for the local audio outputs from the BLADE. The Destinations window has four main parts. Along the bottom of the window is an array of 16 bargraph meters and individual level and balance controls for each source (Mono sources do not have balance controls). These meters and controls are used to monitor the level and set gain on the 16 outputs (or eight stereo pairs, etc.) going out of the BLADE. In the upper left area of the main window is a section labeled "Destination Signals:", in and to the right is the "Free Resources:" section. The Destination Signals: section is where the eight character output signal name and eight character output location names can be seen and modified from their defaults. The Free Resources: section is where the output signal characteristics (mono, stereo, logic, etc.) can be seen. The "User Info" section will display any entries into the selected signals User Info tab. To add info to a signal click on the signal name to select it, then click the *Edit...* button and the User Info tab. Now simply add any notes here about the signal you want displayed.

Destination Signals

In this section you can see two columns; the first column, labeled "Name" is the destination name and the second matching column, labeled "Location," is the destination location. Depending on whether the BLADE has been designated as a stereo or mono BLADE at initial set up, there will be eight or 16 names in the columns. (If the BLADE was originally set up as a custom BLADE, there will actually be no destination or location names showing until you first define the mono and stereo signals you want — more on that later).

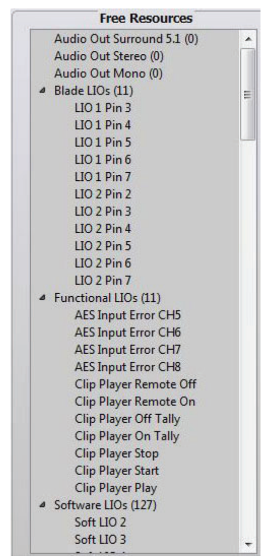
Assuming you are looking at BLADE 1 and you've chosen the stereo signal template, the Destination Signals section will look as shown here:



The first signal in the list (representing output #1) is named "BL01D01" and its location is named "Blade01." These are the system default names and they can be simply decoded. The "BL01" part of the name is just shorthand for "BLADE 1," and the "D01" is shorthand for "Destination 1." Thus the auto generated system name means "the first output in BLADE 1." Likewise, "BL01D02" means "the second output in BLADE 1," and "BL23D07" means "the seventh output in BLADE 23." You can just leave things as they are and go with the system default names if you like. But you can do better. If you double click on a signal name, the name becomes highlighted and you can retype it to be anything you like. "BL01D01" becomes "Speaker," or "TALLY," or "CB01HDPN," or "CB01CUE" - you get the idea. As soon as you type a new name for the signal, it appears everywhere in the system under this new name. In other BLADEs, on the crosspoint grid, on control surface displays, everywhere.

Likewise, the "Location" column has default location names which are even more easily decoded; "Blade01" obviously means "BLADE 1." You can leave these as they are because that pretty much tells you the location of the signal, but if you want, you can change the location to "WXYZ Air" or "Rackroom" or whatever suites your fancy. Edit the Location just as you did the Name, by double clicking on it.

Free Resources

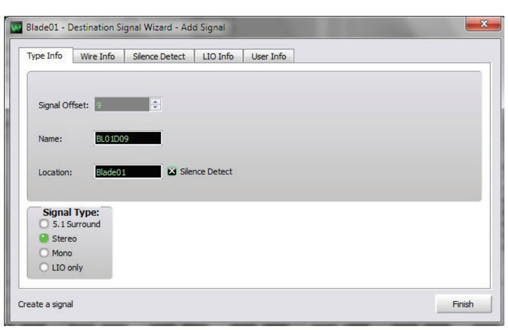


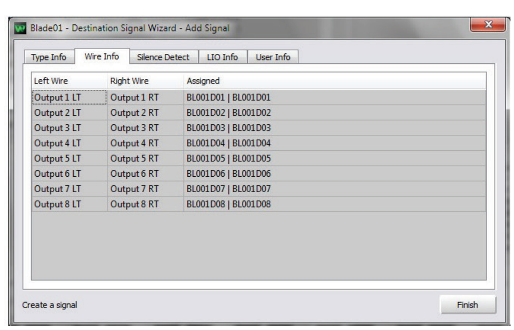
Resources to a BLADE mean audio and logic signals. This section of the Destination window shows the remaining available resources within the BLADE. The first three line entries in this section indicate the number of surround 5.1, stereo, and mono signal destinations, respectively, that have not yet been allocated to the system, and are hence available for allocation. Remember, each BLADE has a maximum total of 16 mono audio channels plus 12 logic ports available. If you have used a standard mono or stereo signal template when you first initiated the BLADE, then all of the signals will have been allocated automatically by the Startup Wizard to match the template, and the number available will show as zero. This is one of the special features of the WheatNet-IP system; it can take care of all of this signal allocating and defining automatically, saving you a lot of work.

If, however, you chose the Custom template, no signals will have been allocated, and all will show as available in the resources list. As you define a new signal, the resources available will decrease. Thus you can tell by looking at the resources list what additional signals you could define for this particular BLADE.

Add Button

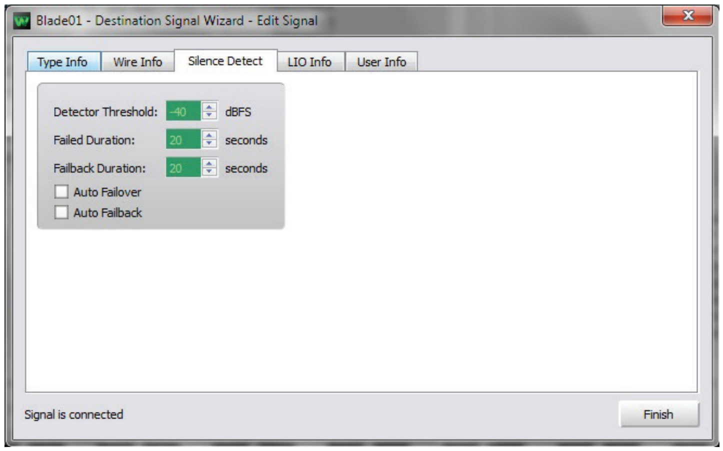
Defining a new signal is easy. Click the *Add* button and the "Destination Signal Wizard - Add Signal" screen pops up. On the Type Info tab enter the Name, and optionally the Location. Select the Signal Type and accept the Packet Type as automatically selected. Next, switch to the Wire Info tab. Highlight the desired wire number (you must pick one that is not already assigned), then click *Finish*. The new signal name will now appear throughout the system.





The same is true for the logic ports. The default configuration makes no automatic assignment of logic ports, so all 12 are initially available and show as LIOs. As you allocate logic ports for functions, the resources decrease correspondingly. The "Free Resources" list, then, allows you to see at a glance how many ports you've used.

The Silence Detect tab opens a window where you defined parameters for detecting silence of audio signal. Use of this form has already been covered in the Destination Details Menu section of this chapter under the topic "Modify Signal."



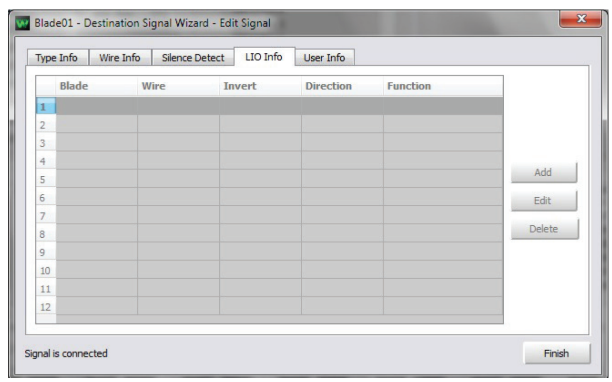
Add Alias Button

To Add Alias to your system follow the same steps described above.

See page 5-46 for the Alias feature desription.

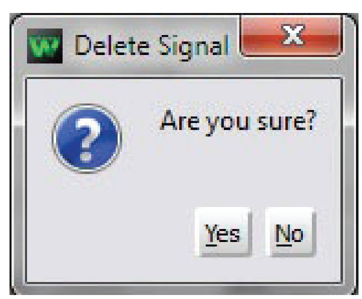
Edit Button

OK, so how do you modify the logic resources? Click on a signal name or location in the Destination Signals: area, then click on the *Edit* button. This opens a "Destination Signal Wizard - Edit Signal" window where you can redefine the audio signal type or, in this case, add or change logic signals associated with the audio. Use of this form has already been covered in the Destination Details Menu section of this chapter under the topic "Modify Signal." The "LIO Info" tab of this form is where you define the logic associated with the audio signal.



Delete Button

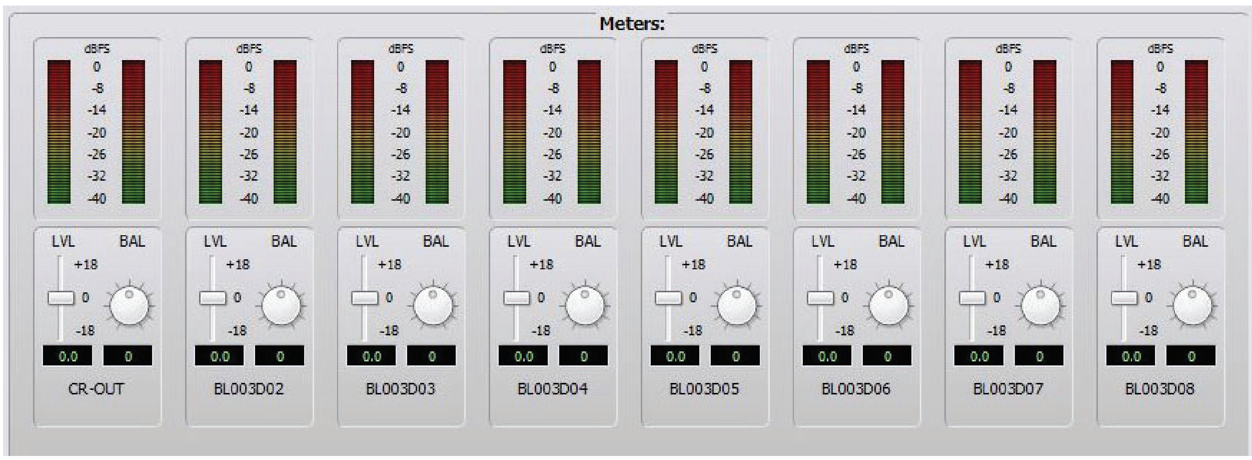
The *Delete* button completes the signal modification tools. Highlight a signal and choose "Delete" and the"Delete Signal" window with a question "Are you sure?" opens. If you click on *Yes*, then the selected signal is removed from the system, adding those resources back to the Free Recources: list.



Most folks will just use the automatic system defaults and not bother with any of this initially, at least until they need to define some logic signals. Don't be afraid to experiment with defining signals. You can always edit back any changes you make, and if you really get things out of whack, you can just rerun the System Startup Wizard for the BLADE and start over.

Meters

The bottom portion of the “Destinations” tab window, as mentioned before, shows the output channel meters and gain settings. The 16 individual baragraph meters show 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 output signal level as modified by the output gain setting.



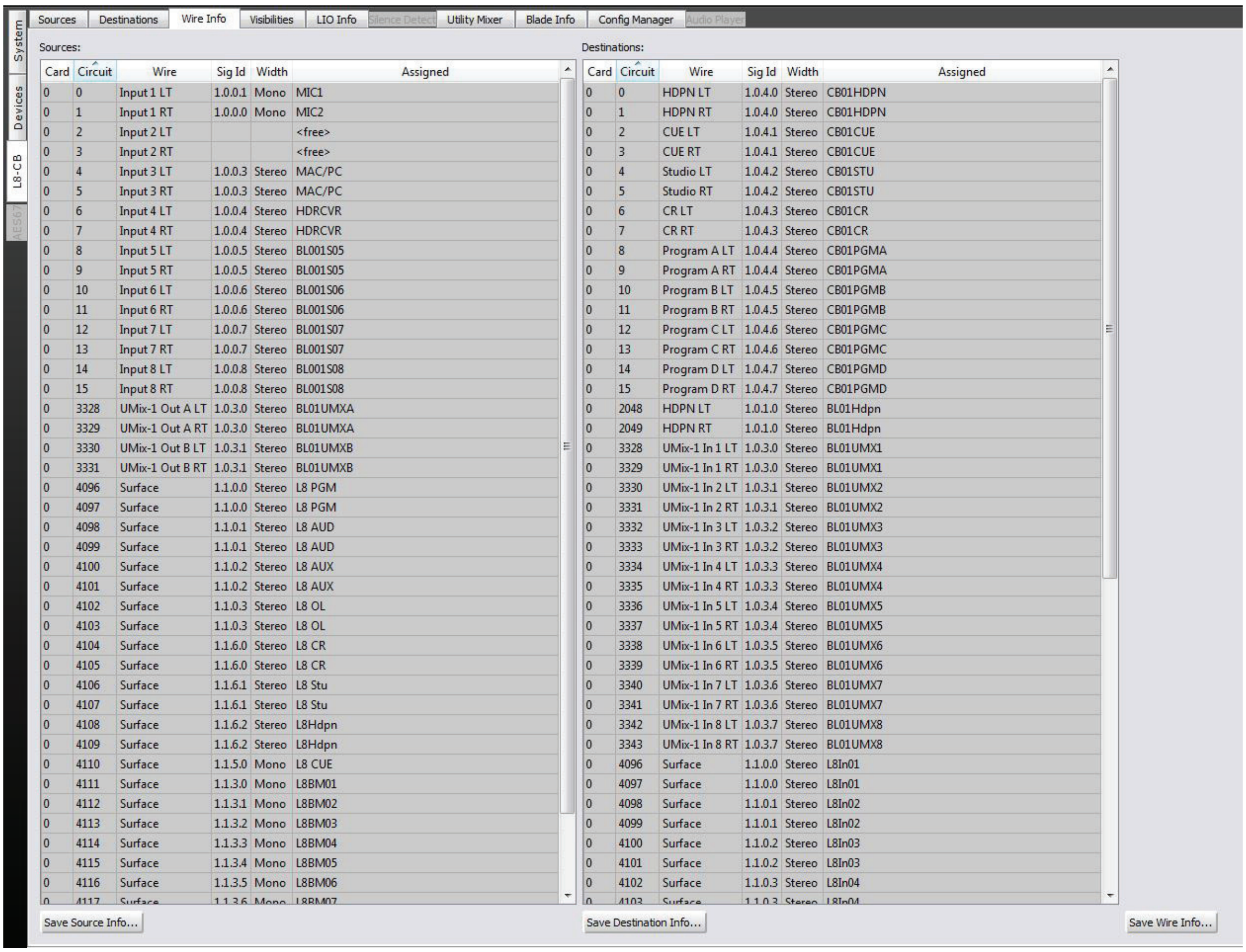
Below the baragraph meters are shown individual slider controls for adjusting each channel’s gain or loss over a range of +/-18dB. The slider handle, or knob, moves to indicate a relative gain setting as you drag it with your mouse, and the text box below the slider updates with the specific gain value. If you prefer, you can drag your cursor over the number in the text box to highlight it and type in the gain value you want. The gain adjustment is made in real time and will reflect instantly on the bargraph meters. The system rounds off gain settings to the nearest 1/10th dB.

If the signal is defined as stereo a balance control will be displayed to the right of the level control. This control allows you to adjust the balance of the left and right stereo signal. The adjustments can be made by left clicking and holding the control while moving the cursor in a circular motion. If you prefer, the arrow keys can also be used to make this adjustment. Like the level control, you can highlight the number in the text box and set the balance level with “0” being center. The balance adjustments are also made in real time and will reflect instantly on the bargraph meters.

Please note that any gain modifications you make to a destination signal will affect the level of that output for all sources feeding it. If you are making a gain adjustment to compensate for a systematic gain problem, it might be better to make a source gain adjustment, and leave the destination gain alone. Destination gain adjustments are best used 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.

Wire Info Tab

The Wire Info Tab allows the user to see all the “wires” used on the selected BLADE. No changes can be made here. Edits to Source or Destination Audio Signals, using the Wire Info tab in the wizard will be reflected here once the signal is saved. Additionally buttons are provided below to allow the user to export either Sources or Destinations or the complete wire info set to a .csv file. This file can be used to import into a spreadsheet or other external database to maintain information about how the system is configured.



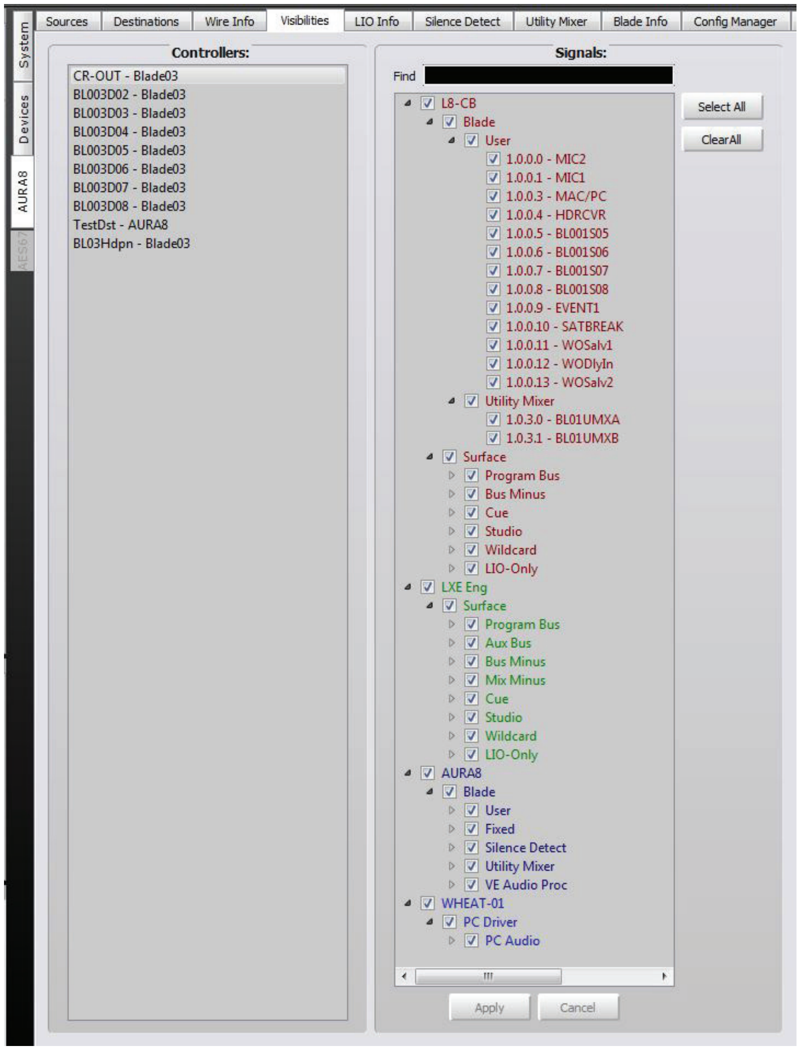
Sources:

Card	Circuit	Wire	Sig Id	Width	Assigned
0	0	Input 1 LT	1.0.0.1	Mono	MIC1
0	1	Input 1 RT	1.0.0.0	Mono	MIC2
0	2	Input 2 LT			<free>
0	3	Input 2 RT			<free>
0	4	Input 3 LT	1.0.0.3	Stereo	MAC/PC
0	5	Input 3 RT	1.0.0.3	Stereo	MAC/PC
0	6	Input 4 LT	1.0.0.4	Stereo	HDRCVR
0	7	Input 4 RT	1.0.0.4	Stereo	HDRCVR
0	8	Input 5 LT	1.0.0.5	Stereo	BL001S05
0	9	Input 5 RT	1.0.0.5	Stereo	BL001S05
0	10	Input 6 LT	1.0.0.6	Stereo	BL001S06
0	11	Input 6 RT	1.0.0.6	Stereo	BL001S06
0	12	Input 7 LT	1.0.0.7	Stereo	BL001S07
0	13	Input 7 RT	1.0.0.7	Stereo	BL001S07
0	14	Input 8 LT	1.0.0.8	Stereo	BL001S08
0	15	Input 8 RT	1.0.0.8	Stereo	BL001S08
0	3328	UMix-1 Out A LT	1.0.3.0	Stereo	BL01UMXA
0	3329	UMix-1 Out A RT	1.0.3.0	Stereo	BL01UMXA
0	3330	UMix-1 Out B LT	1.0.3.1	Stereo	BL01UMXB
0	3331	UMix-1 Out B RT	1.0.3.1	Stereo	BL01UMXB
0	4096	Surface	1.1.0.0	Stereo	L8 PGM
0	4097	Surface	1.1.0.0	Stereo	L8 PGM
0	4098	Surface	1.1.0.1	Stereo	L8 AUD
0	4099	Surface	1.1.0.1	Stereo	L8 AUD
0	4100	Surface	1.1.0.2	Stereo	L8 AUX
0	4101	Surface	1.1.0.2	Stereo	L8 AUX
0	4102	Surface	1.1.0.3	Stereo	L8 OL
0	4103	Surface	1.1.0.3	Stereo	L8 OL
0	4104	Surface	1.1.6.0	Stereo	L8 CR
0	4105	Surface	1.1.6.0	Stereo	L8 CR
0	4106	Surface	1.1.6.1	Stereo	L8 Stu
0	4107	Surface	1.1.6.1	Stereo	L8 Stu
0	4108	Surface	1.1.6.2	Stereo	L8Hdpn
0	4109	Surface	1.1.6.2	Stereo	L8Hdpn
0	4110	Surface	1.1.5.0	Mono	L8 CUE
0	4111	Surface	1.1.3.0	Mono	L8BM01
0	4112	Surface	1.1.3.1	Mono	L8BM02
0	4113	Surface	1.1.3.2	Mono	L8BM03
0	4114	Surface	1.1.3.3	Mono	L8BM04
0	4115	Surface	1.1.3.4	Mono	L8BM05
0	4116	Surface	1.1.3.5	Mono	L8BM06
0	4117	Surface	1.1.3.6	Mono	L8BM07

Destinations:

Card	Circuit	Wire	Sig Id	Width	Assigned
0	0	HDPN LT	1.0.4.0	Stereo	CB01HDPN
0	1	HDPN RT	1.0.4.0	Stereo	CB01HDPN
0	2	CUE LT	1.0.4.1	Stereo	CB01CUE
0	3	CUE RT	1.0.4.1	Stereo	CB01CUE
0	4	Studio LT	1.0.4.2	Stereo	CB01STU
0	5	Studio RT	1.0.4.2	Stereo	CB01STU
0	6	CR LT	1.0.4.3	Stereo	CB01CR
0	7	CR RT	1.0.4.3	Stereo	CB01CR
0	8	Program A LT	1.0.4.4	Stereo	CB01PGMA
0	9	Program A RT	1.0.4.4	Stereo	CB01PGMA
0	10	Program B LT	1.0.4.5	Stereo	CB01PGMB
0	11	Program B RT	1.0.4.5	Stereo	CB01PGMB
0	12	Program C LT	1.0.4.6	Stereo	CB01PGMC
0	13	Program C RT	1.0.4.6	Stereo	CB01PGMC
0	14	Program D LT	1.0.4.7	Stereo	CB01PGMD
0	15	Program D RT	1.0.4.7	Stereo	CB01PGMD
0	2048	HDPN LT	1.0.1.0	Stereo	BL01Hdpn
0	2049	HDPN RT	1.0.1.0	Stereo	BL01Hdpn
0	3328	UMix-1 In 1 LT	1.0.3.0	Stereo	BL01UMX1
0	3329	UMix-1 In 1 RT	1.0.3.0	Stereo	BL01UMX1
0	3330	UMix-1 In 2 LT	1.0.3.1	Stereo	BL01UMX2
0	3331	UMix-1 In 2 RT	1.0.3.1	Stereo	BL01UMX2
0	3332	UMix-1 In 3 LT	1.0.3.2	Stereo	BL01UMX3
0	3333	UMix-1 In 3 RT	1.0.3.2	Stereo	BL01UMX3
0	3334	UMix-1 In 4 LT	1.0.3.3	Stereo	BL01UMX4
0	3335	UMix-1 In 4 RT	1.0.3.3	Stereo	BL01UMX4
0	3336	UMix-1 In 5 LT	1.0.3.4	Stereo	BL01UMX5
0	3337	UMix-1 In 5 RT	1.0.3.4	Stereo	BL01UMX5
0	3338	UMix-1 In 6 LT	1.0.3.5	Stereo	BL01UMX6
0	3339	UMix-1 In 6 RT	1.0.3.5	Stereo	BL01UMX6
0	3340	UMix-1 In 7 LT	1.0.3.6	Stereo	BL01UMX7
0	3341	UMix-1 In 7 RT	1.0.3.6	Stereo	BL01UMX7
0	3342	UMix-1 In 8 LT	1.0.3.7	Stereo	BL01UMX8
0	3343	UMix-1 In 8 RT	1.0.3.7	Stereo	BL01UMX8
0	4096	Surface	1.1.0.0	Stereo	L8In01
0	4097	Surface	1.1.0.0	Stereo	L8In01
0	4098	Surface	1.1.0.1	Stereo	L8In02
0	4099	Surface	1.1.0.1	Stereo	L8In02
0	4100	Surface	1.1.0.2	Stereo	L8In03
0	4101	Surface	1.1.0.2	Stereo	L8In03
0	4102	Surface	1.1.0.3	Stereo	L8In04
0	4103	Surface	1.1.0.3	Stereo	L8In04

Visibilities Tab



The third tab is the "Visibilities" tab. The settings available on this tab are used to limit or control the choices that can be made for connecting sources to the local audio destinations in the BLADE. The default settings of the WheatNet-IP system allow any source to be connected to any destination, but there are some good reasons to restrict this capability in specific places. A good sized system can have hundreds and hundreds of sources available. To locate and select any particular one from the front panel control on a BLADE might involve a lot of scrolling! If you can limit the number of choices available it becomes less confusing and much easier. In many cases it makes practical sense to restrict the source choices.

For example, if one of the destination outputs from a BLADE is being used as a headphone feed to a guest location in a talk studio for WXYZ, why would that guest ever need to select the audition mix output of a production studio in WZZZ? Another good reason for restrictions is that you might never want a connection such as the feed from your processor to your air chain to be inadvertently changed. In many cases you can greatly restrict the source choices available for a destination, sometimes even to as few as one. In the WheatNet-IP system, we use the "visibilities" property to control these choices, and it's very easy to do. Essentially, we allow you to edit the list of names that are "visible" to the user on a destination by destination basis, so that every audio output in the system can have a unique setting. Note that we are not actually restricting the connection possibilities; you can at any time choose any source you want using the Navigator GUI or by firing a salvo, etc. We are only restricting which choices are visible to a user sitting in front of the BLADE and scrolling the front panel knob.

Clicking on the Visibilities tab opens a new window showing two columns. The left hand column, labeled “Controllers:” shows a list of every local destination defined for the BLADE. The right hand column shows a hierarchal view (typical Windows Explorer tree style) of every source defined in the system.

To set visibility for a destination, first make sure the desired destination is actually a member of the BLADE you are currently viewing. You can check on the Blade tab; it will read “BladeXX” where “XX” is the BLADE ID number. If this is not the correct BLADE, then just click on the correct icon in the system pane window to get to the correct visibility tab.

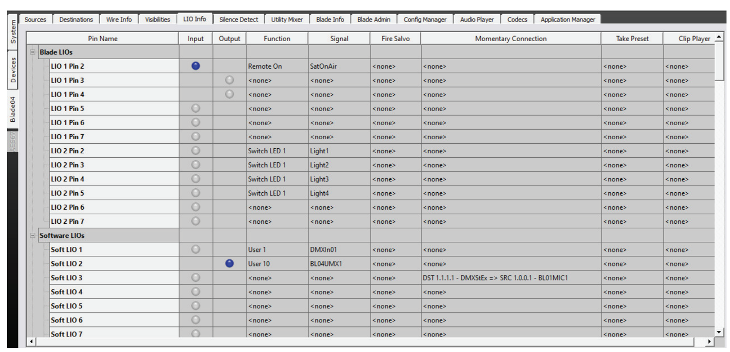
Examine the list of destinations in the left hand window and left click on the desired destination to highlight it. The right hand window shows a list of all of the BLADEs in the system, with a check box beside the name of the BLADE.

If you know that none of the sources in a particular BLADE should be visible to the destination, click on the check box to uncheck it. In this manner, go through the list of BLADEs and uncheck any that should not be visible. Continue on and click on the expand box for any BLADE that you want visibility to some, but not all, of its signals. The list expands in tree fashion to show the individual signals within the BLADE, each with their own check boxes. Uncheck the signals that should not be visible, and repeat this process for any other BLADEs to set them.

When you have completed working on the list for the selected destination, you can click on another destination in the left hand window and set visibilities for it. After setting visibilities for all of the destination signals, click on the *Apply* button at the bottom of the window and your choices will be instantly forwarded to each BLADE in the system.

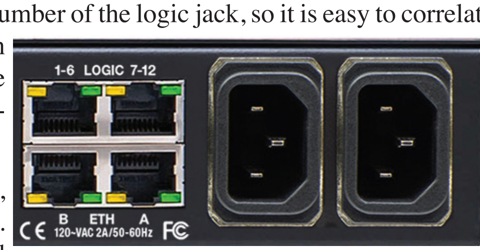
As you no doubt have noticed by now, this process can be somewhat time consuming. Fortunately, the WheatNet-IP GUI has some built in shortcuts that can be very useful. The *Select All* and *Clear All* buttons in the upper right corner of the visibility window allow you to check or uncheck groups of signals at once, assuming that the common selections are suitable for each member of the group. You can accept these common selections, or then drill down through the menu and make individual tweaks without having to repeat the selections that were in common.

LIO Info Tab



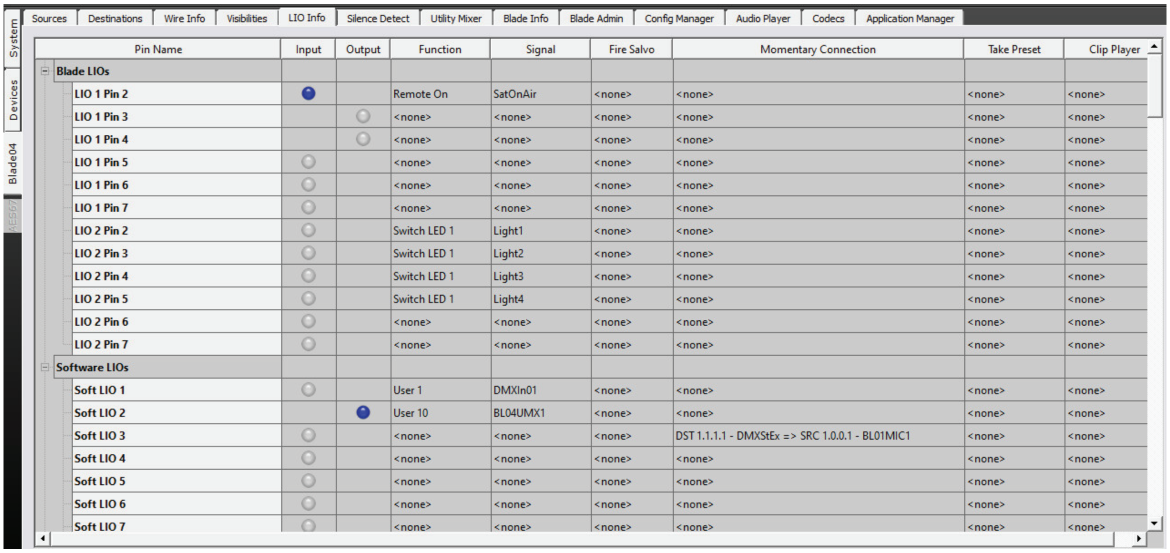
The fourth tab is the “LIO Info” tab. This tab brings up a screen you can use to program and control the operation of the 12 physical Logic Input/Output ports on each BLADE. These ports are available on the two RJ-45 jacks on the rear of the BLADE. Each of these 12 ports can be individually defined as a logic input or a logic output, and can be mapped to a number of different functions.

The LIO info tab is arranged as a table, with logic ports listed along the left side, and attributes listed across the top. Each row, or line, therefore shows the logic settings for a particular logic port. Recall that each BLADE has twelve ports available; they are named LIO 1 pin 2 through LIO 1 pin 7, representing the six logic ports available on the first RJ-45 rear panel logic jack, and LIO 2 pin 2 through LIO 2 pin 7, representing the six logic ports available on the second RJ-45 rear panel logic jack. The logic port names not so subtly reflect the physical pin number of the logic jack, so it is easy to correlate the GUI functions with the corresponding physical connection. These pin numbers have been chosen so they mate up with some common Wheatstone auxiliary switch panels; when they are used for logic outputs, power is available on pins 1 and 8.



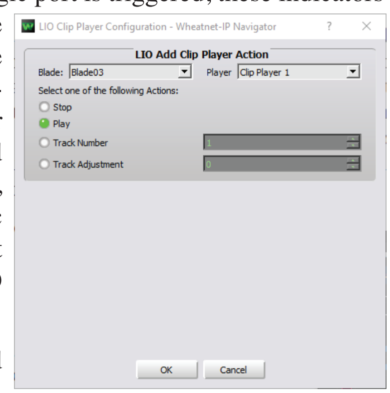
The logic functions that have been programmed will appear in this table, giving you an at-a-glance summary of the physical logic ports on the BLADE. In the row for a particular port you will see whether it has been programmed as an input or an output, the name of the logic function configured for the port (if one has been programmed), the name (the one that appears on the crosspoint grid) you’ve given to the logic signal, and the functions it has been programmed to perform. A logic port can be programmed as a logic-only signal for use in connecting to other logic signals on the grid, or it can be programmed to fire a salvo, trigger a momentary connection, take a preset or control a clip player.

The LIO Info tab shows which programming options have been set for each of the 12 physical ports. If nothing has been programmed, the info will be shown as "<none>."



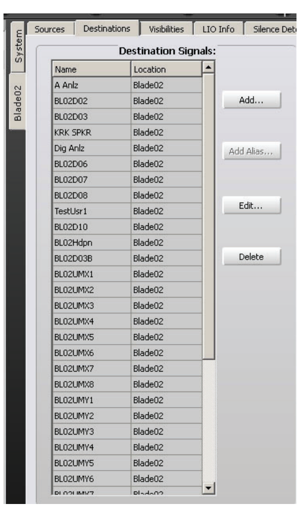
Pin Name	Input	Output	Function	Signal	Fire Salvo	Momentary Connection	Take Preset	Clip Player
Blade LIOs								
LIO 1 Pin 2			Remote On	SatOnAir	<none>	<none>	<none>	<none>
LIO 1 Pin 3			<none>	<none>	<none>	<none>	<none>	<none>
LIO 1 Pin 4			<none>	<none>	<none>	<none>	<none>	<none>
LIO 1 Pin 5			<none>	<none>	<none>	<none>	<none>	<none>
LIO 1 Pin 6			<none>	<none>	<none>	<none>	<none>	<none>
LIO 1 Pin 7			<none>	<none>	<none>	<none>	<none>	<none>
LIO 2 Pin 2			Switch LED 1	Light1	<none>	<none>	<none>	<none>
LIO 2 Pin 3			Switch LED 1	Light2	<none>	<none>	<none>	<none>
LIO 2 Pin 4			Switch LED 1	Light3	<none>	<none>	<none>	<none>
LIO 2 Pin 5			Switch LED 1	Light4	<none>	<none>	<none>	<none>
LIO 2 Pin 6			<none>	<none>	<none>	<none>	<none>	<none>
LIO 2 Pin 7			<none>	<none>	<none>	<none>	<none>	<none>
Software LIOs								
Soft LIO 1			User 1	DMXIn01	<none>	<none>	<none>	<none>
Soft LIO 2			User 10	BL04UMX1	<none>	<none>	<none>	<none>
Soft LIO 3			<none>	<none>	<none>	DST 1.1.1.1 - DMXStEx => SRC 1.0.0.1 - BL01MIC1	<none>	<none>
Soft LIO 4			<none>	<none>	<none>	<none>	<none>	<none>
Soft LIO 5			<none>	<none>	<none>	<none>	<none>	<none>
Soft LIO 6			<none>	<none>	<none>	<none>	<none>	<none>
Soft LIO 7			<none>	<none>	<none>	<none>	<none>	<none>

An especially handy feature of this window is that each logic port has an associated indicator with it. These are the circles shown in the input or output columns next to the logic port name. When the logic port is triggered, these indicators will light up in color for as long as the port stays triggered. This makes it easy to trace out your wiring to the ports; if you wire up a switch as an input to the logic port, the associated indicator will turn color as long as you hold the switch button down. Conversely, if you've wired up a logic port as an output to drive a relay, lamp, or other device, the associated indicator will turn color as long as the logic output is activated by whatever you intend to drive this output with (presumably a console logic signal, another switch panel somewhere, or so forth). In addition to the twelve physical Logic ports, each blade offers 128 Software-based LIO signals, called SLIOs. With the advent of Blade Software version 4, this indicator is now available on both LIO and SLIO signals.



Clip Player functions are new in Navigator 4. The functions that can be controlled via logic signals are shown in the screenshot at right.

Silence Detect Tab

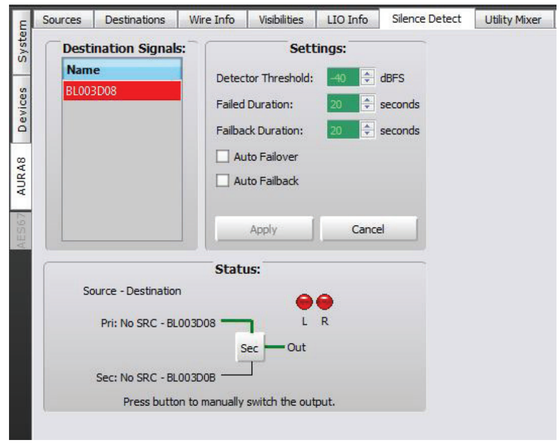


The fifth tab is the "Silence Detect" tab. One of the very powerful features of the WheatNet-IP system is that every single audio output channel can be programmed with a silence detection and automatic switch over function. This capability can go a long way to maintaining smoother, more reliable operation to your radio stations when an unexpected problem happens. Careful planning of alternate and back up audio paths for crucial connections can keep you on the air.

While the silence detect function is available for every destination signal in each BLADE, it is not automatically enabled. Many of the signals in a typical system do not need this function. To enable silence detect for a particular destination signal, you must click on the Destinations tab for the BLADE in which the signal is located, click on the desired signal to highlight it, and then click on the *Edit...* button to open the familiar "Destination Signal Wizard" window. You will notice the Silence Detect check box; if it has not been checked, silence detection will not be enabled for this audio channel.

When you click on the silence detect check box and finish the signal wizard, several things happen.

First, the silence detect function is enabled. Second the silence detect alarm logic signal (default name is "XXXL" where XXX is the name of the destination signal you are working on) is automatically created as a Source Signal to generate messages in the "Alarms" pane of the GUI and to allow connection to a physical logic output port to activate an alarm device. Finally, a new audio destination signal is automatically added into the BLADE (and the system). This signal is created with a default name of "XXXB" (where XXX is the name of the signal you are working on) and represents the secondary audio path that can be used for automatic failover of your source connection upon detecting silence. Create a back up signal path by making a source connection from your back up source to this secondary "B" connection (it will show on the crosspoint grid).



Clicking on the Silence Detect tab for a BLADE opens up a three part window.

The upper left hand window part is labeled "Destination Signals" and shows a list of any destinations that have been set up for silence detection. The upper right hand window part is labeled "Settings" and shows the particular level and duration parameters that have been chosen (or the standard default settings). The bottom window part, called "Status" shows details about the current state of the silence detect function.

Destination Signals

To experiment with the silence detect function, click on one of the destinations in the "Destination Signals" list. The "Settings" and "Status" areas of the window will change to show the particulars for the selected destination signal. If there are no destinations shown in the list, that means silence detection has not been enabled yet for any of the signals in the BLADE. In the right hand "settings" area you can modify the default settings or leave them as the defaults.

Settings

You can review the effect of the settings in the "Status" area of the window. These settings are:

Detector Threshold – This is the signal level threshold for silence detection. Any time the audio signal at the destination falls below this threshold, the BLADE will start to keep track of how long the signal stays below this threshold level. This setting should be adjusted to match your station's format. Not to be obvious, but a Hot format most likely never expects to have a low signal level, while a classical format might frequently do so.

Failed Duration – This is the acceptable length of time for the signal to be below threshold. It is only applied when the "Auto Failover" check box has been set. Again, this setting is very dependant on your format. If your program material has few, if any, pauses, and your Talent voices are energetic, you can set the duration as low as several seconds. Conversely, if your programs have frequent quiet passages and your Talent voices are relaxed you may need to set the duration as high as the maximum duration of 45 seconds.

The Navigator GUI can be helpful in arriving at the optimum settings for threshold and duration. In the Status area of the Silence Detect window are two round indicators labeled "L" and "R." These are audio indicators that show the left and right channels of the destination. They will be shown in green when the audio level is above the threshold setting, and in red when it is below the threshold setting. If you leave the auto failover box unchecked, you can watch these indicators as you alter the threshold without danger of losing the audio connection due to a silence detect triggered failover. Monitor how frequently and for how long the audio is below threshold, add some extra time margin for insurance purposes, and that's your settings. Just remember, if your programming or Talent changes, these settings may need to be readjusted.

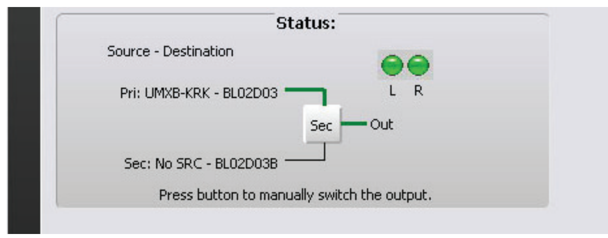
Failback Duration – This setting can be very useful. It is only applied when the "Auto Failback" check box has been set, and represents how long the BLADE will wait to restore the original source connection. It will monitor the original source for level, and, if it stays above the threshold for the specified time, will switch back to the original source. This is useful in situations where the primary connection is intermittent; by specifying a duration over which the primary connection must "prove itself good" you can avoiding a premature switch back before the connection is solid.

The other two controls in the "Settings" area of the Silence Detect tab are the previously mentioned check boxes for "Auto Failover" and "Auto Failback." Check the "Auto Failover" box if you would like to have an automatic source connection change to your specified secondary source when silence detect is triggered. Check the "Auto Failback" box if you would like to have an automatic source connection changed to your primary source when the silence detect function is released.

Finally, you must click on the *Apply* button at the bottom of the window before any of your changes will take effect.

Status

The "Status" area of the Silence Detect tab shows at a glance information about the silence detect function for the destination signal. The primary and secondary connection paths are labeled and indicated, and the "L" and "R" audio level indicators will flicker in the presence of audio. Note that the currently active signal path shows in green and the inactive signal path shows in black. You can click on the *Sec* button to force a connection change to the alternate signal path and a dialog "Manually Switch Output" window will open asking you to confirm the change.

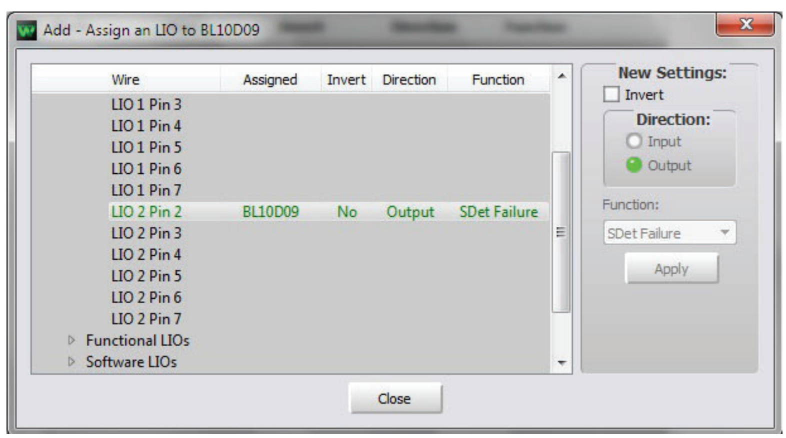


Warning: Clicking *Yes* on the dialog box will instantly change the audio connection. This button is meant to be used for initial set up and testing and for manual failover in cases where automatic failover is not desired, or when the failover is needed for reasons other than the loss of audio signal.

Logic

Enabling Silence Detection on a Destination automatically creates a new Logic Only source signal. This signal will appear in the crosspoint grid with a name of "XXXL" where XXX is the name of the destination using silence detection. This logic signal also has an ID# of XXXXX4XX where XXXXX_XX is the signal ID of the destination.

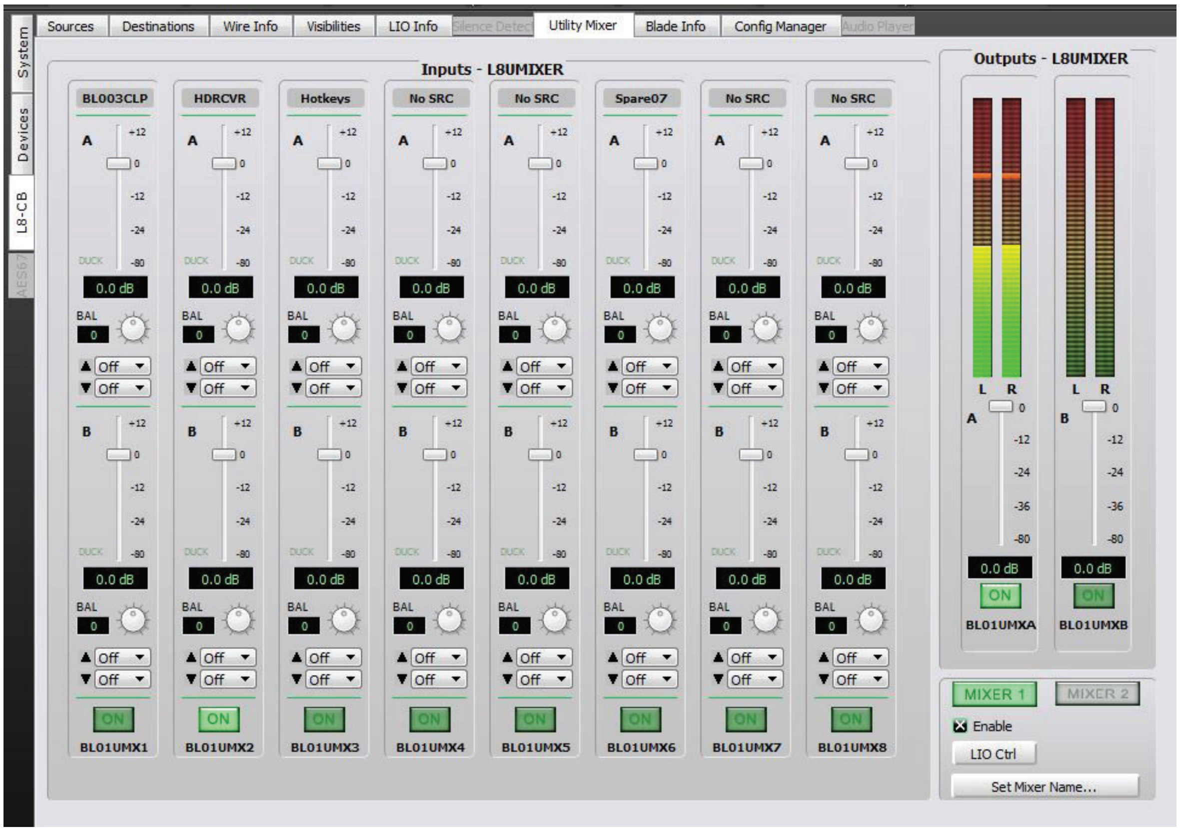
To use this logic signal to trigger a physical alarm, create a new Logic Only destination signal on the BLADE you will use for the physical alarm (light, buzzer, etc.) logic connection. Map the particular logic pin that you want to use and select the "SDet Failure" function from the drop down list.



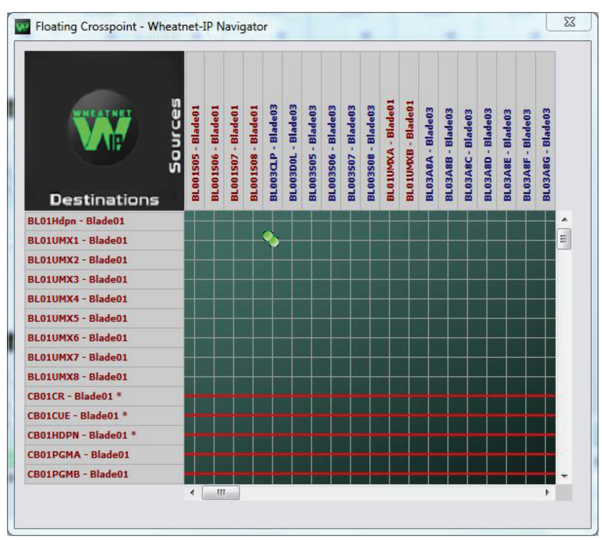
One you have defined the new Logic Only destination signal, make a new crosspoint connection between the auto generated silence alarm source logic signal and your new alarm destination signal. On detecting silence, the SDet Failure logic function will trigger your destination alarm signal for as long as the silence persists.

Utility Mixer Tab

The next tab is “Utility Mixer.” Each BLADE can optionally have a built in audio mixer capability (this tab will be grayed out if it is not available on the BLADE). Clicking on this tab will open the Utility Mixer window, which shows a graphic representation of an 8 x 2 mixer, complete with faders, meters, and ON switches.



There are two different 8 x 2 mixers available on this tab. With each of these mixers, two separate mixes of up to eight audio sources can be created and manipulated. Furthermore, each one of these two 8 x 2 mixers has a separate Automation Control Interface, or ACI, providing for external control of the mixer by a third party program such as an Automation system. Lastly, every physical BLADE in the system can have these two mixers enabled on it simultaneously, so the number of mixers available to you is limited only by how many BLADEs you have.



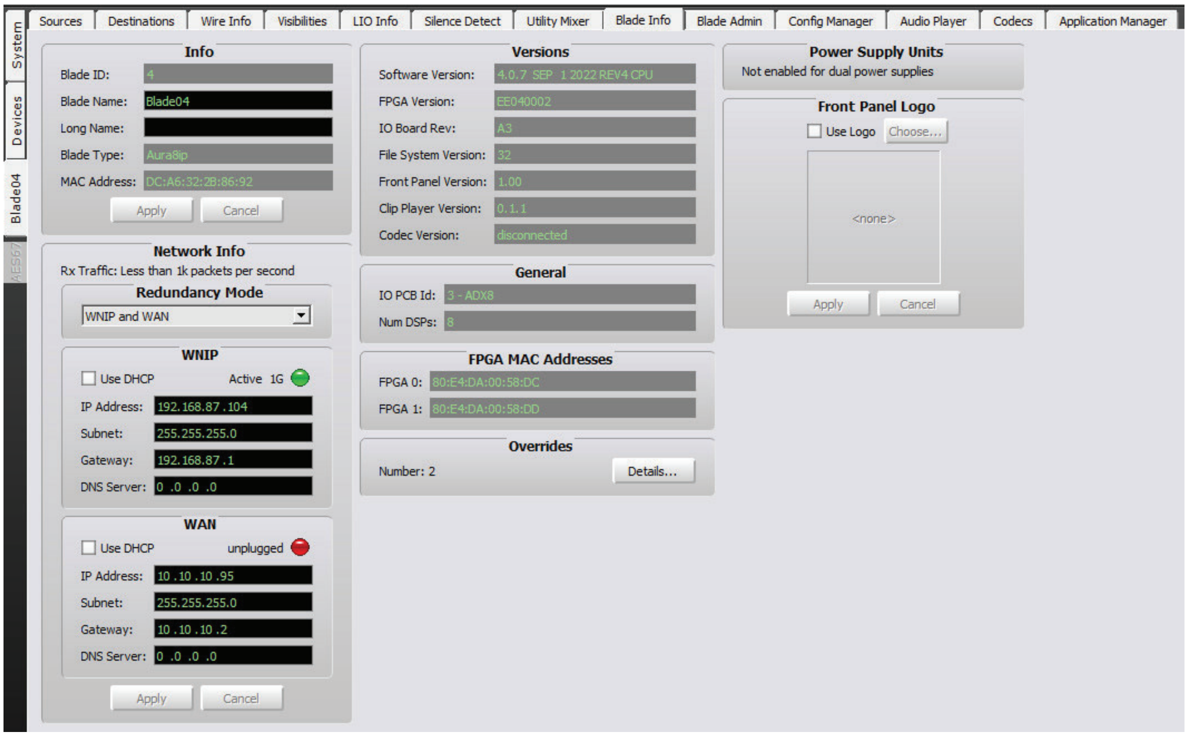
Enabling the Utility Mixer will add (4) new sources labeled BL10UMXA, BL10UMXB, BL10UMXYA, and BL10UMXYB, representing the A and B output channels for each mixer on Blade 10 in this example. Also added will be (16) new destinations, labeled BL10UMX1 - BL10UMX8, representing the eight fader input channels of the first mixer and BL10UMY1 - BL10UMY8 for the eight fader input channels of the second mixer. These new sources and destinations will appear in the system crosspoint grid, allowing you to connect various system resources, mix them as required, and distribute these mixes to other system destinations.

To operate the Utility Mixer, first be sure it is enabled by clicking on the *Enable* check box. You can separately enable mixer number 1, number 2, or both. This will cause the BLADE to autogenerate the required new signals. Then assign the signal sources needed to fader channels by using the system crosspoint grid. To mix the audio signals, bring up the fader channels to a desired mix output bus by dragging with the your mouse and clicking on the channel *ON* button. Adjust the mix by dragging the individual and mix faders up or down. The radio buttons beside each fader provide for automatic *Fade up* or *Fade down* with a variety of speeds. You can monitor the mix by watching the on screen meters, and/or by listening to the mix output on any speaker or headphone output destination. The front panel headphone jack on the BLADE is a good place to do this.

The Utility mixer is handy for a variety of functions. You can use it to premix some standard signals, provide for late night automated operation, set up mix minus feeds, create an intercom system, or even run a small remote.

Blade Info Tab

The next tab is the “Blade Info” tab. This tab is where the BLADE-4’s current software and firmware versions are displayed, and network settings are displayed and can be modified. Wheatstone recommends leaving these settings unchanged unless you have strong reasons to change the default addresses, are experienced in LAN set up, and have created an address plan for the system.



The “Info” part of the window shows the BLADE-4’s hardware address information. Every networkable device is built with a unique physical hardware address (called the MAC address) that cannot be changed. This MAC address, as well as the BLADE ID and BLADE type are displayed for information purposes only in non-editable boxes.

You may wish to change the BLADE Name. This is the name that will identify the BLADE in the System Pane and elsewhere. The system default name for the BLADE is “BladeXX” where “XX” is the BLADE ID number. You can leave the BLADE name as the default, or change it to any eight character name by dragging or double clicking on the name and typing a new one. Just remember that each BLADE needs a unique name to let you identify it in the system. Click on the *Apply* button in order to save any changes. You can also change the BLADE’s Long Name if desired.

The “Network Info” part of the window shows the BLADE’s software address information. Displayed are both the WNIP and WAN ethernet ports. When you originally set the BLADE-4 up you chose a redundancy mode. If you chose **Active Backup Redundant**, the lower “WAN” pane will be grayed out. If you chose **WNIP and WAN** you will see the IP addresses for the WNIP network and your WAN here. You will also be able to see the connection status of each and you can make changes here. If you make a change in this area, hit the “Apply” button and the BLADE will tell you it requires a reboot.

Note that modifying this address information improperly will cause the BLADE to cease operating on the WheatNet-IP network and potentially become invisible to the WheatNet-IP Navigator GUI. In other words, if you mess this up you may not be able to get back without rerunning the System Wizard from the front panel of the BLADE.

The “Versions” portion of the window shows the current software and firmware versions running on the BLADE.

The “General” and “FPGA MAC Addresses” boxes are informational and contain information that may be requested by Wheatstone Tech Support in the event you call in for assistance with your BLADE-4.

“Overrides” is used by the developers.

The “Power Supply Units” pane displays the enabled/disabled status for the redundant power supply. This is a licensed feature of BLADE-4. To enable your BLADE-4 for dual redundant power supplies, reach out to Wheatstone Sales or your dealer.

Finally, the “Front Panel Logo” pane allows you to choose your own logo to display on the front panel of the BLADE-4. This image must be in the .png format and the size should be 120 x 120 pixels.

Blade Admin Tab

The “Blade Admin” tab contains the “Master Preferences” and “Factory Reset” panes. “Master Preferences allows you to designate the current BLADE as Route Master and/or Clock Master. There is a “Slave Mode checkbox on this screen but do not check this box unless advised to do so by Wheatstone Tech Support. (To ensure that a blade never becomes clock master, just uncheck the “Clock Master” box.) “Factory Reset” allows you to restore the BLADE to its factory default settings. To do so, check the box to enable the function, confirm that you want to do this and then click the “Full Blade Reset” box.

Config Manager Tab

The next BLADE tab is the “Config Manager” tab, which gives access to backup or restore the BLADE’s specific configuration information. All of the BLADE’s signal ID’s, names, format, logic settings, silence detect settings, etc., can be saved to a directory on the GUI PC. Likewise, all of this information can be retrieved from the PC and restored to the BLADE.

The “Configuration Folder:” section of the window is used to specify the directory path on the GUI PC to be used for the backup and restore functions. The currently specified path will show in the text box in this section. To specify another folder, click on the browse button next to the text box. A standard Windows dialog box will open allowing you to specify the desired directory. If desired, you can assign this directory as the default location for configuration files by clicking on the *Default* button.

The “Backup BLADE Configuration” section of the window is even simpler. All it contains is a *Backup* button which, when clicked, will write all of the configuration information to the specified directory. First a subdirectory is created, and is named “cfg_YYYY-MM-DD_HH-MM-SS_BL” where YYYY-MM-DD is the current date and HH-MM-SS is the current time. This automatic naming convention makes it easy to keep track of your backup files. Click *Yes* on the ensuing dialog box to proceed (clicking *No* will cancel the operation).

A file will be created with a name of the form “full_BLADE _config_XXXX” where “XXXX” is the BLADE ID number.

The last section of this tab shows the “Restore Blade Configuration” section. Here you can scroll through the list of available configuration directories and files, click on one to highlight it, and then click on the *Restore* button to send the information to the BLADE. A restore dialog box will open showing the selected file and asking you if you are sure. Clicking *Yes* will again show a progress bar as the information is uploaded to the BLADE.

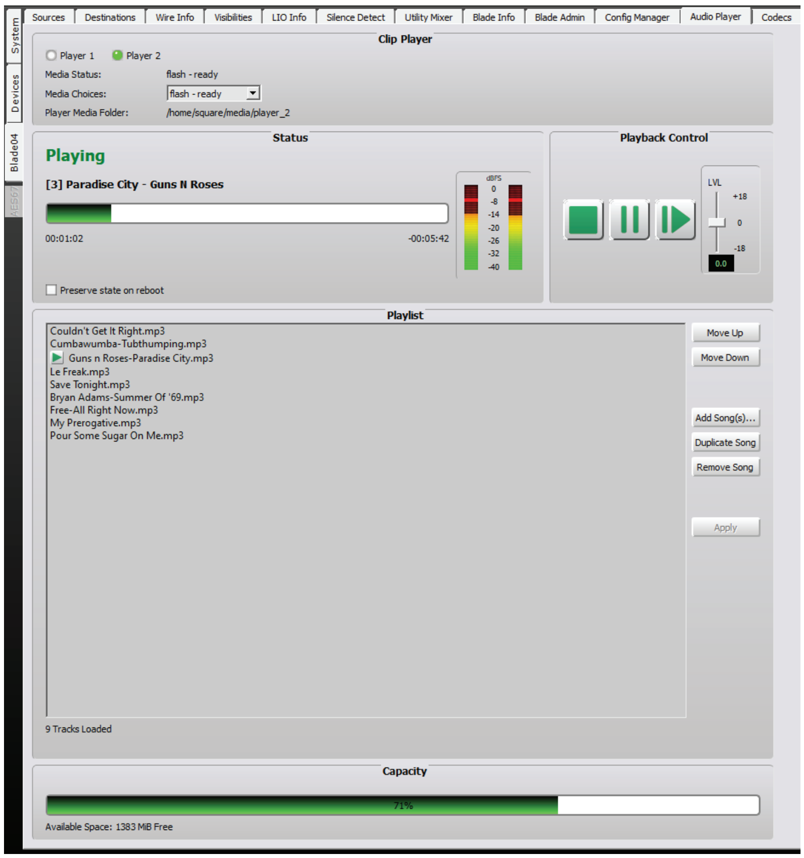
A Word About Backup and Restore

Because of the distributed intelligence of the WheatNet-IP system, the backup function is mainly intended for archival purposes. Since all of the system’s information is concurrently saved in flash memory on multiple BLADEs, it is extremely unlikely that it all would be lost. So why then do we need to perform backups? It would take a catastrophic event, such as a direct lightning strike or massive flooding that simultaneously wipes out all of the BLADEs, in order for all of this information to be lost. Maintaining a regular schedule of backups is a good way to mitigate against this unlikely but still possible scenario.

Because the Navigator GUI is so powerful, Wheatstone has provided in the WheatNet-IP system for up to eight copies to be running at the same time. You can be running a copy in your TOC, running another copy down the hall, and even run a copy from your home if you have provided for external access into your system. This functionality can be handy for managing connection, silence detection, and logic functions. Be aware, however, that the backup and restore functions work in concert with the directories on a particular PC, so to avoid confusion it is best to restrict these activities to only one PC.

Audio Player Tab

Next is the “Audio Player” tab. BLADE-4 includes two optional built-in audio clip players that can be used to put emergency audio on the air. The files are managed in Navigator where you can add files, organize the playlist, and fire playback. Files can be stored in the clip players’ built-in flash memory, or can be played from a flash drive or other external USB drive plugged into the built-in USB port on the front of the BLADE-4. Silence or an LIO event can trigger this playback, or it can be manually controlled from Navigator. The audio clip players are a licensed feature of BLADE-4 so please contact Wheatstone Sales or your dealer for the licensing info. You can license one or both Clip Players in your BLADE-4.

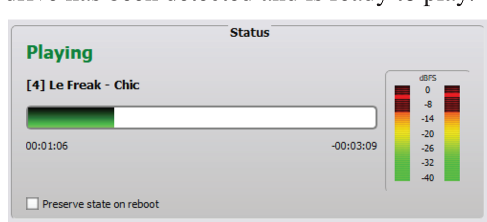


Clip Player

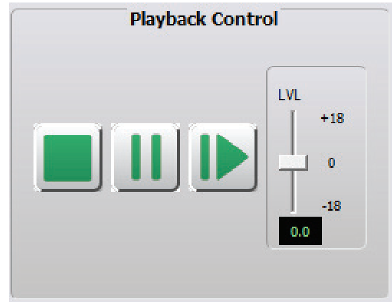
This pane lets you select which Clip Player you want to manage. You can select Player 1 or Player 2. You can also see the status of the media. Select your media choice under “Media Choices.” Choices are “flash” (the built-in flash memory of the Clip Player and “usb0,” the BLADE4’s front panel USB port. “Flash - Ready” means that the Clip Player is read to play from its built-in flash memory. USB-0 Ready means the attached USB drive has been detected and is ready to play.

Status

This pane shows the status of the selected Audio Clip Player. There is a set of meters that will display the levels of the audio that is being played. The “Preserve state on reboot” box will cause the player to continue what it was doing when it comes back from having been rebooted.



Playback Control



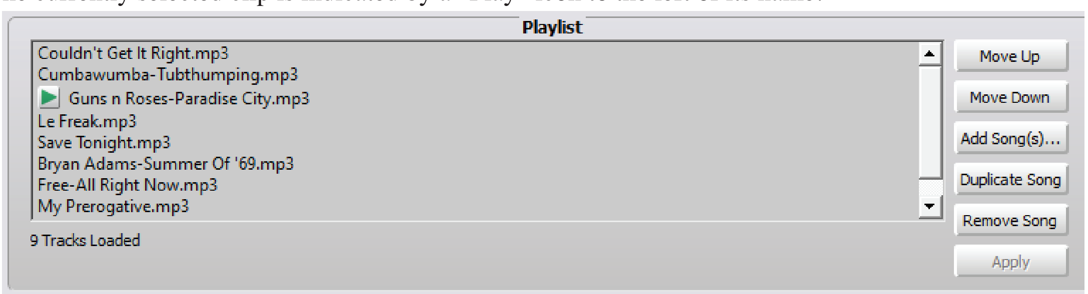
This pane contains the Start, Stop and Next Track controls for the selected Clip Player. There is also a level gain control for the player.

Capacity

The Clip Players in BLADE-4 will play both uncompressed audio files (.wav format) and MP3 files. To play properly the audio files should be recorded at the same sample rate as the WheatNet-IP system. The Clip Player can hold slightly more than 1 hour of uncompressed audio and the capacity pane will show the literal and percentage capacity available.

Playlist

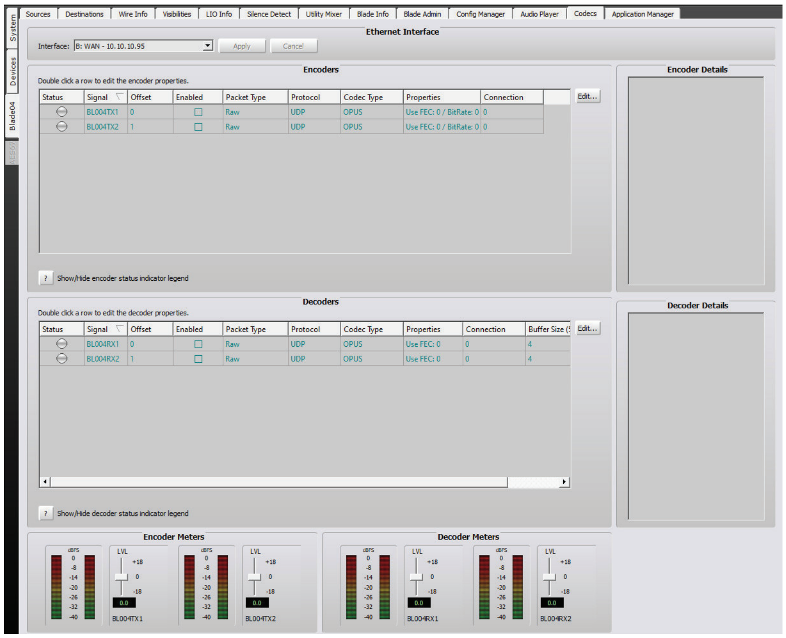
In this pane you can add/remove audio clips and set the playback order. The clips will play in the order shown in the playlist. The currently selected clip is indicated by a "Play" icon to the left of its name.



Clip Player Source Signals

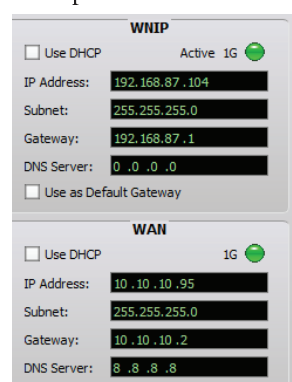
As the Clip Players are playback only, there are no destination signals associated with them; only source signals. These signals appear on the Crosspoint tab as "BLXXXCLP" and "BXXXCLP2" where "XXX" is the BLADE ID number. These signals can be cross-connected to any destination in your Wheatnet system and the destination will receive the audio that is being played by that Clip Player.

Codecs Tab



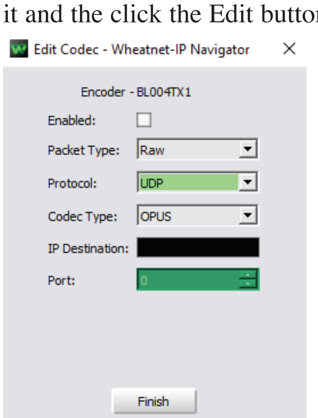
BLADE-4 includes two codecs that support several compression algorithms including Opus, AAC, MP3 and FLAC. These codecs are an optional, licensed feature that allows you to connect two BLADE-4 devices across the public internet or your company's WAN. To obtain a license for one or both BLADE-4 Codecs, please reach out to our sales department or your dealer.

In order to use the Codecs, you will need to have set your BLADE-4 up as "WNIP and WAN" (see page 2-3), or ensure that your WNIP network has a gateway to the outside world. If you chose the "Active Backup Redundant" mode upon initial setup and want to change it, you can so so on the Blade Info tab. See page 2-3.

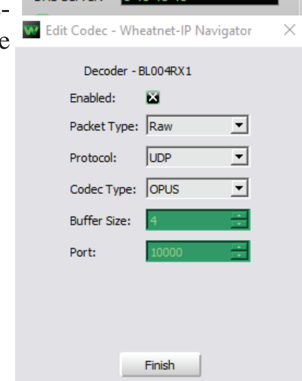


The WAN port can be set to DHCP or to a static IP address (recommended) on the network segment you will use to connect to your second BLADE-4. No additional firewall settings will normally be required to make outgoing connections from your BLADE-4 unless you have a firewall that is blocking outgoing connections. For incoming connections, you will need to set up port forwarding in your firewall and send that traffic to the port you choose for the connection to the WAN IP address of the receiving BLADE-4 device.

To set up a transmit connection, double-click on an Encoder signal (or click on it to highlight it and the click the Edit button) and you will be presented with a popup window in which you can enable the Encoder, select a packet type, protocol and a destination IP address and port. As soon as you click "Finish," the encoder will attempt the connection.



For Decoders, follow the same procedure as above to set up a codec to receive a connection from another BLADE-4. In this case, you will have different options: Instead of IP address (since this is an incoming connection you don't need that), you will have the option to adjust the buffer size to be used on incoming data packets. You will need to select a port as well but this needs to match the port being used by the BLADE-4 that is transmitting the data. The Decoder is now ready to accept a connection from a transmitting BLADE-4 device.A codec isn't much good unless it



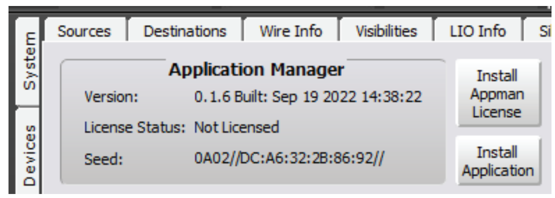
can send audio and do something with the received audio. Signals for the BLADE-4 built-in codecs are named as follows by default (of course, you can change the default names just like you can change any signal names in your Wheatnet-IP system):

Encoder (Transmit) — BLXXXTX1 and BLXXXTX2 (where XXX is your BLADE ID)

Decoder (Receive) — BLXXXRX1 and BLXXXRX2 (where XXX is your BLADE ID)

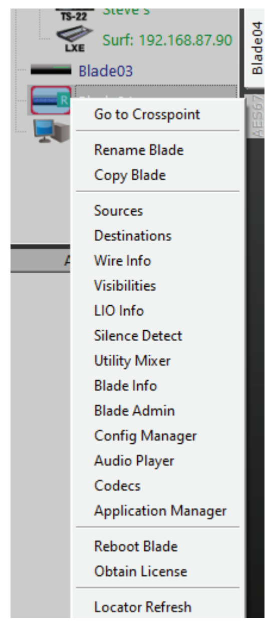
Wheatstone recommends the use of the SRT and RTP options when using the Blade-4 codecs. More information is available in the *Blade-4 Codec Quick-Start Guid*e which you will receive when you purchase the Blade-4 codec option.

Application Manager Tab



The Application Manager is a licensed feature of BLADE-4 that allos you to install certain applications that can be run on the embedded Linux computer and displayed via the BLADE-4's built-in HDMI output. Such applications include the BladeAppMeterGUI and the BladeScreenEngine. To license the Application Manager, copy the Seed from the Application Manager tab and email it to activation@wheatstone.com. You will receive a license code that will need to be copy/pasted into the BLADE by clicking the **Install Appman License** button. Applications that you may want to run on the BLADE-4 will, in most cases, also require a license and you will need to reach out to your dealer or the Wheatstone Sales Department to inquire about obtaining those licenses. When you receive a purchased application file, you will also receive a Quick-Start Guide for the application(s) which covers the licensing process in detail.

More on the System Pane

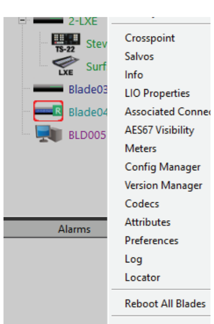


Popup menus are available when a BLADE's icon or name is right-clicked in the System Pane. Additionally, the view in the main window area changes as if the icon or name was left-clicked.

If the BLADE type is any of the hardware BLADEs, the popup menu allows you to choose any of the tabs in the main view. This is most handy when you want to change to a tab that's currently not visible and would require use of the tab scroll buttons to make that tab show before selecting it. With the right-click method you don't need to use the tab scroll buttons.

There are two additional entries in the popup menu for a hardware BLADE. At the top is a choice to "Go to Crosspoint," which changes the main view to the System Crosspoint tab. Near the bottom of the menu is a choice to "Reboot BLADE." This should be used with caution, since the BLADE will be out of commission for the reboot time, and any audio in the BLADE will be lost to the system until reboot is done. The main reason for providing "Reboot Blade" is to allow you to reboot a BLADE when updating its software without having to physically travel to where the BLADE is located. There are also options to rename the BLADE and obtain a license for any of the BLADE's licensed features.

If the BLADE is a PC type, the popup menu once again lists the tabs for that BLADE as choices, and also sports the "Go to Crosspoint" choice. There is, however, no "Reboot BLADE" choice.



You can also right-click on the System icon or name to bring up a similar menu. You will find options to sort the BLADEs in your system tree by BLADE ID or Name, you can go to any of the System tabs which we have already covered, and near the bottom of the list you will see the option to Reboot All Blades (which of course should only be used intentionally and with caution).

Aura8 IP Pro GUI

Chapter Contents

AuraIP Pro GUI

Routable Audio Processing

The BLADE-4s (IP 88d, IP88a, IP88ad models only) include an optional multiband processor useful for processing incoming audio from callers, remotes, codecs, satellite feeds and microphones. This is the same Vorsis processing used in the acclaimed Aura8ip BLADE. You can also use it to process output audio for headphones, web streams, pre-processors, IFB, or for level protection for STL applications. Each of the eight routable bands of processing includes a 4-band parametric equalizer, a 3-way crossover, 3 agc/compressors, 3 limiters, and a final look-ahead limiter. The eight processors are labeled Proc. A through Proc H (you can change these names). They are identical so we will not consider them individually in this manual. The Aura8ip functionality requires a license which you can request from the Wheatstone sales department or your dealer. All BLADE-4 models mentioned above include a single AuraIP processing channel—it's only the additional channels that require a license.

We will address all of the available adjustments and help familiarize you with what the adjustments do, but first you will need to install and setup the GUI.

The AuraIP Pro GUI software is available by scanning the QR code or visiting the link shipped with the Blade-4 and once installed, grants easy access to Aura8ip's vast sound processing capabilities. The AuraIP Pro GUI can be used to control all AuraIP processors in your facility including any single-channel processors you have. Installing the software is easily done using the following procedure:

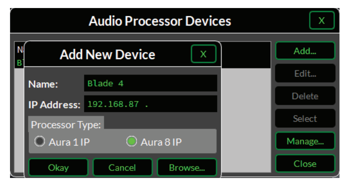
- Insert the AuraIP Pro flash drive into a Windows computer;
- Click the Start button;
- Click the Run option;

- Click the Browse option;
- Browse *My Computer* to locate the flash drive device and double click it;
- When the contents of the flash drive appears, locate the AuraIP_x_x_x.exe file (where x_x_x. is replaced by the version number) and double click it to start the GUI installation;
- Follow the on screen instructions to complete GUI installation.

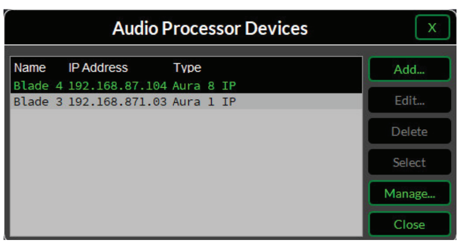
Once the GUI has been installed on the host PC it must be configured before it can connect to and control the Aura8ip processor. Click the AuraIP_pro.exe file to start the AuraIP Pro GUI software and use the following procedure to configure it to be able to connect and control the Aura8ip processor.

Near the bottom right hand side of the GUI, click on the *Devices* button, then click the *Add*... button; the Edit Device dialog will open.

- Type a name for the Blade-4. This is the name that will be displayed at the top of the GUI to inform the user which Blade-4 is currently connected.
- Next enter the IP address of that Blade-4.
- Click the *OK* button to close the dialog.
- Highlight the newly configured device and click the *Select* button.



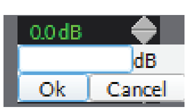
If there is a network connection between the GUI's host PC and the Blade-4, *and* the PC is configured to be on the *same* network subnet as the Blade-4, the *Online* button at the top left of the GUI may be clicked to connect to the Blade-4. When the GUI is online to the processor and controlling it, the green indicator inside the button will be illuminated and the Status window will display "Online."



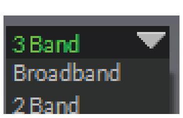
IP Address Note: Unless special routing has been configured by the IT department the controlling PC *and* the Blade-4 must be on the same network subnet. As an example, if the Aura8ip has an IP address 192.168.87.101, then the PC's IP address must be configured to be *between* the addresses 192.168.87.1 and 192.168.87.254, noting that the Blade-4 and the host PC cannot share the *same* IP address.

A Word About Our Controls

The control at left is typical of those found in the Pro GUI. To increase its value, left click on the UP arrow. To decrease its value, left click on the DOWN arrow. If you wish to quickly move to a value, you may click and hold the UP or DOWN arrows and the control will scan to the end of its range.

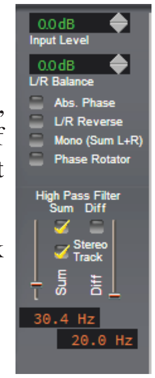


Another option is to double-click in the numeric field of the control which will open up a dialogue where you can input the value you want. If the value is not within the range of the controller, the controller will return to the value within the accepted range that is closest to the requested value.



Controls that have a DOWN arrow but no UP arrow are drop down menus. Usually, only 2 or 3 fixed options are available within this type of control. Click the arrow, select the parameter and the drop down menu will automatically close, having selected and displayed the new value.

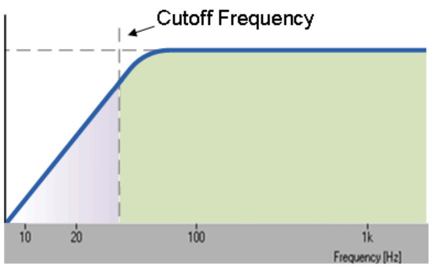
Input Controls



The upper left corner of the Pro GUI hosts the Input settings for the selected processor instance. Here, the input levels and left/right balance can be adjusted, and there are also options for reversing the phase of both left and right channels (Abs. Phase), swapping channels (L/R Reverse) summing the left and right input to mono (Mono (Sum L+R)) and turning on and off the phase rotator.

The input level range is adjustable between -36dB to +12dB with a setting of 0dB referencing a peak input level of -12dBFS. Left/right channel balance may be corrected by +/-12dB from 0dB (default).

High Pass Filter (HPF)



High Pass Filter Response

The purpose of a high pass filter is to remove or reduce low frequency signals that are in the audio, but may not be a desired part of the audio. Whatever frequency is chosen as the Cutoff Frequency is the frequency at which the response to undesired signals will be reduced by 3dB (half power). The high pass response is that of a critically damped fourth order filter.

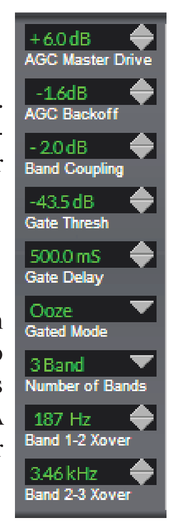
The high pass filter (HPF) in the Aura8ip is designed a bit differently than those found in other processors in that it has the ability to reduce undesired low frequency noise in the sum (mono) signal, or the difference (stereo) signal, or both. It does this by using its two different high pass filter operating modes as explained next.

Stereo – In the STEREO (St.) mode, the left hand control sets the frequency where the filter begins to work on both sum and difference signals simultaneously. Because the effect is applied to both signals equally, it is mathematically equivalent to the filter being operated in the left/right domain. As the image at upper left shows, audio signals below the selected frequency are reduced or filtered out.

Sum & Difference – In this mode, two controls separately affect the L+R and L-R aspects of the input audio. Since lower frequencies (generally below 300Hz) are non-directional, eliminating lower frequencies in the L-R domain can yield enhancements to the audio signal above the filter's frequency. Adjust this control while listening to the bass to find the best setting when using the HPF in this mode.

As with all adjustments in the Aura8ip, the high pass filter settings are preset dependent. That is, presets can be saved with the HPF in STEREO or SUM & DIFFERENCE modes, and the preset will remember this.

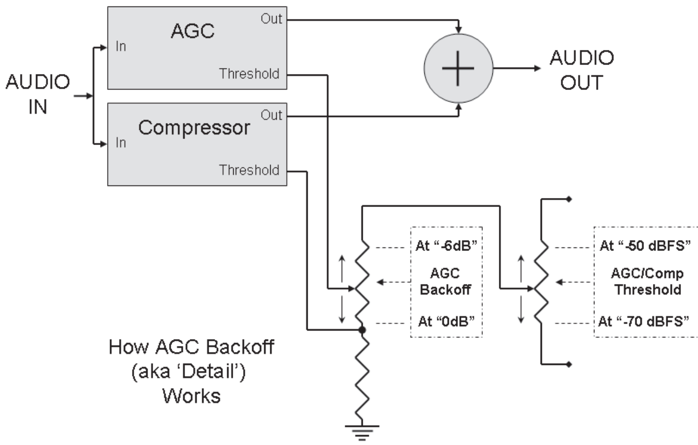
AGC and Compressor Controls — Part 1



To the right of the Input control column is the column of Master adjustments for the multiband AGC. These adjustments include AGC Master Drive (with a range of -12 to +6 dB), the AGC Backoff control (explained next), Band Coupling, Gate Threshold, Gate Delay, Gate Mode, and lastly, controls for the Number of Bands of processing desired and the Crossover frequency adjustments.

AGC Backoff

This is a very unique control found only in Wheatstone signal processors. The AGC Backoff algorithm decouples the AGC and Compressor processing blocks from each other. When the Backoff control is set to 0dB the AGC and Compressor act as one processor. However, as the Backoff control is adjusted towards -6dB, the AGC and Compressor become more decoupled and begin acting as two separate processors. A better explanation of our AGC Backoff control, a control sometimes called the "Detail" control by our customers, is in order.



The diagram at left shows the essentials of what the AGC Backoff control does. When the Backoff control is at 0dB the AGC and Compressor are operating with identical thresholds. While their time constants may be different (and typically are) their thresholds, or the audio level where they begin to reduce the level, are the same.

As the Backoff control is adjusted away from 0dB the threshold of the AGC is raised above that of the Compressor. This causes the AGC to do less work, but since the AGC and Compressor operate as two separate entities they do not see each other, and the Compressor has no idea that the AGC is now doing less work.

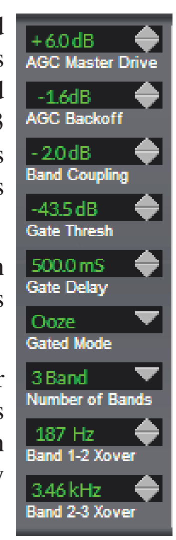
The audible effect is that as the Backoff control is adjusted away from 0dB the action of the Compressor becomes more obvious even though it is doing the same amount of work. In essence, lifting the AGC threshold has exposed the action of the Compressor, which then exposes the audibility of the work that it is doing. Because the AGC/Compressor stage always operate in sum and difference mode, as the Backoff control is adjusted away from 0dB the audibility of processing on L+R and L-R is increased, with the net effect being that the audio becomes more detailed, more alive, has more depth, and is more up front.

It is important to recognize that while the Compressor and AGC operate independently, from a maximum gain standpoint they are linked. That is, at any moment in time the Compressor can never have more gain than the AGC. In fact, when the AGC and Compressor attack a signal at their own time constants and then release, the Compressor can only increase its gain up to whatever gain value the AGC is current at. This behavior is obvious in operation by watching the two meters associated with AGC and Compressor gain reduction as audio is being processed – because the attack time of the Compressor is shorter, it will be reducing gain more than (or faster than) the AGC.

Moving the AGC Backoff setting away from 0dB is one of the places in the processing structure where additional density and loudness may be gained. Basically, you have the ability to not only add or take away compression via the bypass option, but you have the ability to dial in the audibility of that compression in any way desired.

Note that if the AGC Backoff is operated at its maximum value (-6dB), changes to the compressor release times will probably be needed in order to ensure that the audio doesn't become too busy-sounding or overly dense.

Band Coupling



This adjustment controls how much gain could be ADDED by the AGC in Bands 1 and 3 (referenced to Band 2) when energy in those two bands isn't sufficient to cause the same amount of gain reduction as is occurring in Band 2. When Band Coupling is set at 0dB the AGC will prohibit the gains in Bands 1 and 3 from increasing above whatever the current gain in Band 2 happens to be. This prevents Bands 1 and 3 from adding gain when they release, which causes the spectral balance to remain flat. A setting like this is useful in situations where the benefits of multiband gain control are needed but "spectral rebalancing" is not required or desired.

As the Band Coupling control is moved away from 0dB Bands 1 and 3 are allowed to have more gain than Band 2 by whatever the Coupling setting is. For example, setting the control at -6dB will allow Bands 1 and 3 to add up to an additional 6dB of gain from Band 2.

Note the Band Coupling control works only on the AGC. If the AGC is bypassed and the compressor is enabled the compressor does not utilize the Band Coupling controls and it will be allowed to take on as much gain as needed. Also note that in this mode the compressor will always release to 0dB gain reduction because the compressor itself is not gated, only the AGC. We do not recommend using the compressor by itself unless a specific sound is desired or it is used with <6dB of average gain reduction.

Gate Thresh, Gate Delay, and Gated Mode

Each band of the AGC is managed by a gating algorithm that serves to freeze the AGC's action when audio levels fall below a set value. In effect, that gate manages how the AGC recovers in the absence of audio. Without a gate, the gain would continue to increase as the AGC released, potentially causing noise suck-up or other undesired effects.

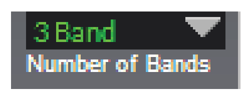
The operation of the Gate Thresh control is straightforward. When audio in a processing band falls below the value set by the Gate Thresh control, the AGC will freeze its gain. The compressor may be allowed to decrease gain if needed, but no additional gain increase will occur by the AGC once audio has fallen below this value.

The Gate Thresh is calibrated in dBFS (decibels Full Scale) a common calibration in digital audio equipment. Because the internal audio reference level is -20dBFS (to allow headroom) a normal Gate Threshold setting will be as much as 24dB to 30dB below this value. Therefore it is quite normal to see Gate Threshold settings that are in the range of -44dB to -60dB. The gate function may be defeated by adjusting the Gate Thresh control towards -80dB which will then disable it and cause the Gate Thresh display to indicate OFF.

The Gate Delay setting tells the AGC how long to wait after the audio falls below the Gate Thresh before it freezes the gain. The control range is 50ms to 500ms. Setting the Gate Delay control to times greater than about 100ms loosens up its action which helps gating action when the level of audio passages is just riding the Gate Thresh level.

The Gated Mode control decides if the AGC should freeze the gain when audio falls below the Gate Thresh (Gate), or if it should allow the gain to very slowly recover towards 0dB gain reduction (Ooze). As explained in the introduction, allowing the gain to freeze prevents noise suck-up in the absence of audio. The Ooze function, on the other hand, can be very helpful on formats such as Classical or Jazz, where it might be inappropriate for the AGC gain to get stuck when audio was present, but below the Gate Threshold setting. Using the Ooze mode to allow the gain to slowly recover sounds very natural, and therefore this is the setting that is recommended for the more gentle formats.

Number of Bands



The Aura8ip's AGC, Compressor and Limiter sections may be operated in broadband, 2 band or 3 band modes. Whichever operating mode is selected, the appropriate number of columns of processing controls will appear in the Pro GUI. When switching from 3 Band, to 2 Band, to Broadband mode, columns of controls will be defeated and hidden, revealing only the controls available for the number of bands chosen.

Comparison of AGC controls visible in 3 band mode (left), 2 band mode (center), and broadband mode (right)

Crossovers

The purpose of a crossover (Xover) is to separate the audio spectrum into different frequency bands prior to processing. The reason this is done is to eliminate or reduce the effects of gain control happening in one part of the spectrum from affecting another.

For example, processing bass-heavy material with a broadband (1 band) processor almost inevitably results in an effect called "spectral gain intermodulation," which simply means that the gain is being arbitrarily changed in one part of the audio spectrum because of signals in another part of the spectrum that need the gain to be changed. Unless this is done to create an effect, spectral gain intermodulation can be annoying as well as fatiguing to listen to.

Aura8ip has very flexible phase-linear crossovers which operate at 24dB/octave (4th order). Each crossover may be adjusted within a wide frequency range:

- The BAND 1-2 crossover is adjustable between 20Hz and 687Hz in 3 band mode, or 20Hz and 20kHz in 2 band mode. This band has a wide adjustment range in order to accommodate the requirements of running in two band mode
- The BAND 2-3 crossover has a range of 728 to 20 kHz.

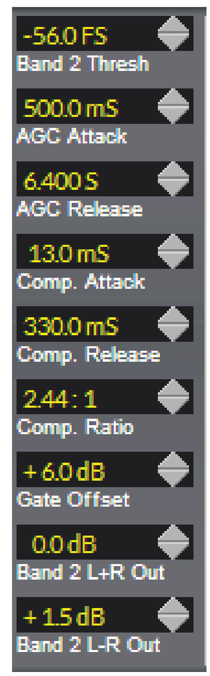
Making the crossover settings by ear is the best way to discover how to set the crossovers for the best sound on the type of material being processed.

In “3 Band” mode, the BAND 1-2 crossover will usually end up between 80Hz and 300Hz while the BAND 2-3 crossover will fall somewhere between 800Hz and 3kHz.

In “2 Band” mode the Band 1-2 crossover will be found somewhere in the range between 120Hz and 400Hz. There is no Band 2-3 crossover setting when the processing is in two band mode, as in that mode there is no Band 3.

In Broadband mode there are no crossover settings because there is no crossover to adjust.

AGC and Compressor Controls — Part 2



To the right of the AGC Master controls in column #1 are additional adjustments for each of the three AGC/Compressor bands. As pointed out earlier, the number of AGC/Compressor control columns depends on the number of processing bands chosen. We have chosen to color code the controls in each column to make navigation easier. Please note that column #2 and #3 are the only two AGC/Compressor columns serving two roles:

Column #2: Processing adjustments for the lowest frequency band when in 2 or 3 Band mode, or all of the controls when in Broadband mode. The control values in this column are always orange.

Column #3: Processing adjustments for the “Mid” band when in 3 Band mode, or the “High” band when in 2 Band mode. The control values in this column are always yellow.

Column #4 is only visible when the AGC/Compressors are operating in 3 Band mode and it hosts the processing adjustments for the “High” band when in 3 Band mode. The control values in this column are always blue.

What follows is an explanation of what each processing control is called, what it does, and if applicable, what its audible effect is.

Threshold

The first adjustment in each column is the Threshold (Thresh) control. This control sets the level at which the AGC will start working (or processing) the audio. If the AGC is defeated, then this control will govern the behavior of the compressor.

Like many other controls, the Threshold control is calibrated in dFBS. And, like the Gate Threshold discussed previously, the Threshold control operates with a peak program reference level of -20dBFS. What this means is that if the onset of AGC gain control action should begin 20dB below average program level (to achieve 20dB of average compression), this control should be set 20dB below the internal reference level, or at -40dBFS.

AGC Attack/Release

The next two adjustments in the column control the speed of the AGC. The AGC Attack setting controls how fast the AGC adapts to increases in audio levels. The range of the AGC Attack control is 50-500ms.

Conversely, the AGC Release control setting controls how fast the AGC responds to decreases in audio level. The range of the Release control is 1000-7000ms (1 second to 7 seconds).

Recommending “perfect” settings for the AGC Attack and Release controls is difficult because of how highly subjective the resulting processing will be. What this means is that the settings are highly dependent on many factors including the desired density of processing and its audibility. In general, slower settings in both controls create less noticeable AGC action while faster settings cause the audibility of processing to increase.

If we were to recommend starting points for the AGC Attack and Release we would specify around 300 ms for Attack and 4000ms (4 seconds) for Release. While the range of the AGC Attack controls could achieve a 50ms Attack and 1000ms Release, we do not suggest using AGC Attack times faster than about 150ms and Release times faster than about 2000ms IF all parts of the processor are enabled (AGC, Compressor, Limiter, etc.).

Compressor Attack/Release

These next two adjustments control the timing of the Compressor. Unlike the AGC however, the Compressor is designed to work primarily on short term dynamics and therefore helps to not only build density, but it allows the limiters upstream to not work so hard on the audio coming out of the AGC/Compressor stage.

The Compressor Attack (Comp. Attack) control range is adjustable between 3ms and 100ms. Compressor Release (Comp. Release) is adjustable between 50 and 1000ms (1 second). The ranges of the Compressor controls have been limited to what we feel are the most useful settings and they cannot be set to sound bad. That said, we recommend Compressor Attack settings of between 3ms and 20ms and Compressor Release settings around 300ms. These settings may need to be modified to work better in concert with other controls later downstream.

Compressor Ratio

The Compression Ratio (Comp. Ratio) control adjusts how much the audio output level is allowed to increase as the input level increases. A Compression Ratio of 1:1 would make output level changes be a mirror image of the input, i.e., there would be no processing. Likewise a Compression Ratio of 20:1 would allow the output level to only increase by 1dB even though the input level increased by 20dB (a 10:1 change).

The “correct” setting of the Compression Ratio control is highly subjective, just like many other controls in any audio processor. However, our experience is that a Compression Ratio setting of between 2:1 and 6:1 is the most useful, with a setting halfway between (at 4:1) a good all around tradeoff.

Higher Compression Ratios will sound tighter and more squashed while lower Ratios will sound more free and dynamic. The user is completely free to use whatever Compression Ratio he feels sounds best in his application.

It would not be uncommon to see different Compression Ratio settings for each processing band, although that is never a requirement. Our recommendation is to pick a number, say 4:1, and set all bands to that Compression Ratio. Then after adjusting the other controls for the desired density and impact, make small adjustments to the ratios as needed to tame a particular issue. Let us provide an example of when the Compression Ratio is the right knob to grab:

Suppose the Aura8ip is running in its 3 Band mode and everything is sounding really good but you notice that sometimes the high end isn’t quite controlled enough on some material. The best way to even things out would be to slightly increase the Compression Ratio for Band 3, and only band 3. Suppose you look at the Compression Ratio setting for that band and see that it is set to 4:1. Try setting it a bit higher, to perhaps 4.4:1 and then listen for a while. If there is too much control, reduce the ratio a little and listen again. If it’s not controlled enough, nudge it up a little and listen again.

Again, the ears are always the best judge of the correct settings to use. The best advice that we, as processing experts, can offer an end user about audio processing is this:

Regardless of what the controls and the meters might say, if it sounds right, then it IS right!

Stop adjusting!

Gate Offset

The Gate Offset applies a Gate Threshold offset to each band – an offset of whatever the master Gate Thresh is as applied in the first column.

The purpose of the Gate Offset controls is to allow the precise gating thresholds for each band to be different from the master setting by a specified amount. The amount of available offset is +/- 6dB. The best way to explain how the Gate Offset controls work is by example:

Suppose the master Gate Threshold is set to -48dB and everything seems fine except that sometimes Band 3 seems to be gating too late. This can be remedied by adjusting the Band 3 Gate Offset to a setting that is "higher" than 0dB, such as +3dB, which would then set the Band 3 Gate Threshold to -45dB (-48dB plus 3dB = -45dB). This adjustment will have raised the effective Gate Threshold for Band 3, making its gate operate sooner.

At first glance the Gate Offset controls may not seem to have much range, but remember that -6dB is half and +6dB is twice whatever the 0dB gating level is.

Processing Band L+R and L-R Outputs (L+R Out, L-R Out)

Each processing band has a pair of output level controls (L+R Out, L-R Out) that serve as mix controls allowing the processing's output spectral mix to be adjusted to taste. Both pairs of Output controls have a +/-6dB range. The L-R Output controls, because they are a special case, are also equipped with a MONO position (to be covered shortly).

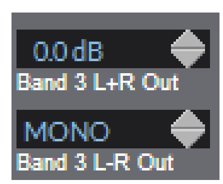
The L+R and L-R Output controls feed the input to the following multiband limiter (if enabled) so some care must be taken in adjusting the mix controls in order to feed the multiband limiter an appropriate signal. We recommend staying within a +/-3dB range when setting the L+R Output mix controls.

As mentioned previously the L-R Output controls are a special case. The Aura8ip AGC/Compressors operate in the sum and difference domain (L+R/L-R). What this means is that the mono part of the signal (L+R) and the stereo parts of the signal (L-R) are processed independently. Doing it this way permits useful audio enhancements that cannot be accomplished in processors that operate strictly in the Left/Right domain, as most do.

In the Aura8ip the L-R Output control adjusts the stereo part of the audio signal (its depth, width, and spectral balance) without affecting the mono, or "dead center" part (such as live voice). This permits very unique sonic signatures to be created that cannot be achieved any other way.

Because there is an L-R Output mix control for each band, certain parts of the audio spectrum may have their stereo width and depth enhanced (or reduced) independently of the other bands.

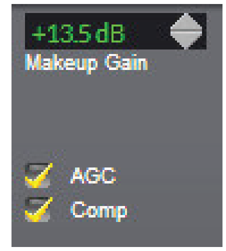
The L-R Output controls also have a MONO position. When a band's L-R Output control is set to MONO, there is no L-R stereo width or depth signal added by that band. A popular use of this feature is to remove subsonic "mud" from the stereo difference signal. Bass energy in most contemporary music has equal amplitude, in-phase components in the left and right channels, so any L-R signal that might creep into the low frequencies is probably not bass at all, but noise or other undesired signals. By setting the Band 1 L-R Output (L-R Out) control to MONO, extraneous signals that might otherwise have contaminated the bass frequencies are eliminated.



The setting of the L-R Output controls also adjusts the amount of stereo enhancement present in the output mix. Adjusting the L-R Output controls to positive numbers increases the amount of stereo separation for frequencies contained in the bands whose controls are set above 0dB. A useful setting of the L-R Output controls for tasteful stereo enhancement would be Band 1 = 0dB, Band 2 = +3dB, Band 3 = +1.5dB. Of course reducing these controls has the opposite effect, reducing stereo separation.

Makeup Gain

All of Aura8ip's processing is accomplished by feed-forward control algorithms. Feed-forward control has the advantage that it doesn't rely on errors in the compressor's output signals (as do feed-back algorithms) in order to dynamically control the gain. Rather than measuring mistakes in the output level and then trying to correct them by a (now very late) control signal, feed-forward control prevents errors in the output signal by carefully measuring changes in the input signal's levels and then calculating the precise amount of gain control needed to achieve the perfect output.



Because the compressor's output levels are controlled by changes in the input levels, when the input levels go up, the compressor will push the output level down by whatever amount of gain reduction is called for. This causes the output levels of feed-forward compressors to need to be "made up" after processing, and this is accomplished with a control called Makeup Gain.

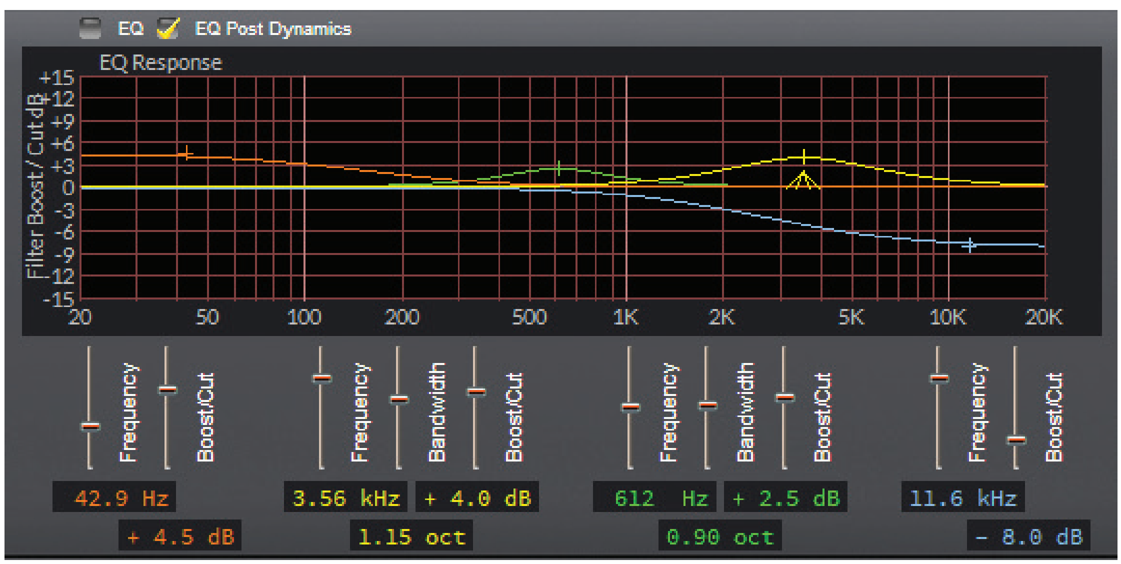
The amount of Makeup Gain needed is a function of how much gain reduction was called for due to an increase in input level. In our design we leave around 6dB of additional headroom to accommodate the compressor attack times and such, so if 20dB of gain reduction is being done by a band's AGC/ Compressor, then the correct amount of Makeup Gain will be 20dB plus that 6dB, or around +26dB.

The less gain reduction being called for, the less Makeup Gain that is required to bring the signal back up to normal levels afterwards.

Those who may be concerned about "… adding gain after AGC/Compression because it will increase noise…" need to know that the signal processing chain inside Aura8ip has 144dB of dynamic range. This is approximately 50dB more dynamic range than a digital CD. Therefore "noise" is of no concern whatsoever – the processing chain will remain absolutely dead quiet regardless of the amount of Makeup Gain that may be required.

Note also that the amount of Makeup Gain is somewhat dependent on the Compression Ratios being applied to the signals in each processing band. The higher the Compression Ratio, the tighter the output level is regulated, and therefore the more Makeup Gain that will be required. However, the difference in the Makeup Gain required with 20dB of compression at a 4:1 ratio and that required at 20dB compression with a 10:1 ratio is only around 3dB.

Parametric EQ



The Aura8ip is equipped with a flexible equalizer section which may be used to sweeten the spectral balance. The equalizer provides a graphical representation of the equalizer's contribution to the audio by creating shaded areas in the graph representing the mathematical result of overlapping equalizer sections.

The equalizer may be placed before or after the AGC/Compressor stage, and though the audible effects of each placement are different (and sometimes subtle) they are important to understand. We will discuss this shortly.

The equalizer has two parametric sections (adjustable frequency, boost/cut, and Q) and two shelving filters (adjustable frequency and boost/cut). The shelving filters behave somewhat like tone controls on consumer audio equipment, and provide a broad, low-Q boost or cut at the extremes of the audio spectrum.

The two parametric sections provide a broad or narrow boost or cut to any frequency within the 20Hz to 20kHz audio spectrum, and may even overlap to create special EQ curves.

- Equalizer Band 1 provides a shelving response of +/-14dB and may be tuned between 20Hz and 198Hz.

- Equalizer Bands 2 and 3 have a parametric response and may be tuned anywhere within the 20Hz to 20kHz audio band, providing up to 14dB of boost or cut and at bandwidths (Q) of between 0.20 and 3.0 octaves.

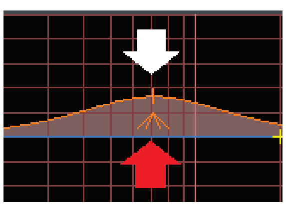
- Equalizer Band 4 provides a shelving response of +/-14dB and may be tuned between 2.0 kHz and 20 kHz.

As mentioned earlier, the equalizer section may be placed before or after the AGC/Compressor. Placing it before "pre-loads" the AGC and allows any tonal adjustments to be managed by the AGC/Compressor. This, for instance, allows the adding in of more bass or high end without fear of overloading the following multiband limiter on some program material because the AGC/Compressor will see this extra energy and try to manage it.

On the other hand, placing the equalizer after the AGC/Compressor can sound more dramatic because any equalization is no longer managed by the AGC/Compressor (which helps to tame it somewhat) but is instead managed by the multiband limiter which typically is doing very little gain management.

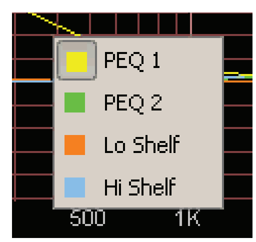
The correct placement for the equalizer is both highly subjective and highly dependent upon the particular application. For most applications we recommend operating with the "EQ Post Dynamics" box unchecked. There are three ways to adjust the EQ:

1. The sliders below the graphical area may be used to adjust the frequency, boost or cut and the bandwidth (Q, if available) in the band of interest;
2. The value displays under the controls can be double-clicked which opens an entry dialog where the desired values can be manually entered from the keyboard;
3. The equalization curves themselves may be dragged with a mouse to the desired settings.



When manually dragging the curves there are three control behaviors to be aware of. The first two pertain to the "+" at the center of the curve which can be dragged left to right to set the desired equalizer frequency and up and down to set the desired boost or cut.

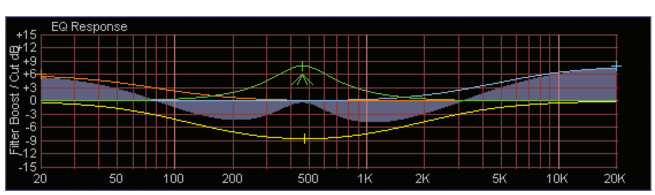
The third control is available only in the two parametric sections and it is represented by the tent symbol underneath the curve. Placing the mouse cursor on this symbol and then dragging left or right adjusts the Q (bandwidth) of the equalizer section.



If it seems that a curve isn't responding to mouse input, right click on the graphical area to bring up the dialog shown at right and select the curve that you wish to adjust.

When the equalizer section is enabled the audio spectrum being influenced by the equalization is represented by shaded areas of the audio spectrum. To show what we mean, please refer to the next graphic.

Below we've created a bizarre (for example only!) curve to show how the shaded areas represent the mathematical effects of the applied equalization. We've added low and high frequency shelving to boost the signals at the extremes of the audio spectrum. We've also used the two parametric equalizers in an overlapping fashion to create two scooped out areas of the midrange. Note how the yellow curve (bottom) is very broad – this is applying a very broad dip in the frequency response between about 100Hz and 3kHz. However, notice that the green curve (top) is set to be rather narrow – much narrower than the yellow curve on the bottom. The combined effect is a broad reduction in frequencies between 100Hz and 350Hz and between 600Hz and 2.5kHz.



A Word About Our Limiters

Vorsis has returned the limiter to its rightful place as a device that only reacts to control a peak in the audio level and only to the degree necessary to control that peak. These limiters are not intended to be used to add their own signature to the audio; they are there merely to prevent audio from exceeding a predetermined peak level.

In more conventional designs the limiters are sometimes found to be equipped with gates, return to zero functions, temporary holds and even interband coupling. These limiters typically need these functions to make up for deficiencies in the preceding AGC or compressor – the limiters then act as a second, faster compressor to build density while, at the same time, are also tasked with controlling peaks. Conversely, Vorsis designs utilize much better AGC and Compressor algorithms that allow the following limiter to be just that—a limiter.

Unless the limiters have been tuned to create a very specific effect, there should normally be no more than 3dB of average gain reduction seen. At times, there may not be any activity at all in a limiter band, however rest assured that the limiters ARE working properly, they just don't need gating and 12dB of gain reduction to do it!

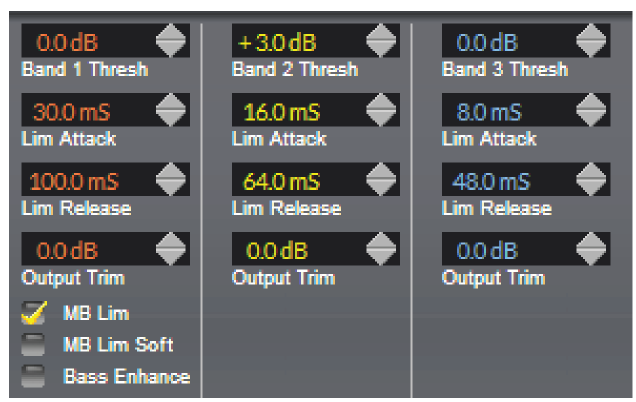
Multiband Limiter

Before we begin discussing the multiband limiter it is important to recognize that the number of limiter bands is controlled by the number of AGC/Compressor bands as selected by the Number of Bands control discussed in the AGC/Compressor section of this manual. Further, if the number of bands control has been set to Broadband, we recommend not enabling the remaining band of the multiband limiter – this work is better done by the final limiter. In fact it will be obvious from our presets that all Broadband factory presets defeat this limiter.

There are four adjustments for each limiter band:

Threshold (Band x Thresh)

This control has a range of -6dB to +6dB and sets the level at which LIMITING will commence. At 0dB the limiter acts more as a protective device to prevent peaks from getting above 0dB. Set to negative numbers the limiter begins to work sooner and therefore limits the audio to below 0dB. Set this way the limiter is not only preventing peaks, it is also imparting its own signature on the sound. When set to positive numbers, and if the gain structure of the processing prior to the limiters is correct, the limiter will still be awake but will rarely, if ever, introduce gain reduction.



Limiter Attack (Lim Attack)

This controls how rapidly the limiter will act to control audio peaks. We made the range of this control 0.3ms to 100ms; however, we recommend operating with settings between 0.3 and 10ms. With settings slower than this, peak control will be sloppier, and though the multiband limiter attack setting isn't critical, slowish attack times will make the final peak limiter work harder.

Limiter Release (Lim Release)

This control sets how quickly the limiter recovers once a peak has passed and the audio level falls below the limit threshold. The adjustment range of this control is 3ms to 100ms.

Very fast release times (under 30ms and especially in the low band) coupled by very fast attack times (under 5ms) will yield a tightly controlled audio signal that has a "radio" sound. Very slow release times (greater than 50ms) will yield a more open sound that is still well controlled (relative to the attack time settings). As we have said with the

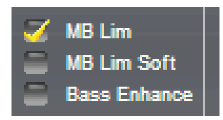
AGC/Compressors, unless you are very familiar with these types of controls, it's probably best to not wander too far from the settings in the factory presets.

Output Trim

Each limiter band is followed by its own Output Level mix control which can be used to make fine adjustments to the final tonal balance. Because the setting of these controls can be fairly touchy, we recommend leaving them at 0dB unless a specific sonic effect is desired.

Multiband Limiter Options

The multiband limiter is equipped with two other operating modes besides simply on and off. On and Off is controlled by the check box labeled **MB Lim**. The other two options require some explanation.

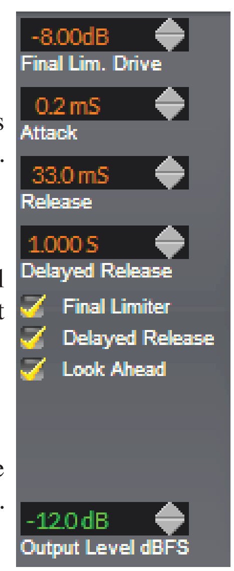


MB Lim Soft – Checking this box enables a small amount of anticipation in the limiter behavior, causing it to start to limit approximately 2dB below the absolute limit threshold as set by the Band x Thresh control. This anticipation serves to soften the limiter action by making it "spongy." That is, it will ooze in and out of limiting in a softer fashion which makes it quite effective (and good sounding) in voice applications.

Bass Enhance – This check box enables a Vorsis-proprietary algorithm which enhances low bass without creating intermodulation distortion or muddiness. It enhances the sound of bass when heard on small, bass shy speakers and adds richness to the sound without adding noticeable distortion.

Look Ahead Final Peak Limiter

The final section of processing is the Lookahead Limiter with its defeatable lookahead function. In studio applications, the final limiter can probably be defeated. However, if the audio destination is a method of transmission (STL, audio stream, uplink) with a defined maximum peak input level, or if you want to recreate a "radio" sensation for talent headphones, using this limiter is a good idea.



Final Lim. Drive

This control sets the drive level for the final peak limiter. The preferred way to set this control is to adjust the Final Lim. Drive until there is 1dB to 3dB of indicated limiting on the final limiter meter.

Attack

This control sets how quickly the limiter will react to audio peaks. While the range for this control is 0.2 to 30ms, we recommend a setting between 0.2 and 10ms. Anything slower than 10ms will not yield effective peak control.

Release

This control sets how quickly the limiter will recover after reacting to an audio peak and after the level drops. The range of this control is 33ms to 330ms, with a recommended setting of around 180ms.

Delayed Release Control

This control sets the amount of delayed or secondary release for the limiter. When Delayed Release is engaged (see below) the first 3dB of gain reduction is released at the Release Time setting and the remainder occurs at the speed set by the Delayed Release control. The purpose of delayed release is to reduce or prevent intermodulation distortion when very fast limiter release times are being used. Delayed Release also helps to reduce pumping artifacts by preventing the limiter from making a full gain recovery during syllabic changes in audio level.

Look Ahead Limiter Special Option Check Boxes

Final Limiter – When this box is checked the final limiter is engaged and its operation is governed by the final limiter operating adjustments. When this box is not checked the final limiter is disabled and no final peak control is in effect.

Delayed Release – When this box is checked the final limiter is utilizing the Delayed Release algorithm as governed by the Delayed Release control setting as explained earlier. When this box is not checked, only the primary Release time algorithm is in effect.

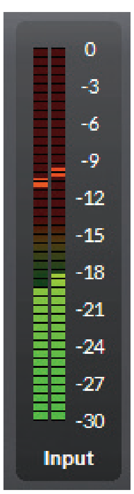
Look Ahead – When this box is checked a small amount of lookahead is applied to the final limiter, allowing it to react to an upcoming audio peak just as it arrives at the limiter input. Lookahead allows the limiter to anticipate peaks and adapt to them early enough that output level overshoots due to non-zero attack time are prevented. We recommend using the Lookahead option whenever signal path latency is NOT an issue. If latency is an issue, this option should not be checked (lookahead is then bypassed).

Output Control (Output Level dBFS)

The output level control sets the absolute peak output level within the range of -39.5dBFS to 0dBFS. If the control is set below -39.5dBFS the audio is muted (OFF). Remember that there is no more processing available after this stage so some care is required in setting the Output Level if peak headroom is a concern in your application.

Metering Discussion

Input Metering



All metering in the Aura8ip is sample-accurate, true peak reading, including the gain reduction meters. The Input and Output meters are calibrated in dBFS so that an accurate determination of these levels may be made. The recommended input level operating range is between -18dBFS and -12dBFS. Care should be taken to ensure that the input peak level never exceeds -9dBFS, especially if the Phase Rotator is enabled. This is because clipped waveforms exit any phase rotator at much higher peak levels because the phase rotator upsets the signal's harmonics. It is not uncommon to see clipped waveforms exit a phase rotator with an increase of 12dB in peak levels!

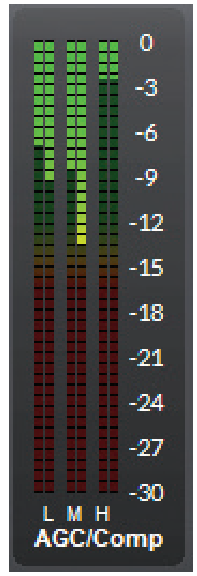
In conventional VU and average responding meters, **0dB** (or 0 VU) usually indicates the desired average operating level. On the other hand, the metering within the Aura8ip follows standard operating practice for digital signals and provides an accurate indication for when **0dBFS** is reached. If and when signal peaks reach 0dBFS, there are no more digital bits available to define the audio signal, which results in hard clipping and severe distortion. The Input meter shown at left is indicating good input levels – peaks are at, but not above, -12dBFS – good operating practice.

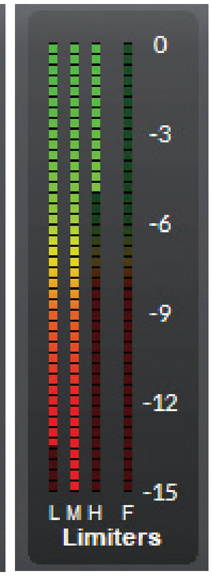
Gain Reduction Meters

Multiband AGC/Compressor and Limiter – The AGC/Compressor gain reduction meters display the amount of processing in each band, and for both the slower AGC, and faster Compressor.

The gain reduction meters for the multiband limiters look similar to the meters for the AGC/Compressor, but have reduced scales more appropriate for limiters.

Metering for each band follows the L, M, H (Low, Medium and High) convention, and the left meter is for AGC and right for Compressor.



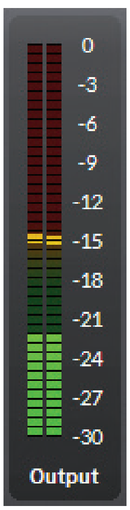


Final Look Ahead Limiter Metering – The right-most meter scale within the group of multiband limiter meters is for the final lookahead limiter. This meter should rarely show more than 2dB to 3dB of activity.

Normal Gain Reduction – The following is a general guideline for what normal indications might be:

Meter	Minimum Reading	Maximum Reading
Multiband AGC	3dB	24dB
Multiband Limiter	0dB	6dB
Final Limiter	0dB	3dB

Output Metering



Like the Input metering, the Output metering is sample-accurate, peak reading, and is calibrated in dBFS. By observing the difference between the consistency of the Input and Output levels the effects of processing are readily apparent.

Note also that because the Output Meters are reading the peak levels of audio which has been processed and probably also peak limited, there is no maximum level constraint like there is on the Input side of the processor. In other words, the effects of processing have made the maximum peak levels 'known' and therefore the Output meters may safely indicate all the way up to 0dBFS.

While a 0dBFS output level is certainly possible, it may not be practical from the standpoint that we do not know what the behavior of the device following the Aura8ip is going to be, and whether it has enough headroom. Our experience is that it is safe to set the digital output levels up to around -3dBFS without incurring any unexpected distortion or other issue in the equipment coming afterwards.

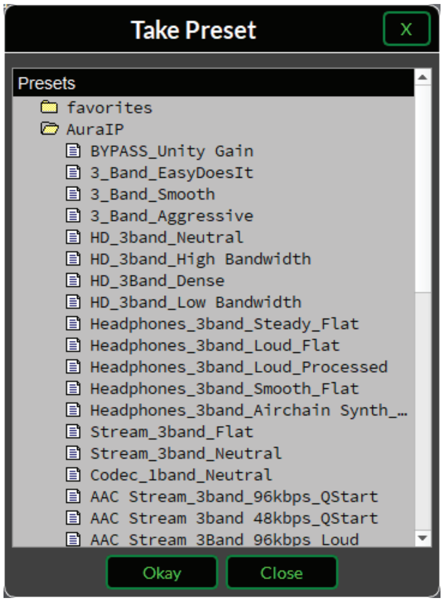
One additional thought about Output levels, if we may … when feeding audio codecs it is best to keep their maximum Input level at -3dBFs or even slightly lower. The reason for this is that when the codec removes energy from the audio (which it must do in order to encode the audio) the peak audio levels inside the codec algorithm increase because information has been removed, information that was required in order to maintain the original peak levels. Now, the designers of the codec may have accounted for this effect, or they may not. We do not know for sure. Therefore the best thing to do is run the codec's input levels a little on the light side, perhaps between -6dBFS and -3dBFS, just to be safe.

Sidebar Region

To the right of the OUTPUT METERING column is a vertical row of seven special buttons. Each button has been designed as an entry point into a dialog designed to help the end user get the most functionality out of the product.

Preset

When this button is left-clicked, a Windows style dialog opens. The Pro GUI must be online to the processor for the window to display the list of presets installed on the Aura8ip hardware.



The folder called **AuraIP** represents the hardware itself and the presets stored there. Other folders, **favorites**, **Factory Presets**, etc. can only be seen within the Library dialog, covered later.

Here, the presets stored on the hardware itself are visible, and any preset may be selected and placed into use by simply double-clicking on it.

In order to save a preset, simply press the **SAVE** button to open a Windows-

style file save dialog. Note that the Pro GUI must be online to the processor in order for presets to be saved. If the Pro GUI is not online and the Save button is pressed, a warning dialog will appear.

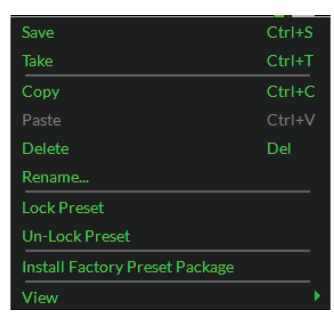
It is important to remember to save any preset deemed important before taking another because any unsaved settings will be lost once the new preset is loaded. There is no warning dialog!

When saving a preset, and unless selected otherwise, the preset will be saved into the next available empty slot on the hardware.

Alternatively, by nudging the preset number ("PRESET #") up or down, a preset may be saved in any preset location except one that has been locked. If a preset is saved into an unlocked location where a preset already exists, that preset will be overwritten with the new preset!

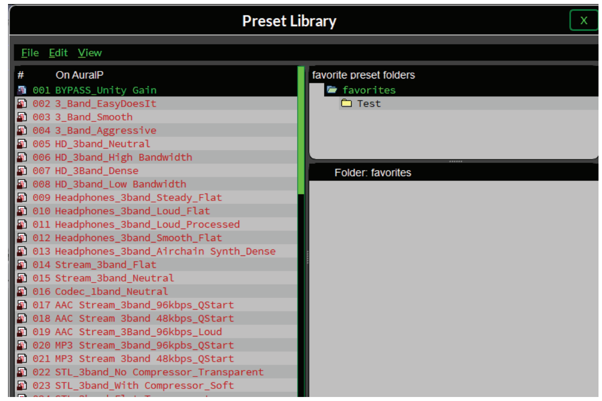
Locking Presets – Presets that have been stored within the processor hardware may be locked by the user to prevent inadvertent overwriting, renaming, or deletion. This is accomplished by opening the Preset Library by clicking on the Library button in the Pro GUI. Once the list of presets is open, the presets stored on the processor hardware are visible in the left pane. There are two ways to manage the lock status of user presets:

- The first method is by highlighting a preset (single left click) and then right clicking it to open a dialog box. Among the options are Lock Preset and Unlock Preset.
- The second method is by highlighting a preset as above, and then clicking the Edit option at the top of the Preset Library dialog box to reveal the Lock Preset/Unlock Preset options.



Note that these are user-level preset lock options and do not override the lock status of a preset that has been factory-locked!

Library



When the Library button is clicked a three panel dialog will appear.

This dialog is divided down the center, and each side has a special purpose. The left hand side will display all of the presets currently stored on the hardware, and the right hand side shows the folders and presets currently stored on the user's PC where the Pro GUI has been installed.

Simple Windows-style drag and drop mouse actions are utilized when moving presets back and forth between the PC and the hardware

Note that if the Pro GUI is not online to the hardware, no presets will appear in the left hand pane simply because when the Pro GUI is not online it has no way to retrieve the list.

The Library dialog is also the place where presets can be added and deleted from the PC or the hardware, or if desired, presets can even be locked on the hardware to prevent inadvertent changes or deletions.

Devices

Clicking on the Devices button opens up a list of Aura8ip devices known to the Pro GUI. To connect to any Aura8ip processor, it must first be selected in the device dialog before the Pro GUI will attempt to go online to it. By highlighting the desired Aura8ip's name and hitting *Select*, the Pro GUI will then know that that is the unit you wish to connect to the next time you press the Pro GUI's Online button.

If the Pro GUI was already online to another device at the time a new device is selected within the Devices dialog, the Pro GUI will immediately try to connect to the new device as soon as the Select button has been pressed.

The first time the Device dialog is opened, no devices will be shown. Before the Pro GUI can connect to **any** Aura8ip or Aura1ip unit, the unit must first be made known to the Pro GUI by using the Add Device dialog.

When the Add Device dialog is opened there is an opportunity to provide a custom name for the Aura8ip, and this name will be shown in the Device window at the top of the Pro GUI. Once the IP Address of the Aura8ip has been entered the Select button should be pressed if that is the processor you wish to connect to. Or, if you are just adding a device for later, click the OK button to close the dialog.

Quick Save (QSave)

The Aura8ip has a unique feature called QSave which allows the instant comparison of two different sets of processing tuning settings. It can also be used to compare the sound of a Factory preset to the modifications being made by a user without having to first save the user preset.

The QSave A and QSave B buttons are assigned to two temporary buffers inside the Aura8ip that hold all current processing settings as long as power is applied to the unit. While QSave A is highlighted green any adjustments that you make to the controls are being saved to that temporary buffer. QSave B is another temporary buffer that operates just like QSave A. When a QSave button is active its green indicator is illuminated.

Though there are several ways to use the QSave feature, one popular way is to compare the sound of a factory preset to changes made to that preset by a user without having to first save it as a user preset. To do this, follow these steps:

1. Recall the factory or user preset that you wish to adjust.
2. Ensure that QSave A is highlighted. If it is not, press its button to highlight it.

3. Press the B=A button. This will copy the contents of QSave buffer A to QSave buffer B. Now the contents of both buffers are identical.
4. Change some settings on the Aura8ip. These settings will automatically be stored in the QSave A buffer.
5. Compare your changed settings to the recalled factory preset by pressing the QSave B button.
6. Compare those settings back to the factory preset by pressing QSave A.

When you are happy with your changes you can commit them to a user preset by using the Save preset dialog that was covered previously.

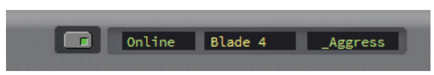
The QSave A and QSave B buttons may also be used to compare the sound of two different sets of user settings. To do this:

1. Load the preset that you want to change, then make changes to it and press QSave A to save those settings to buffer QSave A.
2. Make additional changes as desired and then press QSave B to save those additional changes to buffer QSave B.
3. Now you can compare the two sets of settings by toggling back and forth between the QSave A and QSave B buttons.
4. When you are pleased with one set of settings and need more buffers for further tweaking, you can use the A=B/B=A button to make the two buffers the same and have one of them to use to start comparing from again.

Title Bar Region

As was hinted at in the section of the manual pertaining to configuring and selecting devices, the AuraIP Pro GUI is capable of controlling hundreds of AuraIP units, both Aura1ip and Aura8ip, on the same connected network.

Along the top edge of the AuraIP Pro GUI screen and between the "Aura8ip" product label and the Windows About/Minimize/Exit icons on the right are four status indicators and controls for the management of devices and presets.



The first is a small button with embedded green indicator. This button is used to put the GUI online to an Aura8ip or Aura1ip device. When the indicator is green the Pro GUI is connected to, and is controlling, the selected device.

Status

Next is the Status indicator. When a connection is attempted, made, or disconnected the Status window will display the status of this action. When the display indicates Offline no connection to an Aura8ip device is being attempted.

When the Status window indicates "Trying," the Pro GUI is in the process of establishing a connection to a remote Aura8ip device. As long as the status is "Trying," the device has been found but full communications has not been established. When the Status window indicates "Online," the Pro GUI is in command of the connected device.

Devices

The third indicator is the Device indicator. This window indicates what device has been selected for control from within the Devices dialog covered earlier. If no device is displayed, or if it indicates "Unknown" then no device has been configured or selected in the Devices dialog.

Presets

The last small indicator shows the currently running processing preset. If the text is displayed in green, all parameters that were originally saved with the preset are still active and no changes have been made to any of the settings. If the text is displayed in orange, then one or more parameters in the current preset has been modified and the new settings have NOT yet been saved as a new preset. If the text is displayed in orange and a new preset is taken, any changes preset in the previous preset are lost forever. This may or may not be the desired action – be careful!

Accessing Menu Options

Right clicking anywhere on the Aura8ip Control Panel will open a pop up menu tree with access to the View, Setup, Hardware, and Presets choices. These choices then lead to sub-menus and dialog boxes that may also be accessed by clicking on other dedicated buttons on the main Aura8ip control panel.

As with many Windows programs, there are multiple ways to access the menu trees – please feel free to go ahead and explore.

View Menu Items

About – Brings up the About box to indicate the Pro GUI software version.

File Paths – Brings up a list of program file paths. Here you can see the folders used to store all the files used by the Aura8ip.

Exit – Closes the entire Pro GUI (not just the dialog window).

Setup Menu Items

Set NIC – Allows you to choose which of your computer's NICs should be used by Aura8ip in order to communicate with your processors.

GUI Size – Brings up a number of screen sizes that you can choose from to customize your view of the processor settings.

Processor Labels – On this screen, you can rename the eight processors A through H to names that are more meaningful to you. You can use up to ten characters for each name.

Hardware Menu Items

Devices – Opens the Devices dialog box which allows the creation, editing, selection, and deletion of Wheatstone processor devices that are known to the Pro GUI.

On-Line Mode – Toggles between ONLINE and OFFLINE modes. In offline mode the Pro GUI is not connected to the processor but can still take presets and have their settings viewed.

Version – Displays the current software and firmware versions that are installed and running on the Aura8ip hardware, noting that the only time you can view the hardware versions from the Pro GUI is if it is actually connected and online to the hardware.

Presets Menu Items

The Presets menu tree may be accessed by right clicking anywhere on the main Aura8ip Control Panel.

Take – Performs the same action as clicking the Preset button.

Save – Performs the same action as clicking the Save button.

Library... – Performs the same action as clicking the Library button.

Appendix 1

Switch Configuration

Switch Configuration

The switches listed in this appendix are now designated end-of-life by Cisco. However, we have included the instructions for configuring these switches because many of our customers are still using them, and the configuration for the newer Cisco switches is very similar.

Wheatstone now recommends the Cisco Catalyst 9200 series for Core switches, and the 1000 series for Edge switches. For a detailed document on configuring these switches, email techsupport@wheatstone.com.

Cisco 2960G, 2960S, and 2960X Configuration for WheatNet-IP

Overview

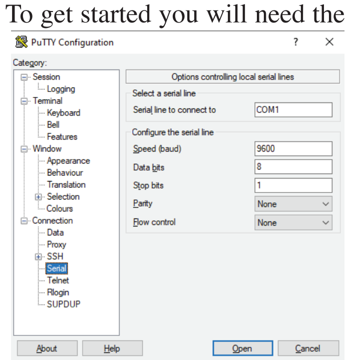
Let's take a look at what needs to be done to get your Cisco 2960 ready for the installation of your WheatNet-IP system. Properly configuring your switch allows you to take advantage of the "management" capabilities to control network traffic and allows the network to operate at its highest potential. This becomes necessary to prevent overloading the network as the system size increases.

In this setup process you will setup switch ports according to the type of device connecting to that port. You will be setting things like VLAN access, Trunking, Speed, etc. Each section below gives you the exact commands needed to get your WheatNet-IP network up running.

Below is a chart that gives you some information about the commands you will be using to complete the setup. This can be a quick reference for you as well:

Command	Purpose
Configure Terminal	Enter Global configuration mode on switch
Interface	Enter interface configuration mode
Switchport mode access	Configures the port as an access port
Switchport mode Trunk	Configures port for trunking to other switches
Switchport nonegotiate	Prevents DTP frames from being generated
Spanning-tree portfast	Enables portfast on the switch port
Show running-config	Show the current running configuration
Write memory	Writes the configuration to memory on the switch
IP igmp snooping querier	Enables IGMP querier
IP igmp snooping querier timer expiry	Set the length of time until the IGMP querier expires

This document will explain the initial configuration of the Cisco 2960 series switch. To get started you will need the blue console cable that came with your switch. Go ahead and connect the console cable to the serial port on your PC and the RJ-45 to the console port on the switch. If your PC is not equipped with a serial port you will need a USB to Serial converter.



If you do not have the blue Cisco console cable there is an alternative. Cisco is now shipping with a USB console port on most of the new models. You can download the USB driver needed from the Cisco download site. You will need to download the Cisco_usb-console_driver.

Next let's get your PC ready to communicate. You will need a terminal program such as Putty to finish this portion of the setup. Putty is an application which is free to download (this is not a Wheatstone application) that you can use in order to connect your computer to other remote systems. These systems include other switches, routers, other computers, and Telnet sites.

To get started, open Putty and start a new connection. Select the COM port you will be using and set up a terminal session using 9600 Baud, 8 bit, no Parity, and no Flow control.

For those who are familiar with the Cisco IOS you may wish to jump ahead to the commands. For the rest, keep reading and we'll walk you through it step by step. Along the way we'll even explain why we use the commands below so that you have some basic understanding of what you are doing. Hopefully you will walk away with some newfound knowledge.

Privileged EXEC Mode

Now that we are connected to the switch let's log in. When logging into a Cisco switch under the default configuration, you are in user EXEC mode (level 1). In EXEC mode, you have limited access to the status of the switch. However, you can't make any changes or view the running configuration file.

Because of these limitations, you need to type ***enable*** to get out of user EXEC mode. By default, typing ***enable*** takes you to "Privileged" EXEC mode (Level 15). In the Cisco IOS, this level is equivalent to having root privileges in UNIX or administrator privileges in Windows. In other words, you have full access to the switch.

Let's get started on the configuration of your switch. Type "***enable***" command at the prompt. When prompted, enter the password and press Enter again. If no password has been defined just press Enter.

NOTE: The command prompt now ends with "***#***" indicating you are now at the Privileged EXEC mode (Level 15).

Global Configuration Mode

To enter the IP address and Subnet Mask for the VLAN or configure the switch ports you must first enter the configuration mode. To enter the global configuration mode on the 2960 series switch type "**Config T**" and press Enter. This places the switch in Global configuration mode and will allow configuration from the terminal window for the selected interface. You should now have the **switch (config)#** prompt.

Configuring the VLAN Interface

A VLAN is a switched logical network that is segmented based on the function or application. VLANs are virtual LANs but have the same attributes as the physical LAN. VLANs allow a user to create a virtual broadcast domain in which traffic can be isolated to keep it from reaching unwanted destinations. Any switch port can belong to a VLAN, and unicast, broadcast, and multicast packets are forwarded only to those end stations assigned to that VLAN.

Now that you are in the Global configuration mode you need to select the interface that you would like to configure. We'll start with the default VLAN.

The switch will come with a default VLAN enabled. In the default configuration all ports on the switch have been assigned to VLAN1. The command below selects the default VLAN for configuration to segment network traffic on the switch. If you are adding an additional VLAN to existing hardware, substitute that VLAN number in place of 1.

Enter the following commands ("XXX" = the actual network IP address):

```
interface Vlan1
ip address 192.168.87.XXX 255.255.255.0
end
```

Let's look at what you just set up. By typing "interface Vlan1" you are entering the configuration for that VLAN. The "IP Address" command simply sets the IP address of the VLAN1 interface for remote management purposes. The IP address must be unique on the network.

IGMP Snooping Querier Configuration

By default, IGMP is enabled globally on the switch. To set up IGMP Snooping Querier on the switch you must be in the Global configuration mode. To enter the configuration mode once again type "**Config T**" and press Enter.

Enter the following commands:

```
ip igmp snooping querier
ip igmp snooping querier max-response-time 25
ip igmp snooping querier timer expiry 205
end
```

By default IGMP Snooping is globally enabled on the switch. It is enabled on VLANs by default. Global IGMP snooping takes precedent over VLAN IGMP Snooping. If globally disabled you cannot enable IGMP Snooping on a per VLAN basis.

The commands above simply enable the querier on the switch and set a few values for maximum response time and the expiration duration for the querier.

Configuring Gigabit Ports Connecting to WheatNet-IP I/O BLADEs and PC Drivers

Configuring the ports on the Cisco 2960 series switch is a key step in ensuring optimal performance of the Wheatnet-IP network. This section will guide you in the setup of each port used for WheatNet-IP I/O BLADEs.

Switch ports operate in one of three modes, dynamic, trunk, or access mode.

Switch ports connecting to Wheatstone IP devices must be in Access mode. Access mode places the port in static access mode and gives it access to the default VLAN. The switchport **nonegotiate** command disables the Dynamic Trunking Protocol and tells the port not to generate DTP frames.

To setup ports on the switch you must also be in the Global Configuration mode. To enter the configuration mode once again type "**Config T**" and press Enter.

Enter the following commands based on the OS versions of your switch:

- OS any version prior to version 15.0

```
Interface gig 0/x  (x=the Ethernet port being configured)
switchport mode access
switchport nonegotiate
switchport block multicast
no ip igmp snooping tcn flood
spanning-tree portfast
end
```

- OS any version after 15.0

```
Interface gig 0/x  (x=the Ethernet port being configured)
switchport mode access
switchport nonegotiate
no ip igmp snooping tcn flood
spanning-tree portfast
```

```
end
```

"

Ports on the 2960 series switch can be configured individually or in a "Range." If range is desired type

```
Interface range gig0/1-24
```

using the desire number of ports.

Configuring Gigabit Ports Connecting to WheatNet-IP Control Surfaces, GP Panels, and XY Controllers

Enter the following commands based on the OS versions of your switch:

- OS any version prior to version 15.0

```
Interface gig 0/x (x=the Ethernet port being configured)
switchport mode access
switchport nonegotiate
switchport block multicast
no ip igmp snooping tcn flood
spanning-tree portfast
end
```

- OS any version after 15.0

```
Interface gig 0/x (x=the Ethernet port being configured)
switchport mode access
switchport nonegotiate
no ip igmp snooping tcn flood
spanning-tree portfast
end
```

Ports on the 2960 series switch can be configured individually or in a "Range." If range is desired type

```
Interface range gig0/1-24
```

using the desired number of ports.

Configuring Ports for Linking to Other Network Switches

Trunk mode is used when connecting another switch to the port.

To set a specified port to trunk mode when connecting to another network switch the port needs to be set for Trunk mode. To setup Gigabit ports on the switch you must also be in the Global Configuration mode. To enter the configuration mode once again type "**Config T**" and press Enter.

Enter the following commands based on the OS versions of your switch:

- OS any version prior to version 15.0

```
Interface gig 0/x (x=the Ethernet port being configured)
switchport mode trunk
```

```
switchport nonegotiate
switchport block multicast
no ip igmp snooping tcn flood
end
```

- OS any version after 15.0

`Interface gig 0/x` (x=the Ethernet port being configured)

```
switchport mode trunk
switchport nonegotiate
no ip igmp snooping tcn flood
end
```

Checking and Saving the Switch Configuration

When you are done, check the switch configuration by typing the following command from the command prompt.

```
show running-config
```

Once you are sure you have the correct configuration you need to save it. You can save the configuration by typing one of the following commands:

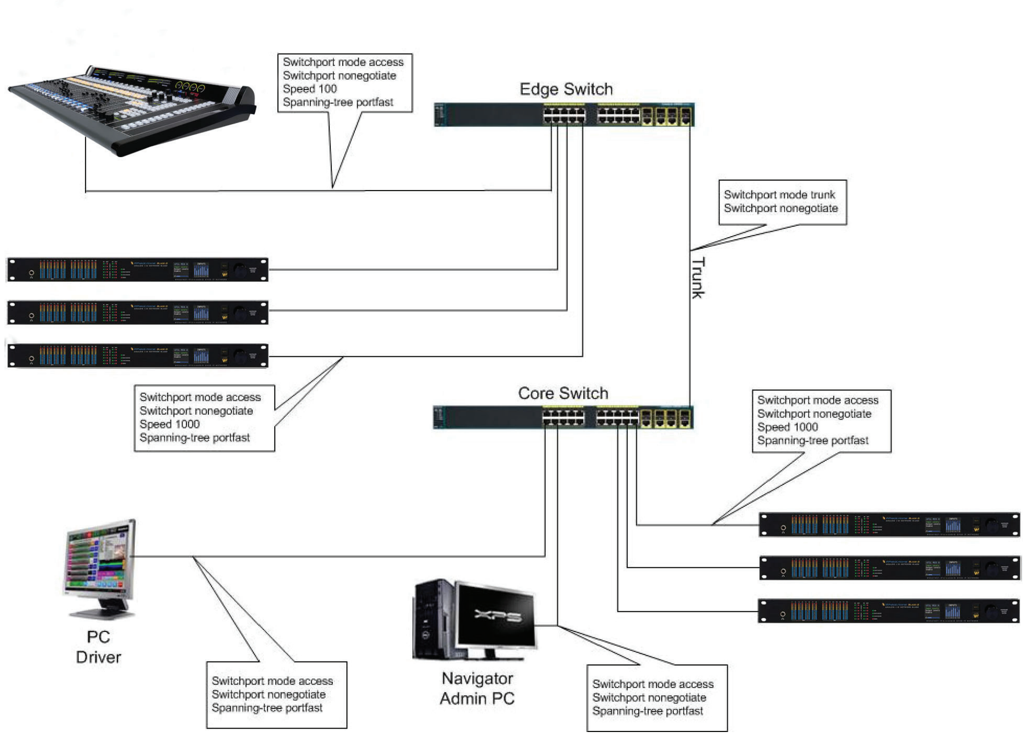
```
copy running-config startup-config
```

or

```
write memory
```

Below is a diagram that shows you what a typical configuration might look like.

Sample Switch Configuration



Cisco 3750G, 3560G, 3650, and 3850 Configuration for WheatNet-IP

Overview

Let's take a look at what needs to be done to get your Cisco Catalyst ready for the installation of your WheatNet-IP system. Properly configuring your switch allows you to take advantage of the "management" capabilities to control network traffic and allows the network to operate at its highest potential. This becomes necessary to prevent overloading the network as the system size increases.

In this setup process you will setup switch ports according to the type of device connecting to that port. You will be setting things like VLAN access, Trunking, Speed, etc. Each section below gives you the exact commands needed to get your WheatNet-IP network up running.

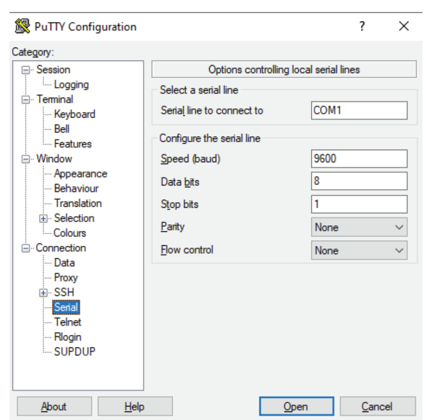
Below is a chart that gives you some information about the commands you will be using to complete the setup. This can be a quick reference for you as well:

Command	Purpose
Configure Terminal	Enter Global configuration mode on switch
Interface	Enter interface configuration mode
Switchport mode access	Configures the port as an access port
Switchport mode Trunk	Configures port for trunking to other switches
Switchport nonegotiate	Prevents DTP frames from being generated
Spanning-tree portfast	Enables portfast on the switch port
Show running-config	Show the current running configuration
Write memory	Writes the configuration to memory on the switch
IP igmp snooping querier	Enables IGMP querier
IP igmp snooping querier timer expiry	Set the length of time until the IGMP querier expires

This document will explain the initial configuration of the Cisco Catalyst switch. To get started you will need the blue console cable that came with your switch. Go ahead and connect the console cable to the serial port on your PC and the RJ-45 to the console port on the switch. If your PC is not equipped with a serial port you will need a USB to Serial converter.

If you do not have the blue Cisco console cable there is an alternative. Cisco is now shipping with a USB console port on most of the new models. You can download the USB driver needed from the Cisco download site. You will need to download the Cisco_usbconsole_driver.

Next let's get your PC ready to communicate. You will need a terminal program such as Putty to finish this portion of the setup. Putty is an application which is free to download (this is not a Wheatstone application) that you can use in order to connect your computer to other remote systems. These systems include other switches, routers, computers, and Telnet sites.



To get started, open Putty and start a new connection. Select the COM port you will be using and set up a terminal session using 9600 Baud, 8 bit, no Parity, and no Flow control.

For those who are familiar with the Cisco iOS you may wish to jump ahead to the commands. For the rest, keep reading and we'll walk you through it step by step.

Along the way we'll even explain why we use the commands below so that you have some basic understanding of what you are doing. Hopefully you will walk away with some new found knowledge.

Privileged EXEC Mode

Now that we are connected to the switch let's login. When logging into a Cisco switch under the default configuration, you are in user EXEC mode (level 1). In EXEC mode, you have limited access to the status of the switch. However, you can't make any changes or view the running configuration file.

Because of these limitations, you need to type ***enable*** to get out of user EXEC mode. By default, typing ***enable*** takes you to "Privileged" EXEC mode (Level 15). In the Cisco IOS, this level is equivalent to having root privileges in UNIX or administrator privileges in Windows. In other words, you have full access to the switch.

Let's get started on the configuration of your switch. Type "***enable***" command at the prompt. When prompted, enter the password and press Enter again. If no password has been defined just press Enter.

NOTE: The command prompt now ends with "***#***" indicating you are now at the Privileged EXEC mode (Level 15).

Global Configuration Mode

To enter the IP address and Subnet Mask for the VLAN or configure the switch ports you must first enter the configuration mode. To enter the global configuration mode on the Cisco Catalyst type "**Config T**" and press enter. This places the switch in Global configuration mode and will allow configuration from the terminal window for the selected interface. You should now have the **switch (config)#** prompt.

Configuring the VLAN Interface

A VLAN is a switched logical network that is segmented based on the function or application. VLANs are virtual LANs but have the same attributes as the physical LAN. VLANs allow a user to create a virtual broadcast domain in which traffic can be isolated to keep it from reaching unwanted destinations. Any switch port can belong to a VLAN, and unicast, broadcast, and multicast packets are forwarded only to those end stations assigned to that VLAN.

Now that you are in the Global configuration mode you need to select the interface that you would like to configure. We'll start with the default VLAN.

The switch will come with a default VLAN enabled. In the default configuration all ports on the switch have been assigned to VLAN1. The command below selects the default VLAN for configuration to segment network traffic on the switch. If you are adding an additional VLAN to existing hardware, substitute that VLAN number in place of 1.

Enter the following commands ("XXX" = the actual network IP address):

```
interface Vlan1
ip address 192.168.87.XXX 255.255.255.0
end
```

Let's look at what you just set up. By typing "interface Vlan1" you are entering the configuration for that VLAN. The "IP Address" Command simply sets the IP address of the VLAN1 interface for remote management purposes. The IP address must be unique on the network.

IGMP Snooping Querier Configuration

By default, IGMP is enabled globally on the switch. To set up IGMP Snooping Querier on the switch you must be in the Global configuration mode. To enter the configuration mode once again type "**Config T**" and press Enter.

Enter the following commands:

```
ip igmp snooping querier
ip igmp snooping querier max-response-time 25
ip igmp snooping querier timer expiry 205
```

```
end
```

By default IGMP Snooping is globally enabled on the switch. It is enabled on VLANs by default. Global IGMP snooping takes precedent over VLAN IGMP Snooping. If globally disabled you cannot enable IGMP Snooping on a per VLAN basis.

The commands above simply enable the querier on the switch and set a few values for maximum response time and the expiration duration for the querier.

Configuring Gigabit Ports Connecting to WheatNet-IP I/O BLADEs and PC Drivers

Configuring the ports on the Cisco Catalyst is a key step in ensuring optimal performance of the WheatNet-IP network. This section will guide you in the setup of each port used for WheatNet-IP I/O BLADEs.

Switch ports operate in one of three modes, dynamic, trunk, or access mode.

Switch ports connecting to Wheatstone IP devices must be in Access mode. Access mode places the port in static access mode and gives it access to the default VLAN. The **switchport nonegotiate** command disables the Dynamic Trunking Protocol and tells the port not to generate DTP frames.

To set up ports on the switch you must also be in the Global Configuration mode. To enter the configuration mode once again type "**Config T**" and press Enter.

Enter the following commands based on the OS versions of your switch:

- OS any version prior to version 15.0

```
Interface gig 0/x (x=the Ethernet port being configured)
switchport mode access
switchport nonegotiate
switchport block multicast
no ip igmp snooping tcn flood
spanning-tree portfast
end
```

- OS any version after 15.0

```
Interface gig 0/x (x=the Ethernet port being configured)
switchport mode access
switchport nonegotiate
no ip igmp snooping tcn flood
spanning-tree portfast
end
```

"

Ports on the Cisco Catalyst switches can be configured individually or in a "Range." If range is desired type

```
Interface range gig1/0/1-24
```

using the desire number of ports.

Configuring Gigabit Ports Connecting to Wheatnet IP Control Surfaces, GP Panels, and XY Controllers

Enter the following commands based on the OS versions of your switch:

- OS any version prior to version 15.0

```
Interface gig 0/x
```
(x=the Ethernet port being configured)

```
switchport mode access
switchport nonegotiate
switchport block multicast
no ip igmp snooping tcn flood
spanning-tree portfast
end
```

- OS any version after 15.0

```
Interface gig 0/x
```
(x=the Ethernet port being configured)

```
switchport mode access
switchport nonegotiate
no ip igmp snooping tcn flood
spanning-tree portfast
end
```

Ports on the Cisco Catalyst switches can be configured individually or in a “Range.” If range is desired type

```
Interface range gig0/1-24
```

using the desired number of ports.

Configuring Ports for Linking to Other Network Switches

Trunk mode is used when connecting another switch to the port.

To set a specified port to trunk mode when connecting to another network switch the port needs to be set for Trunk mode. To set up Gigabit ports on the switch you must also be in the Global Configuration mode. To enter the configuration mode once again type “**Config T**” and press Enter.

Enter the following commands based on the OS versions of your switch:

- OS any version prior to version 15.0

```
Interface gig 0/x
```
(x=the Ethernet port being configured)

```
switchport trunk encapsulation dot1q
```
(Only 3750 and 3560)

```
switchport mode trunk
switchport nonegotiate
switchport block multicast
no ip igmp snooping tcn flood
end
```

- OS any version after 15.0

    `Interface gig 0/x` (x=the Ethernet port being configured)

    `switchport trunk encapsulation dot1q` (Only 3750 and 3560)

    `switchport mode trunk`

    `switchport nonegotiate`

    `no ip igmp snooping tcn flood`

    `end`

Checking and Saving the Switch Configuration

When you are done, check the switch configuration by typing the following command from the command prompt.

```
show running-config
```

Once you are sure you have the correct configuration you need to save it. You can save the configuration by typing one of the following commands:

```
copy running-config startup-config
```

or

```
write memory
```

Cisco 9200x/9300x/C1000 Configuration for WheatNet-IP

Overview

Let's take a look at what needs to be done to get your Cisco 9200/9300/C1000 ready for the installation of your WheatNet-IP system. Properly configuring your switch allows you to take advantage of the "management" capabilities to control network traffic and allows the network to operate at its highest potential. This becomes necessary to prevent overloading the network as the system size increases. In this setup process you will setup switch ports according to the type of device connecting to that port. You will be setting things like VLAN access, Trunking, Speed, etc. Each section below gives you the exact commands needed to get your WheatNet-IP network up running.

Below is a chart that gives you some information about the commands you will be using to complete the setup. This can be a quick reference for you as well:

Command	Purpose
Configure Terminal	Enter Global configuration mode on switch
Interface	Enter interface configuration mode
Switchport mode access	Configures the port as an access port
Switchport mode Trunk	Configures port for trunking to other switches
Switchport nonegotiate	Prevents DTP frames from being generated
Spanning-tree portfast	Enables portfast on the switch port
Show running-config	Show the current running configuration
Write memory	Writes the configuration to memory on the switch
IP igmp snooping querier	Enables IGMP querier
IP igmp snooping querier timer expiry	Set the length of time until the IGMP querier expires

This document will explain the initial configuration of the Cisco 9200/9300/C1000 series switch. To get started you will need the blue console cable that came with your switch. Go ahead and connect the console cable to the serial port on your PC and the RJ-45 to the console port on the switch. If your PC is not equipped with a serial port you will need a USB to Serial converter. There are also console cables with a built-in serial port available from Amazon and other sellers.

If you do not have the blue Cisco console cable there is an alternative. Cisco is now shipping with a USB console port on most of the new models. You can download the USB driver needed from the Cisco download site. You will need to download the Cisco_usbconsole_driver.

Next let's get your PC ready to communicate. You will need a terminal program such as PuTTY to finish this portion of the setup. PuTTY is an application you can use in order to connect your computer to other remote systems. These systems include other switches, routers, other computers, and Telnet sites.

To get started, open PuTTY and start a new connection. The terminal session should be setup using 9600 Baud, 8 bit, no Parity, and no Flow control.

For those who are familiar with the Cisco IOS you may wish to jump ahead to the commands. For the rest, keep reading and we'll walk you through it step by step.

Along the way we'll even explain why we use the commands below so that you have some basic understanding of what you are doing. Hopefully you will walk away with some new found knowledge.

Privileged EXEC Mode

Now that we are connected to the switch let's log in. When logging into a Cisco switch under the default configuration, you are in user EXEC mode (level 1).

In EXEC mode, you have limited access to the status of the switch. However, you can't make any changes or view the running configuration file. Because of these limitations, you need to type enable to get out of user EXEC mode. By default, typing enable takes you to "Privileged" EXEC mode (Level 15). In the Cisco IOS, this level is equivalent to having root privileges in Linux/UNIX or administrator privileges in Windows. In other words, you have full access to the switch.

Let's get started on the configuration of your switch. Type "enable" command at the prompt. When prompted, enter the password and press Enter again. If no password has been defined just press Enter.

NOTE: The command prompt now ends with "#" indicating you are now at the Privileged EXEC mode (Level 15).

Global Configuration Mode

To enter the IP address and Subnet Mask for the VLAN or configure the switch ports you must first enter the configuration mode. To enter the global configuration mode on this series of switch type "Config T" and press Enter. This places the switch in Global configuration mode and will allow configuration from the terminal window for the selected interface. You should now have the switch (config)# prompt.

Configuring the VLAN Interface

A VLAN is a switched logical network that is segmented based on the function or application. VLANs are virtual LANs but have the same attributes as the physical LAN. VLANs allow a user to create a virtual broadcast domain in which traffic can be isolated to keep it from reaching unwanted destinations. Any switch port can belong to a VLAN, and unicast, broadcast, and multicast packets are forwarded only to those end stations assigned to that VLAN.

Now that you are in the Global configuration mode you need to select the interface that you would like to configure. We'll start with the default VLAN.

The switch will come with a default VLAN enabled. In the default configuration all ports on the switch have been assigned to VLAN1. The command below selects the default VLAN for configuration to segment network traffic on the switch. If you are adding an additional VLAN to existing hardware, substitute that VLAN number in place of 1.

Enter the following commands ("XXX" = the actual network IP address):

```
interface Vlan1
ip address 192.168.87.XXX 255.255.255.0
end
```

Let's look at what you just set up. By typing "interface Vlan1" you are entering the configuration for that VLAN. The "IP Address" command simply sets the IP address of the VLAN1 interface for remote management purposes. The IP address must be unique on the network.

IGMP Snooping Querier Configuration

By default, IGMP is enabled globally on the switch. To set up IGMP Snooping Querier on the switch you must be in the Global configuration mode. To enter the configuration mode once again type "Config T" and press Enter.

Enter the following commands:

```
ip igmp snooping querier
ip igmp snooping querier max-response-time 25
ip igmp snooping querier timer expiry 205
end
```

By default IGMP Snooping is globally enabled on the switch. It is also enabled on VLANs by default. Global IGMP snooping takes precedent over VLAN IGMP Snooping. If globally disabled you cannot enable IGMP Snooping on a per VLAN basis.

The commands above simply enable the querier on the switch and set a few values for maximum response time and the expiration duration for the querier.

Configuring Gigabit Ports Connecting to WheatNet-IP I/O BLADEs, Audioarts DMX, all IP consoles, and PC Drivers

Configuring the ports on the Cisco 9200/9300/C1000 series switch is a key step in ensuring optimal performance of the Wheatnet-IP network. This section will guide you in the setup of each port used for WheatNet-IP I/O BLADE-3s or BLADE-4s.

Switch ports operate in one of three modes, dynamic, trunk, or access mode.

Switch ports connecting to Wheatstone IP devices must be in Access mode. Access mode places the port in static access mode and gives it access to the default VLAN. The `switchport nonegotiate` command disables the Dynamic Trunking Protocol and tells the port not to generate DTP frames.

To set up ports on the switch you must also be in the Global Configuration mode. To enter the configuration mode once again type " Config T" and press Enter.

Enter the following commands:

```
Interface gig 0/x (x=the Ethernet port being configured)
switchport mode access
switchport nonegotiate
no ip igmp snooping tcn flood
spanning-tree portfast
end
```

Ports on the 9200/9300 series switch can be configured individually or in a“Range.” If range is desired type `Interface range GigabitEthernet0/1-24` using the desired number of ports.

Configuring Ports for Linking to Other Network Switches

Trunk mode is used when connecting another switch to the port. You cannot trunk a C1000 model switch to another C1000 switch. A new feature of this Cisco switch model prevents this from working properly. If you desire to use a C1000 as both a core and edge switch, please consult with Wheatstone Tech Support first to see if Cisco has provided a fix or workaround for this problem.

To set a specified port to trunk mode when connecting to another managed network switch the port needs to be set for Trunk mode. To setup Gigabit ports on the switch you must also be in the Global Configuration mode. To enter the configuration mode once again type “ Config T” and press Enter.Enter the following commands based on the OS versions of your switch:

```
Interface gig 0/x (x=the Ethernet port being configured)

switchport mode trunk

switchport nonegotiate

no ip igmp snooping tcn flood

end
```

Checking and Saving the Switch Configuration

When you are done, check the switch configuration by typing the following command from the command prompt.

```
show running-config
```

Once you are sure you have the correct configuration you need to save it. You can save the configuration by typing one of the following commands:

```
copy running-config startup-config
```

or

```
write memory
```

Appendix 2

Wheatnet-IP Logic

WheatNet-IP Logic

As described in this manual, the WheatNet-IP system provides for certain logic (i.e. non audio) related functions and controls. The messaging structure for these functions is entirely contained within the WheatNet-IP hardware itself, and distributed over the same LAN connection as is the audio. No PCs are required, other than to use the WheatNet-IP Navigator GUI application to make the configurations and programming needed.

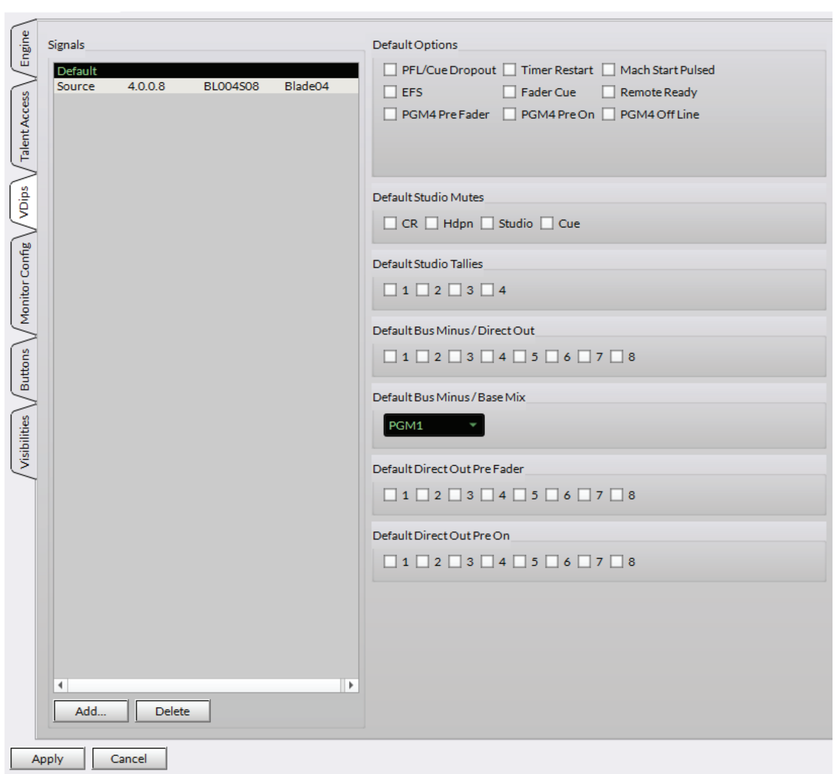
There are many different logic functions and controls available in the WheatNet-IP system; these can be sorted into four different categories. This appendix will provide specific examples in t hese categories to demonstrate the category as well as provide step by step instructions on how to program the function with the Navigator GUI software.

Category 1: Direct Logic

This type of logic function acts directly on and controls the operation of certain control surface features. Direct logic operation is independent of any BLADE and/or physical logic ports. Direct logic functions are available on the control surfaces (Evolution series, LX-24), and are further classed as to control surface functions and programmable buttons.

VDip Function

Direct logic control surface functions are programmed on the control surface itself under the Options>VDIP Settings window. These VDIP (Virtual Dip Switch) functions affect how the control surface works, and can be set to act either globally, for all input sources, or differently depending on the source. VDIP settings for surfaces such as the LX-24 and E Series are accessed on the attached monitor. Newer surfaces including the DMX, LXE, L-and IP-Series, GSX, Tekton32 and Strata VDIP settings are accessed through the associated Surface Setup GUI program for that surface.



The following functions are available (may vary according to the surface):

PFL/Cue Drop Out: Any fader channel that has been placed in Cue will automatically be removed from Cue when the channel is turned ON.

Timer Restart: Forces a return to 0 and start counting on the Timer display when a fader channel is turned ON.

Machine Start Pulsed: When a signal is assigned to a fader, turning the fader ON generates a Machine Start logic that can be used to start a machine, such a CD player.

EFS: Moving a fader up from full off will automatically trigger a START logic command.

Fader Cue: Pulling a fader all the way down automatically puts the channel into Cue.

Remote Ready: Forces the fader channel OFF indicator to be driven by an external READY logic signal.

Program 4 Pre Fader: Sets the PGM D bus to be pre fader.

Program 4 Pre ON: Sets the PGM D bus to be ON independent of the ON/OFF switch.

Program 4 Off Line: Determines what will be heard at the fader's Bus Minus output when the fader is OFF.

Studio 1 Mute: Mutes the studio 1 output when the fader channel is turned ON.

Studio 2 Mute: Mutes the studio 2 output when the fader channel is turned ON.

HP Mute: Mutes the headphone output when the fader channel is turned ON.

CR Mute: Mutes the control room output when the fader channel is turned ON.

Cue Mute: Mutes the cue output when the fader channel is turned ON.

Studio 1 Tally: Activates a tally 1 signal when the fader channel is turned ON.

Studio 2 Tally: Activates a tally 2 signal when the fader channel is turned ON.

Studio 3 Tally: Activates a tally 3 signal when the fader channel is turned ON.

Studio 4 Tally: Activates a tally 4 signal when the fader channel is turned ON.

Default Bus Minus Direct Out: For each signal, determines if the Bus Minus output is a mix-minus of the selected BUS MINUS SOURCE (unchecked) or a Direct Output (checked). On signals where the BUS MINUS DIRECT OUT box is checked, the PGM 4 Off Line box (above) will have no effect.

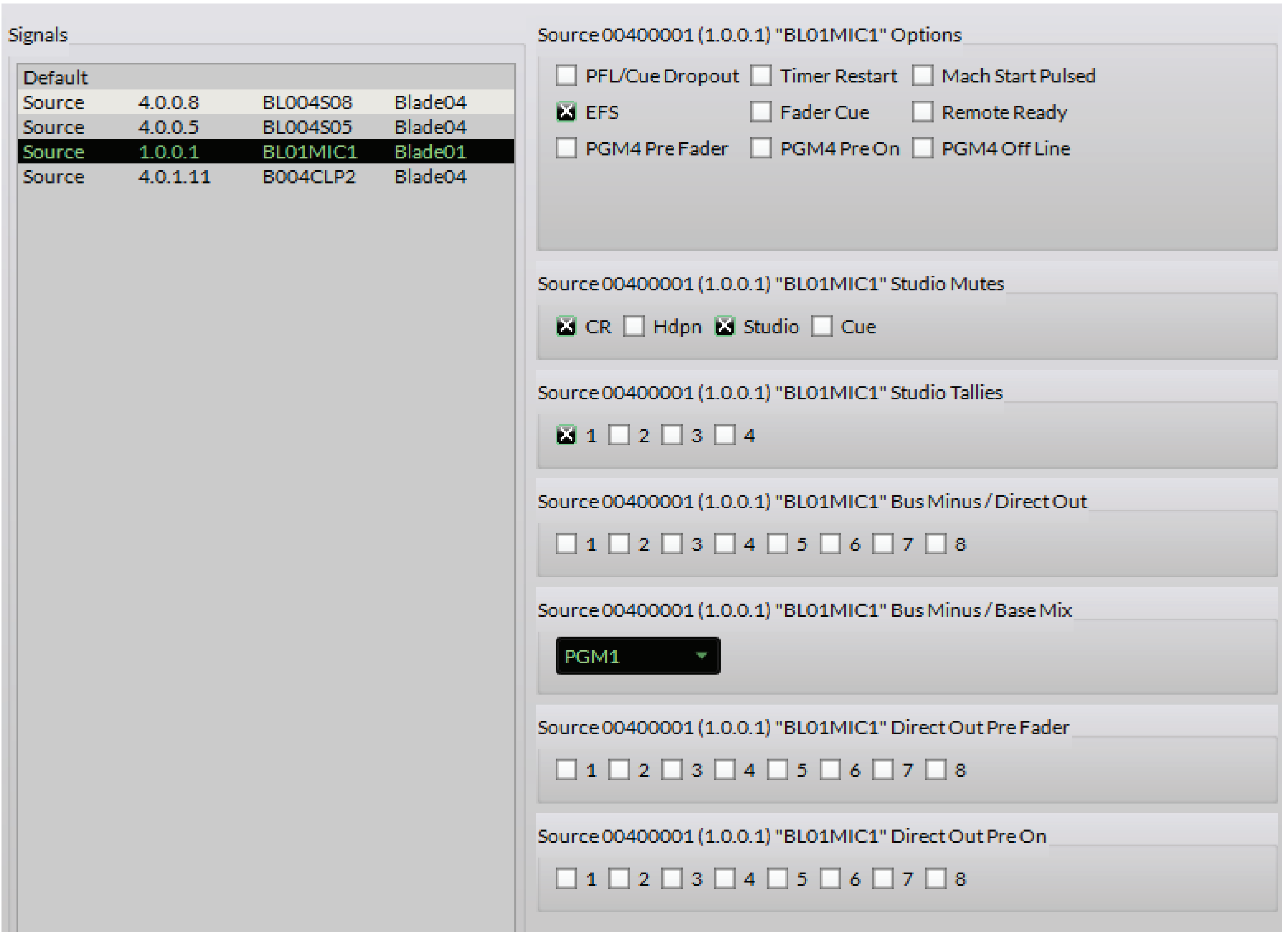
Default Bus Minus/Base Mix: For each signal, determines which bus the Bus Minus output is a mix-minus of. Any of the four PGM busses can be selected as Bus Minus Source. On larger surfaces, AUX and MXM (mix minus) busses can also be selected as the Base Mix.

As a programming example, let's use the Studio Mute function. This function is commonly used to mute the control room speaker outputs while the talent microphones are turned ON to avoid feedback from occurring if the amplified microphone signal is passed out the speakers and then picked back up by the microphone. The intention is that whenever a microphone channel that happens to be located close to the control room speakers is turned ON, the speakers are automatically turned OFF to prevent the feedback. Once the microphone channel is turned OFF the control room speakers are automatically turned back ON.

To enable this function, first identify the microphone source(s) that is(are) located near the control room speakers. These are the source signals that could cause feedback. In this situation you would normally want this logic action (mute the speakers) to happen only with these particular source signals.

Open the VDIP Settings form on the attached surface screen. This menu can be password protected so you must have access privileges before you can modify these settings. If you have a surface with a dedicated Surface Setup GUI application, access VDIP settings on the Device Properties or User Options tabs as appropriate.

Once the VDIP Settings form is open, select the audio source (the mic signal) you wish to activate the muting. The manner of selection varies depending on whether you are using a surface's built-in GUI screen or a GUI application. If you are using a GUI, you may not see any source sources listed except “Default” when you first open the page. Any settings you apply to the “Defualt” signal will apply to every source you use with that surface. If this is not what you desire, use the **Add** button to add the sourc(s) you wish to modify. The source name you are working with should appear highlighted in the SIGNAL window like BLo1MIC1 in the graphic below:

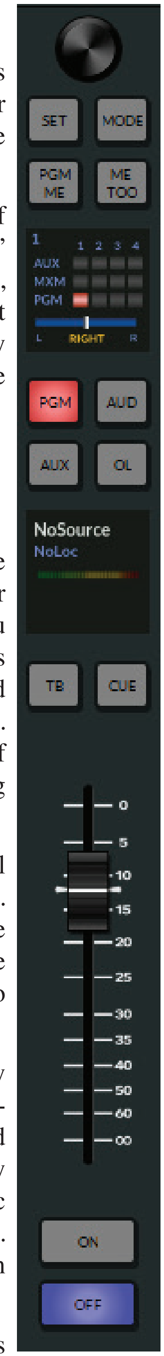


Click on the CR Mute check box and hit the APPLY button. The control surface has now been programmed to automatically mute the control room output signal whenever any fader channel that has the mic signal routed to it is turned ON. A caveat: this feature does not actually mute the speakers, but only mutes the control room output signal. If, as is normal, you have connected the speakers to an amplifier whose input is connected to the control room output signal, this feature will work as expected; however, if for some reason the speakers are connected to some other output signal, they will not be muted.

Repeat the process for any other mic signals that could cause feedback with the control room speakers.

In similar fashion you can activate any of the other VDIP functions as you see fit. Some of these, such as the mutes and tallys, may need to be set on a per signal basis, while others, such as Timer Restart or PFL/Cue Drop Out, are better suited to the default Global (i.e. for any signal) setting.

Programmable Buttons



Wheatstone control surfaces can be equipped with a number of switches whose operational functions can be programmed by the user. On our legacy consoles, these are located in specific locations such as fader panels and monitor panels and may only be used for specific functions. A full description of how to set these buttons up is available in our BLADE-3 manual.

On many of our newer console surfaces, the programmable buttons can each support a wide variety of functions. The LXE fader panel pictures had two programmable buttons labeled “PFM ME” and “ME TOO.” Using the LXE Surface GUI, these buttons can be programmed as signal SEND or Bus TAKE functions, to TAKe events, to display EQ and Dynamics settings, to put EQ or Dynamics In or Out. They can be set up as scripted buttons (using the LXE’s built-in script engine) or as Spare Buttons that can be used by any other device in your Wheatnet network. And that’s just the beginning. The LXE programmable buttons are versatile and functional.

Category 2: Audio Associated Logic

There are many logic functions that are associated with or tied to specific audio signals. You may have a START or a STOP logic function that associates with a specific CD player or Automation machine, or ON and OFF logic functions that associate with a control surface fader channel. In the good old days you would have to wire a multi-conductor control cable from the logic ports on the machine to the logic ports on your console. Once you were done, those logic connections would only work for that one machine and one fader channel; if you patched your audio to a different channel, the logic wouldn’t work right anymore. For this reason (and to make it easier to set it all up in the first place), general practice was to wire all of these connections up to punchblocks so connections could be changed via punch downs rather than rewiring complicated multi-pin connectors.

It’s much easier with the WheatNet-IP system. First of all, many devices (including Wheatstone control surfaces) now support logic control directly over Ethernet connections, so separate logic wiring isn’t needed. For that equipment that still requires physical logic connections, WheatNet-IP devices provide 12 available logic connections on every BLADE, and the system provides for audio associated logic. That means the only physical wiring you’ll need for these devices is a direct connection from the device logic connector to the RJ-45 jacks on a BLADE.

Here’s how it works. Each audio signal within the WheatNet-IP system – that’s every source and every destination including control surfaces – can have up to 12 different logic functions (from a list of 500 different types) associated with it. Whenever an audio crosspoint connection is made between a source and a destination, the system looks for matching logic functions (for example START and STOP). For every matching function, a virtual logic connection is established such that the logic input will control the logic output. If the audio connection is changed, the system looks for matching functions in the new connection. In this manner the logic functions are associated with or attached to the audio devices, and hence follow with whatever audio connections are made.

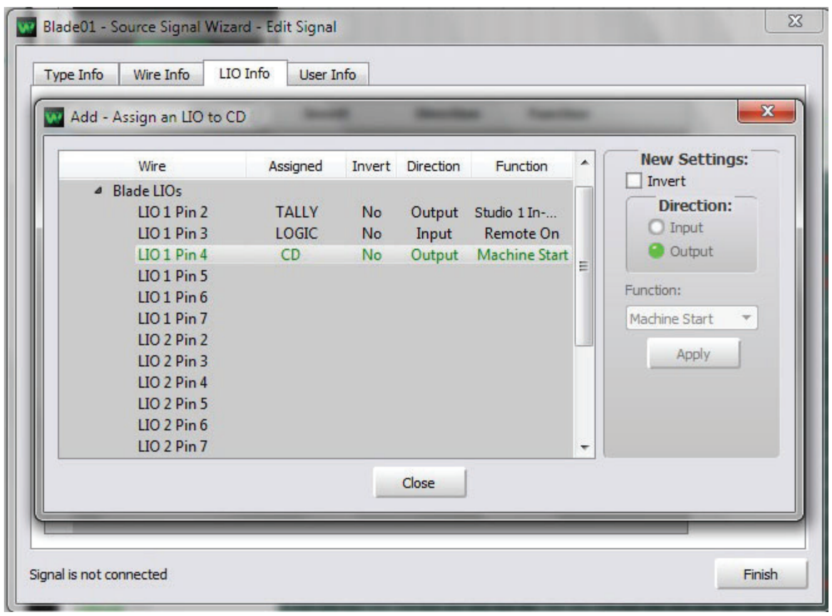
This makes it easy to enable complex logic functionality without a lot of physical wiring, and minimizes the need for punchblocks or other cross connect and fan out wiring devices.

For an example, let’s set up our system so that a control surface ON button will start a Denon DNC620 CD player. This machine has a D-sub 25 logic connector, with a START function located on pin #9 and Command Common located on pin #23. A momentary connection between pins 9 and 23 will cause the machine to begin playback. Let’s assume that the CD player is located in our Air studio, which has an LX-24 control surface and 88cbe console BLADE #1. We’ll say that the CD’s stereo audio output is connected to stereo input 7 on BLADE #1 and we have given this source signal the obvious name “CD1.” Let’s further assume that we have already used the first two logic ports connection on this BLADE, so we want to use the therd logic port connection, pin #4, to START the DNC620. Your system will likely have different BLADE and port numbers than these in the example; just substitute your ID #s as necessary.

First we need to wire the logic ports, connecting pin #4 and #1 of the first logic connector on BLADE #1 to pins #9 and #23 respectively on the DB-25 connector of the DNC620 machine. That's all the physical wiring we will need to do for this function.

In the WheatNet-IP Navigator GUI, we need to locate the audio signal that represents the CD audio; that is BL05S07 which we have subsequently named "CD." On the crosspoint grid we can search until we see the source signals for BLADE #1, and then locate "CD."

Right click on the source signal name "CD" which opens the signal edit window and choose "Modify Signal..." from the popup. Click on the LIO Info tab of the Source Signal Wizard to open the LIO info view. Click on the *Add* button to open the "Assign an LIO to CD" window. Click and select pin 4. In the Direction: box choose "Output" as we want to create a logic output to fire the Denon machine. Finally, in the Function: window scroll down and select "Machine Start". This is the all-important function that the system will attempt to match up to create our virtual logic connection. It doesn't matter what the function name actually is, it's only necessary for there to be a match on the destination side. It makes sense to use the function Machine Start, however, one, because it's a clear, easily understood name, and two, more importantly, the control surface automatically has a Machine Start function mapped on each fader. Click *Apply* and your LIO tab should look like this.



Click *Close* to close the Edit window. Then click *Finish* to exit the Source Signal Wizard. In this fashion, you can map up to 12 different logic functions with each audio signal. Notice also, that you could have mapped this function to a physical logic port in a different BLADE by using the signal tree on the left side of the window. This feature is very useful when you need more than the 12 physical logic ports in the BLADE; just map the logic signals onto another BLADE and wire your logic connections to it. For audio associated logic, the audio signal and the physical logic port can be in different BLADEs.

A further note about logic functions: Just because we have used the Machine Start function here doesn't mean it's all used up and can't be used elsewhere; the complete set of over 500 functions are available for every signal, so you can use Machine Start over and over again. In fact that's what makes audio associated logic so powerful – any signal that has the Machine Start function defined will automatically create the virtual logic connection anytime it is cross connected to any destination signal (say a fader channel) that also has the Machine Start function defined. Just as you need only the one physical wire to connect to the machine logic connector, you need only the one Machine Start function definition to allow any channel of any surface anywhere in the system to exercise Machine Start logic control of the Denon.

To continue with the example: we've wired up the logic connection to the machine and mapped and defined the Machine Start logic function. Let's move over to our control surface and pick a fader channel, say fader #3. Check the source name display above the fader indicating which audio source is currently connected to the destination Fader 3 of the control surface. Make sure it is not the Denon machine. Pushing the channel ON button will turn the fader channel on, but will do nothing as far as the Denon machine is concerned.

In the WheatNet-IP Navigator GUI, locate the destination signal for fader 3 of the control surface and right click on it and choose modify signal to get to the LIO info tab for this signal. You will notice that there is already defined the logic function Machine Start, among others. For future reference, you might want to make note of all of the functions used. By the way, this information is also visible in the Details Pane. Close the window and go back to the crosspoint grid.

Make an audio connection between the source signal “CD1” (the Denon audio signal) and the destination Fader 3 on your control surface. You can use the crosspoint grid, or use the source selector knob on the control surface; it doesn’t matter as long as you make the connection.

Now turn on fader channel #3 and the CD player will start playing! Manually STOP the CD player by pressing its front panel switch. Break the audio connection between the CD player and fader 3 and make a new audio connection between “CD1” and fader #5 and turn that channel on. The CD player STARTs playing audio again, this time over fader #5. This is the power of associated logic; a single physical connection can provide transparent system-wide logic functionality.

You’ll notice that turning the fader channel OFF did not stop the Denon machine; that’s why you had to do it manually. This is because we have only defined the Machine Start function. We will leave the definition of the STOP function as an exercise. Remember, each audio signal can have up to 12 associated logic functions, so there’s plenty of room for STARTs and STOPs and ON TALLYs, etc.

Many of the logic functions needed in a typical radio environment are associated with audio signals. You’ll find the associated logic functionality of the WheatNet-IP system very useful in these situations.

Logic Function Definitions: A large number of function names are defined in the WheatNet-IP system. The functions available at the time of this writing are shown in groups 1 through 8 below, along with descriptions of where and how they are used.

1. These functions are used with audio associated logic. The audio source they are associated with is expected to connect to a surface fader (example: *LXIn01*), which will have a matching pre-programmed function.

Machine Start – Logic output used to start a machine, such as a CD player or Music Playout System channel, when a surface fader is turned on – by default the **Machine Start** function is a latched signal, but can be made to provide a pulse by selecting the *Machine Start Pulsed* VDip option for the associated audio signal in the control surface VDip settings (see the manual for the control surface type you are using)

Machine Stop – Logic output used to stop a machine, such as a CD player, when a surface fader is turned off

Ready LED – Logic input used to control the lighting of the OFF button on the fader to advise the operator of a condition such as a CD player being cued up and ready to play – the machine usually provides an alternating on and off signal so that the OFF button flashes on and off

On Tally – Logic output used to provide a tally of the fader’s ON button to a remote location

Off Tally – Logic output used to provide a tally of the fader’s OFF button to a remote location

Remote On – Logic input used to turn the fader on from a remote location

Remote Off – Logic input used to turn the fader off from a remote location

Cough – Logic input used to unassign the fader from its output bus while a switch at a remote location is pressed, allowing talent at a microphone the chance to cough (or make some other sound) without it being heard on air

Talk Back – Logic input used to assign the fader to the surface cue audio while a switch at a remote location is pressed, so talent at a microphone can talk directly to the board operator

Some systems may have additional built-in functions.

2. These functions are programmed on logic-only destinations to control the timer on a surface. The logic-only destination must be routed to the surface source signal (example: *LXTIMER* on an LX-24) that has the timer logic pre-programmed on it.

Start Timer – Logic input to start a surface timer from a remote location

Stop Timer – Logic input to stop a surface timer from a remote location

Reset Timer – Logic input to reset (set to zero) a surface timer from a remote location

Hold Timer – Logic input to hold a surface timer at its current setting from a remote location.

3. These functions are programmed on logic-only destinations to interface with the Silence Detect functions. The logic-only destination must be routed to the logic signal that is automatically created when an output is enabled for Silence Detect. See the section on Silence Detect starting on page 5-65 of this manual for more details.

SDet Failure – Logic output to indicate when an output set for Silence Detect is in a failed state; that is, when the primary source fails to provide audio to that output

SDet Mux Pos – Logic output to indicate when an output set for Silence Detect is using its backup audio source

SDet Force Pri – Logic input to force an output with Silence Detect enabled to its primary source

SDet Force Sec – Logic input to force an output with Silence Detect enabled to its backup source.

4. These functions are currently undefined.

Take Preset n (where *n* = any integer between 1 and 10 inclusive).

5. These functions are programmed on logic-only destinations to indicate when certain sources on the surface have their fader on. The logic-only destination must be routed to the surface source signal (example: *LXTALLY* on an LX-24) that has the tally logic pre-programmed on it. Sources that will trigger the surface tallies are set in the surface VDip settings (see the manual for the control surface type you are using).

Studio *n* In-Use (where *n* = any integer between 1 and 12 inclusive) – Logic output – the numbers 1, 2, 3, and 4 correspond to tallies 1, 2, 3, and 4, respectively – use of the remaining values for *n* is currently undefined.

6. These functions are programmed on logic-only destinations to use with programmable (spare) buttons on a surface. The logic-only destination must be routed to the surface source signal that has the logic for the desired spare button pre-programmed on it. On an LX-24, for example, there are 14 such sources, named (by default) *Spare1*, *Spare2*, and so on, through *Spare14*. Other surfaces may have fewer buttons, and thus fewer sources.

Switch *n* (where *n* = any integer between 1 and 14 inclusive) – Logic output to read a spare button. No matter which spare button is used, the function must be **Switch 1**; use of the remaining values for *n* is currently undefined.

Switch LED *n* (where *n* = any integer between 1 and 14 inclusive) – Logic input to light the LED in a spare button. No matter which spare button is being lit, the function must be **Switch LED 1**; use of the remaining values for n is currently undefined.

7. **AES Error n** (*n = 1-8*) – For this logic function to work you must click the check box *Enable AES Detection* on the Source Signal Wizard window. This logic output will give a closure if you lose your AES reference on that source.

8. These functions are by design undefined, to be used in any manner desired. They may be associated with audio signals or programmed on logic-only signals as needed, and may be used with input or output logic as required. Keep in mind the master rules of system logic: (1) a logic input must connect to a logic output; and (2) a common function name must be used at both ends of a logic connection.

User *n* (where *n* = any integer between 1 and 500 inclusive).

Category 3: Discrete Logic

A third class of logic functions available in WheatNet-IP systems is discrete logic. These are logic functions that work on their own, with no specific association to any audio signals. Typical of these is a situation where a button press in one area lights a light in another, or a satellite receiver detects a tone and closes a relay that is to be used to start a record machine. The WheatNet-IP system can handle this type of logic function very easily. As in the associated logic case, you need only to wire the specific logic connections on your devices to the logic ports on any conveniently located BLADE. All of the control communications between BLADE 3s happens over the LAN connection.

As an example let's take the case of a profanity delay DUMP control. We'll assume we have a switch panel located by our talent microphone and we have an airTools-6000 Delay unit located in our rack room. BLADE #1, located in the studio, has available logic ports, as does BLADE #10 located in the rack room. We'll use LIO #7 in BLADE #1 and LIO #3 in BLADE #10. Your system will likely have different BLADE and logic port numbers than these in the example; just substitute your BLADE ID#s as necessary.

To activate the DUMP function the airTools Delay unit requires a momentary closure on pins #7 and #13 of its DB-25 GPIO control connector. First, in the rack room, wire the Delay unit GPIO connector pins 7 and 13 to the first RJ-45 logic connector on BLADE #1, pin #1 and #2 respectively. In the studio you will need to wire the normally open contacts of the DUMP switch to the BLADE #1 pins #1 and #7.

In the WheatNet-IP GUI, you will need to define two new signals for the logic function. You will need a logic source signal, representing the button, and a logic destination signal, representing the DUMP connections on the airTools Delay unit. First click on BLADE #1 in the System Pane of the GUI to open the tab windows for BLADE #1. Click on the Sources tab to open the sources window, and click on the *Add*... button to open the Signal Definition Wizard. Click on LIO only as the signal type and give this new signal a convenient name such as "Dump Sw."

On the LIO Info tab of the Wizard, click on the *Add* box. Click on the "LIO 1 pin 7," and then select Input in the Direction: box as the logic direction (the DUMP switch will be a logic Input). Finally open the logic function drop down menu and choose a logic function. As mentioned previously, the logic function chosen is unimportant, the requirement is that the device you wish to control must also use the same function. In this case choose "User 1" as the function; you can rename it as "DUMP" if you like. Click *Apply*, click *Close*, then click *Finish*, and the new logic source signal definition is complete.

Click on the System icon and Crosspoint tab to open the crosspoint grid; you should see your new "Dump Sw" signal source.

Similarly you need to define a new logic destination signal in BLADE #10. Click on the BLADE #10 icon in the System Pane and select the Destinations tab. As before, click on *Add*..., then select LIO only, to make the new signal, and name it something like "Dump Dev." On the LIO Info tab of the Signal Definition Wizard, click *Add*, select "LIO 1 Pin 3" to map the logic pin. In the Direction: box select Output for the direction, and finally select "User 1" as the logic function (this is where the logic function must match what you've previously defined for the DUMP switch; if these functions do not match, then the logic connection will not work). Click *Apply*, then *Close*, then *Finish* on the Wizard, and your new logic destination signal will appear in the crosspoint grid.

To activate and make this logic function operational, you must make a crosspoint connection on the grid between the source "Dump Sw" and the destination "Dump Dev." Once this has been done, pressing the DUMP switch will create a closure on the logic port of BLADE #10, triggering the DUMP function in the airTools Delay unit. Hint: you can use the WheatNet-IP Navigator GUI to trouble shoot this logic connection. Click on the BLADE #1 icon in the System Pane and click on the LIO Info tab. The window that opens will show the logic signals as they have been defined for the BLADE; you should see your "Dump Sw" shown on line 6. If you have wired and mapped this correctly, the circular indicator in the INPUT column for LIO #7 will change color every time you press the switch. This tells you that the logic input has been wired correctly and is working.

Likewise, if you click on the BLADE #10 icon and LIO Info tab, you should see the "Dump Dev" logic signal shown on line 2. Again, if defined correctly and crosspoint connected to the "Dump Sw" signal, the circular logic status indicator will change color when you press the DUMP switch, showing activation of the logic signal at the output port on the BLADE.

All discrete logic functions are defined and configured the same way. Once you've made a few of them work to get comfortable with the process, it's easy. Just remember the fundamentals:

- Define the source and destination signals and map them to the logic ports you'll use.
- Choose a matching pair of logic functions.
- Make a crosspoint connection between the source and destination signals (note, if you want to, you can lock this connection just as you can audio signals).

Category 4: Action Logic

This fourth class of logic function in the WheatNet-IP system includes system events such as Salvos and Momentary Connections. Action logic is intended to force crosspoint connection changes. Perhaps you have an Air studio that undergoes a major change in signal connections when the morning show finishes. Instead of having the talent go through and change all the source and destination connections individually at each shift change, you could create a Salvo that makes all of the required changes at once. Furthermore, you can use a logic connection to a button to fire the Salvo itself, so all that your operator needs to know is to push the button at shift change. What could be easier?

For an example, let's assume you have created a Salvo to change out your studio configuration from Morning Drive to your 10 o'clock show, and you've cleverly called it "10AM." You are planning to use a switch panel in your studio to fire the Salvo, and you're going to wire the "10AM" switch on the switch panel to logic LIO 2 port #2 on BLADE #1.

Here's how to do it: First wire up the normally open terminals of the switch to pins #1 and #2 on the second RJ-45 logic port of BLADE #1. In the WheatNet-IP Navigator GUI, click on the icon for BLADE #1 in the System Pane, and then click on the LIO Info tab. On LIO 2 #2 (the 7th line) double click on the Fire Salvo box to open the window and click on the "Fire Salvo" check box. In the drop down window, scroll and select the "10AM" Salvo and click on the *OK* button.

To test this out, switch to the crosspoint grid view of the GUI and watch the crosspoints switch on the grid as you press the switch (be sure to do this at a safe time as you will actually be switching audio and can mess up a show On-Air).

You can also use action logic to make a crosspoint change (hint: use a Salvo of one signal) that switches the source for a destination, or to make a temporary crosspoint change that substitutes a source to a destination for as long as the button is held down. The latter is particularly useful in Talkback/Intercom types of situations.

Appendix 3

Wheatnet-IP and AES67

WheatNet-IP and AES67

WheatNet-IP is compatible with and can successfully stream to and from AES67 devices made by other manufacturers. WheatNet-IP supports two AES67 packet timings (more on this later), 1ms and 1/4 ms.

A brief overview

WheatNet-IP and most other audio-over-IP technologies (AES67, Livewire, Ravenna, Dante, etc) are based on using common IP protocols for identifying, parsing, transmitting, and routing digital information over an IP network. This is no coincidence because all of these AoIP technologies depend on using standard off the shelf network switches to move packets around the network. We must use protocols these switches understand if they are to be useful for this.

We speak of "packets" when talking about AoIP because that is how IP networks work. Any information that is transmitted on an IP network whether it's a print job, email, a browser session, or AoIP is first broken down into discrete digital pieces, each representing a very small part of the entire "message." These discrete pieces of digital information are put together in a specific order with standardized blocks of identification information (specified by the IP protocol); this assembly of identification and digital information is then called a "packet," and any IP network device knows how to transmit and receive these "packets."

Thus any content of any kind sent over an IP network is broken down into individual fragments sent one piece at a time and reassembled by the receiving device into useful information. As long as the sending device, network switches, and receiving device all use the same rules for this process it all works. These "rules" are what is referred to as the "IP Protocol".

It is very important to understand this point: network switches have no special functions or structure that is made for routing audio. To the switches, packets are much the same whether they are AoIP, video, email, or a print job. It is the data within the packets that is unique.

Wheatstone, in the process of developing WNIP, has taken audio that is input into a BLADE, digitized it into digital pieces and inserted these digital pieces as the payload into standardized packets that use these IP protocols.

So have the other vendors of AoIP systems. So what makes them different from each other?

As far as sending and receiving IP audio streams, not much at all. Yes there are huge differences relating to control and discovery and special features like mixing and processing, but for the actual stream itself very little, mostly having to do with the specifics of the payload within the packets themselves.

The Audio Engineering Society, recognizing this fact and wanting to create a standard that would allow different AoIP devices to stream with each other came up with the AES67 standard, which describes the IP protocols to be used to identify and route the packets and also describes some standard ways to put together the digital pieces of audio information in the packet payload.

The theory is that if a device uses the prescribed protocol in the packet header to identify them and fills the packet payload in the prescribed manner, other devices will be able to receive the packet and reassemble the payload into the correct audio signal.

In fact this works and the rest of this chapter is about how to use WNIP Navigator to send and receive streams with other devices configured to the AES67 standard.

System Requirements

Timing

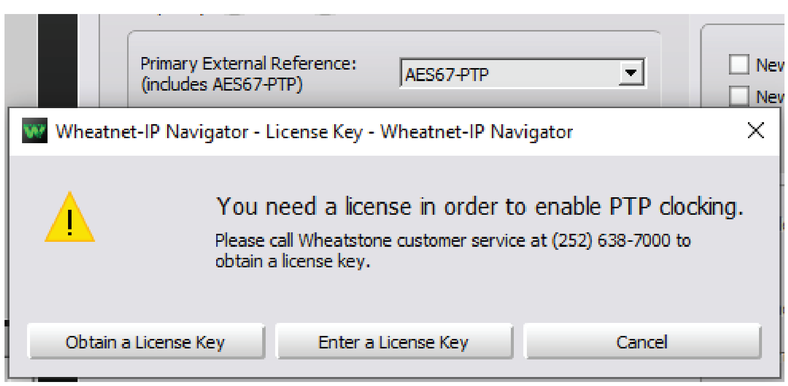
One of the key problems AES was faced with when creating the standard was how to keep disparate audio devices all synchronized so audio would playback without clicks and pops due to sample rate and timing mismatches. Here's the problem – in WNIP, BLADEs all synchronized their internal clocking to a special signal that the system distributes to every BLADE. We call that signal the "metronome" and we send it around the network many times per second to keep all of the individual clocks in BLADEs that actually play out audio in sync with each other. We developed this method of synchronization back in 2004 when we started making WNIP. Axia did something on their own with Livewire for the same purpose, and other vendors did yet something else. We each did our own thing because back in the day there was nothing suitable for the purpose; we had to invent something to make it work.

Natively, WNIP can't synchronize an xNode and vice versa. Same with the others because we all use our own inventions for the purpose. AES67, in recognition of this difficulty, specifies a method to share synchronization amongst devices, a standard timing protocol that has come out in recent years; IEEE-1588, also known as the **P**recision **T**ime **P**rotocol, or PTP. In fact the standard specifies a particular version of this protocol known as PTPv2.

So for an AoIP system to maintain timing and stay synchronized with other AES67 devices, the system timing must be controlled by PTPv2. For that to occur there must be some device in the system that serves the role as PTPv2 timing generator to which all other devices slave their timing. Generally that role is filled by a specialized PTP master clock device because the PTPv2 protocol is so precise that in the best circumstances (PTPv2 master clock synced to GPS for absolute timing reference and PTP-aware switches used for reference signal distribution) timing accuracy of better than 1 microsecond can be achieved. An ordinary crystal oscillator in a PC or I/O device is nowhere near accurate and stable enough for this performance level, hence the need for standalone Master Clock generators.

Sub-microsecond timing accuracy is not required to maintain click free audio however, so if your main concern is clean audio and you're not worried about absolute timing accuracy you can dispense with the added expense of PTP aware switches and use a basic PTPv2 master clock. Some AoIP devices will actually provide a PTP reference clock signal themselves, however their timing accuracy is typically poor.

Bottom line – To use AES67 devices your system must have a PTPv2 clock reference device. Select the AES-67 PTP profile from the System | Info tab in Navigator. You will receive a message that the PTP Clocking option requires a license. There is no charge for this license, but you will need to email your license seed to activation@wheatstone.com to receive a license key. Click the **Obtain a License** button and copy/paste the resulting license seed into the email and we will return your license key by email.



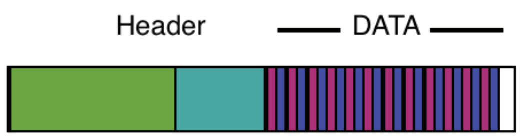
When setting up your PTP clock source, we prefer eight sync messages per second, which corresponds with a value of -3 for many implementations which use 2^n for this configuration.

Packet Structure

We spoke earlier of how an AoIP packet gets created; the transmitting device creates a packet header using the standard IP protocols and the payload gets filled with pieces of digital audio data which will get put back together by the receiving device to recreate the audio signal.

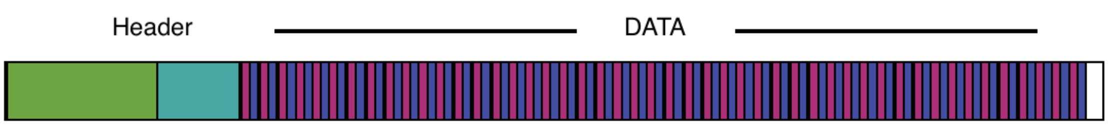
It's important that the transmitting device and receiving device use the same system for filling and decoding the payload for this all to work properly. There are many different ways this can be done:

- Fill the payload with one audio sample of data; for instance left channel, 24 bits. Send another stream with another 24 bits, in this case the right channel. While this would in fact work, it is an extremely inefficient and difficult system because it would take 96,000 packets per second to make one stereo audio stream sampled at 48K.
- Fill the packet with 12 samples of 24 bits of left channel audio and then 24 bits of right channel audio.
- Fill the packet with 12 samples per channel of 24 bit audio, interleaving left and right channels.



1/4 msec packet (WNIP)
12 Stereo audio samples, L-R Interleaved

- Fill the packet with 48 samples per channel of 24 bit audio, interleaved.



1 msec packet (AES67)
48 Stereo audio samples, L-R interleaved

- Fill the packet with 64 samples per channel of 16 bit audio, interleaved.
- Fill the packet with 96 samples per channel of 24 bit audio, mono.

You can see the possibilities are nearly endless, so what AES67 does is to specify a single packet structure that must be used; this is the 1msec packet timing you see in all of the specifications and it equates to 48 samples per channel; 96 samples for a stereo packet.

By the way, AES67 goes on to specify some additional packet structures that could be used because there is no one right answer for the ideal structure. The problem is that larger packet structures are more efficient for the network infrastructure because fewer packets are needed to stream, but larger packets induce greater latency because it takes longer to fill a big packet with 48K audio data samples than a small one. In fact WNIP uses gigabit Ethernet connections and 1/4 msec packet timing as our default to keep latency to a minimum.

Multicast Address Range

Streams that are intended to be sent to more than one device take advantage of a standard IP mechanism, multicasting, to maximize network efficiency. In this protocol every stream is given a unique multicast address to identify it on the network so standard switches can broadcast its packets to the devices that want them, but not to devices that don't want them.

The number of available multicast addresses is very large and individual device manufacturers could chose any of these multicast addresses to use in their system. AES67 specifies a particular range of addresses that must be used in order to assure potential compatibility.

Ports

Ports provide a mechanism in IP networks for pre-identifying the type of information that will be contained in the payload of a packet. For instance an smtp email message will be directed to port 25 so the receiving device automatically knows to forward the payload data to the email application without having to decode the actual payload to figure out what it contains.

AoIP is similar in that it is desirable to forward the payload data directly to the AoIP streaming application. Of course different vendors have chosen their own ports to use, but AES67 specifies a standard port–5004–that all devices should be *capable* of using.

Conclusion: By providing specific configuration details for AoIP streams, AES67 makes it possible for devices that adhere to these details to stream audio between them. Since vendors of AoIP devices may have existing systems that were built before there was an AES67 standard and will want to maintain streaming capability with their own equipment, there must be a mechanism to specify these details on a case by case basis as the needs arise. In WNIP this is done via the Navigator software application. Other AoIP vendors have their own mechanisms to use to alter their device configuration parameters and you'll need to learn how to use each vendor's method for configuring the AES67 devices you'll have in your system.

Using WNIP with AES67

Since AES67 only specifies stream content parameters and does nothing to manage stream discovery and control, these functions must be managed manually. To put it another way, since AES67 does not include a standard way for AoIP streams to be identified there is no way for a device from vendor A to "see" or know about a stream from vendor B. And if you can't "see" an available stream, you can't receive it. The current workaround for this problem is to specifically tell device B that there is a stream from device A available with such and such parameters that it should start receiving. This is purpose of the SDP (**S**ession **D**escription **P**rotocol) mentioned in the AES standard. Not only does the standard specify the parameters in an AES67 stream, it also specifies how those parameters should be presented. So in fact, the system engineer becomes the audio router by manually specifying which devices should listen to which streams.

This is a bit of work, but easy enough until you realize that because the different devices can't "see" each other, it is entirely possible that ***they may be using address settings already in use elsewhere.***

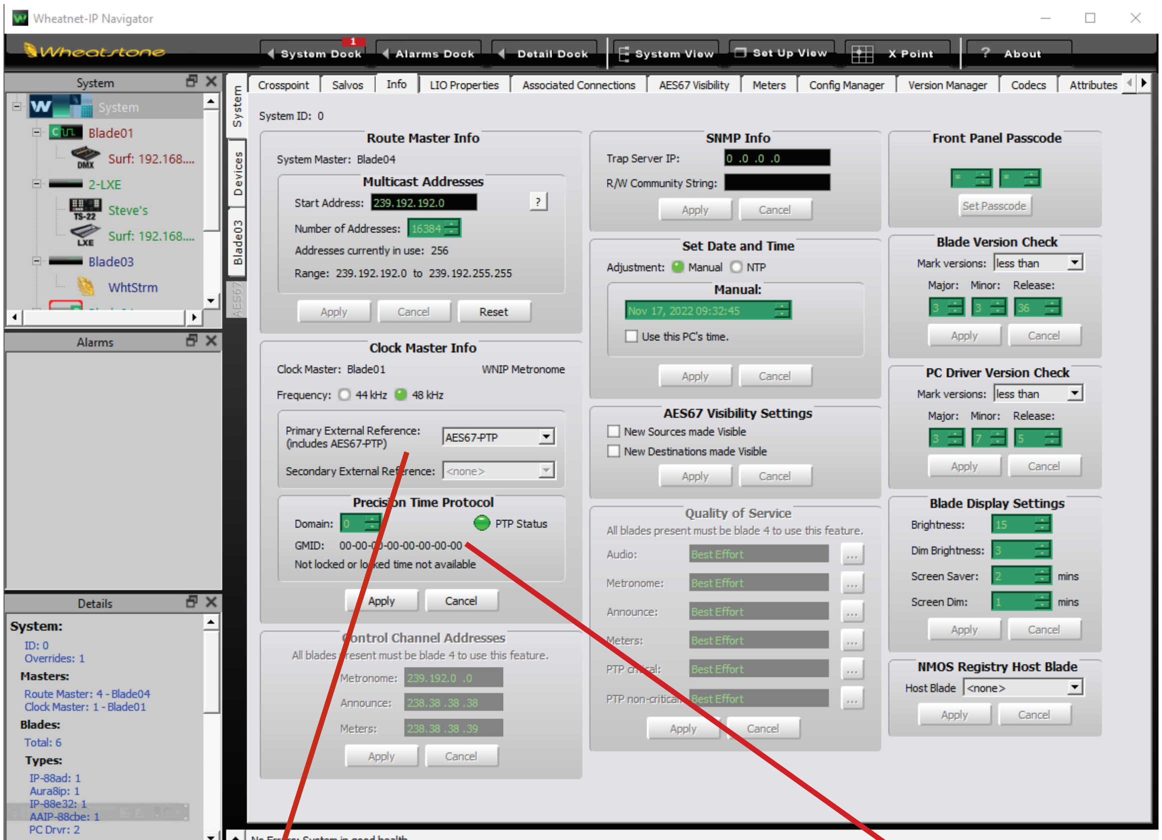
So the first step in putting together the system is to map out an IP and stream multicast address plan that assures every stream on every device will have a unique address available for it.

Multicast addresses are in the form of 239.xxx.yyy.zzz. Each AoIP vendor has their own way of allocating addresses for each stream. WNIP does it automatically but the user can change the starting address and range if needed. Axia uses "Livewire Channel numbers" but can also accept a manually entered address. Dante will let the user specify the xxx octet of the address but automatically generates the yyy and zzz without any user control of what it chooses. Other equipment may do this yet differently.

To make your stream multicast address plan you must know all the different devices that will be in the system and how they allocate multicast stream addresses. Start with the devices which are least common or least flexible in specifying or changing multicast addresses and isolate them in an address range well removed for what the majority of your devices will be. As an example, if you have a WheatNet-IP system with 50 BLADEs and you want to add two Dante devices to it, you would give the Dante device streams a multicast address of .192 for the second octet and check what multicast addresses Dante auto-assigns. Then have the WheatNet-IP devices auto-generate multicast addresses starting lower (239.192.192.1) or higher (239.192.yyy.zzz+10) to make sure there are no WNIP streams assigned the same multicast addresses.

It's important to go through this effort to create a plan first, because as you add AES67 devices to your system you will be doing a lot of hand entry specifying which stream addresses each device is using to transmit on and which stream address each device is using to receive. If you go through all this effort only to discover that some other device is using that same address you'll only have to start over. Besides, having your multicast address plan in place will be useful later when you are routing AES67 streams in your network; you'll refer to it over and over again.

With a multicast address plan in place, lets begin. With the WNIP system up and running and the Navigator application running on your administration PC, open the System Info tab. You'll see a screen that looks like this:



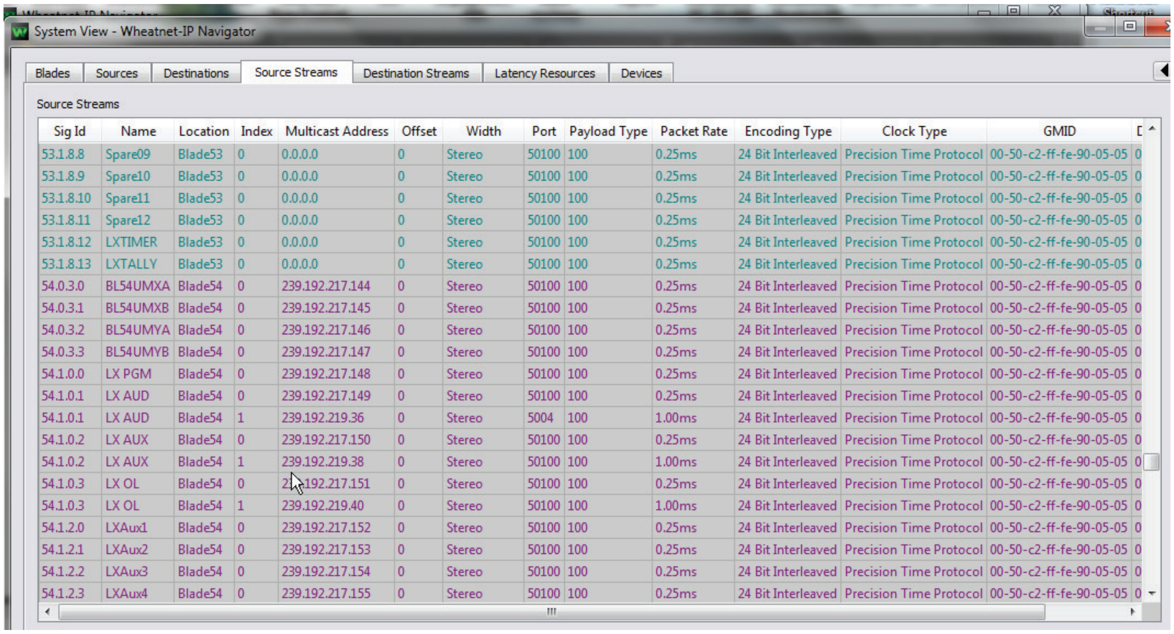
Click on the drop down and select AES67 PTP as your clock reference. If this is the first time you've enabled AES67 PTP, you will be prompted to apply for a license; copy the seed key information and forward it to techsupport@wheatstone.com as mentioned previously.

If you have installed and are running a PTPv2 master clock, Navigator will detect it and show its status here. Note that if you have not installed a PTP master clock or WNIP cannot see it then AES67 devices will not work. This status indicator is also useful when your system is running to alert you; it will turn red and issue an alarm if PTP is lost.

Unless you know otherwise for certain you should set your system sample rate to 48K; the AES67 standard does not require devices to support 44.1K and many do not.

The next step is to make note of the stream and address allocation within WNIP. You'll need this information to "tell" AES67 devices the information for the WNIP streams you want them to receive.

Click on the System Info tab on the Navigator screen and then choose Source Streams to open a window that looks like this:



Sig Id	Name	Location	Index	Multicast Address	Offset	Width	Port	Payload Type	Packet Rate	Encoding Type	Clock Type	GMID	
53.1.8.8	Spare09	Blade53	0	0.0.0.0	0	Stereo	50100	100	0.25ms	24 Bit Interleaved	Precision Time Protocol	00-50-c2-ff-fe-90-05-05	0
53.1.8.9	Spare10	Blade53	0	0.0.0.0	0	Stereo	50100	100	0.25ms	24 Bit Interleaved	Precision Time Protocol	00-50-c2-ff-fe-90-05-05	0
53.1.8.10	Spare11	Blade53	0	0.0.0.0	0	Stereo	50100	100	0.25ms	24 Bit Interleaved	Precision Time Protocol	00-50-c2-ff-fe-90-05-05	0
53.1.8.11	Spare12	Blade53	0	0.0.0.0	0	Stereo	50100	100	0.25ms	24 Bit Interleaved	Precision Time Protocol	00-50-c2-ff-fe-90-05-05	0
53.1.8.12	LXTIMER	Blade53	0	0.0.0.0	0	Stereo	50100	100	0.25ms	24 Bit Interleaved	Precision Time Protocol	00-50-c2-ff-fe-90-05-05	0
53.1.8.13	LXTALLY	Blade53	0	0.0.0.0	0	Stereo	50100	100	0.25ms	24 Bit Interleaved	Precision Time Protocol	00-50-c2-ff-fe-90-05-05	0
54.0.3.0	BL54UMXA	Blade54	0	239.192.217.144	0	Stereo	50100	100	0.25ms	24 Bit Interleaved	Precision Time Protocol	00-50-c2-ff-fe-90-05-05	0
54.0.3.1	BL54UMXB	Blade54	0	239.192.217.145	0	Stereo	50100	100	0.25ms	24 Bit Interleaved	Precision Time Protocol	00-50-c2-ff-fe-90-05-05	0
54.0.3.2	BL54UMYA	Blade54	0	239.192.217.146	0	Stereo	50100	100	0.25ms	24 Bit Interleaved	Precision Time Protocol	00-50-c2-ff-fe-90-05-05	0
54.0.3.3	BL54UMYB	Blade54	0	239.192.217.147	0	Stereo	50100	100	0.25ms	24 Bit Interleaved	Precision Time Protocol	00-50-c2-ff-fe-90-05-05	0
54.1.0.0	LX PGM	Blade54	0	239.192.217.148	0	Stereo	50100	100	0.25ms	24 Bit Interleaved	Precision Time Protocol	00-50-c2-ff-fe-90-05-05	0
54.1.0.1	LX AUD	Blade54	0	239.192.217.149	0	Stereo	50100	100	0.25ms	24 Bit Interleaved	Precision Time Protocol	00-50-c2-ff-fe-90-05-05	0
54.1.0.1	LX AUD	Blade54	1	239.192.219.36	0	Stereo	5004	100	1.00ms	24 Bit Interleaved	Precision Time Protocol	00-50-c2-ff-fe-90-05-05	0
54.1.0.2	LX AUX	Blade54	0	239.192.217.150	0	Stereo	50100	100	0.25ms	24 Bit Interleaved	Precision Time Protocol	00-50-c2-ff-fe-90-05-05	0
54.1.0.2	LX AUX	Blade54	1	239.192.219.38	0	Stereo	50100	100	1.00ms	24 Bit Interleaved	Precision Time Protocol	00-50-c2-ff-fe-90-05-05	0
54.1.0.3	LX OL	Blade54	0	2[illegible]192.217.151	0	Stereo	50100	100	0.25ms	24 Bit Interleaved	Precision Time Protocol	00-50-c2-ff-fe-90-05-05	0
54.1.0.3	LX OL	Blade54	1	239.192.219.40	0	Stereo	50100	100	1.00ms	24 Bit Interleaved	Precision Time Protocol	00-50-c2-ff-fe-90-05-05	0
54.1.2.0	LXAux1	Blade54	0	239.192.217.152	0	Stereo	50100	100	0.25ms	24 Bit Interleaved	Precision Time Protocol	00-50-c2-ff-fe-90-05-05	0
54.1.2.1	LXAux2	Blade54	0	239.192.217.153	0	Stereo	50100	100	0.25ms	24 Bit Interleaved	Precision Time Protocol	00-50-c2-ff-fe-90-05-05	0
54.1.2.2	LXAux3	Blade54	0	239.192.217.154	0	Stereo	50100	100	0.25ms	24 Bit Interleaved	Precision Time Protocol	00-50-c2-ff-fe-90-05-05	0
54.1.2.3	LXAux4	Blade54	0	239.192.217.155	0	Stereo	50100	100	0.25ms	24 Bit Interleaved	Precision Time Protocol	00-50-c2-ff-fe-90-05-05	0

This list shows all of the WNIP streams available in your system and gives information about their assigned IP and multicast addresses. You can sort the list by clicking on the desired column heading; one handy sort is to click on the multicast address heading and you will see the list of multicast addresses in ascending order. This makes it easy to see what the first and last addresses are so you can tell what addresses would be safe for an AES67 device that you'll be manually assigning.

You'll also use this list again and again to decide which multicast address you need to specify an AES67 device to receive. Since AES67 does not support stream discovery and connection management, you'll need to manually reassign multicast addresses to AES67 receiving devices each time you make a routing change (more on this later). In this example to receive the stream BL54UMIXA you must configure the AES67 device to receive 239.192.217.144.

Once your PTPv2 clock is running, Navigator is licensed for AES67 and you've noted your WNIP stream multicast addresses, you can begin connecting AES67 devices to your system.

The first step is to decide whether or not you need to use packet timing translation with your AES67 devices. As noted at the beginning of this Appendix, WNIP uses 1/4 ms packet timing for minimum latency. Most AES67 devices also support 1/4 ms packet timing but some (namely Dante) do not. The best and easiest way to interface an AES67 device with WNIP is to use 1/4 ms packet timing wherever you can. That way these devices will operate with minimal latency. If you have some AES67 devices that can use 1/4 ms packet timing and some that can't, use 1/4 ms for the devices that support it and 1ms for the others. You don't need to make every device run at 1ms just because you have one that won't do 1/4 ms.

Having said that, the BLADE-4 auto-generates 1ms streams on all BLADE-4 signals with 1ms mono and 5.1 surround support. For those who have both BLADE-4 and BLADE-3 signal interfaces, we will cover the packet timing translation to generate BLADE-3 1ms streams here. Just know you won't need to worry about it for your BLADE-4 sources.

In order to use an AES67 device running the base 1ms packet timing with Blade-3s in WNIP you must enable packet timing translation functionality in WNIP. This packet timing translation can be performed by any analog, digital, or analog/digital BLADE in your system.

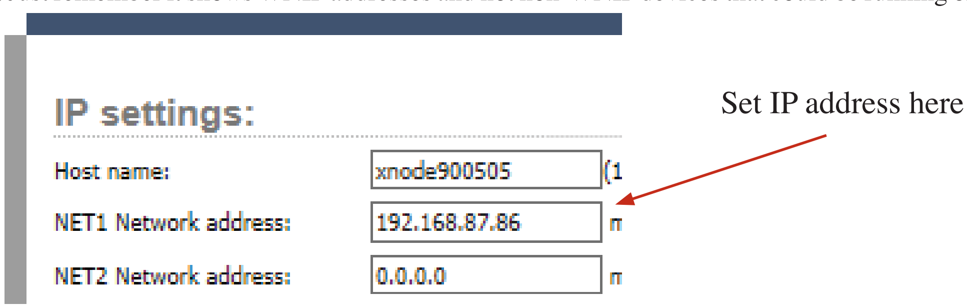
For packet timing translation, click on the BLADE-3 you want to use in the left hand pane of Navigator and then choose the BLADE Info tab. Choose AES67 1ms support for the BLADE here. Note that on BLADE-3 units, this will remove the ability to use the Utility Mixers for that BLADE as these will be used to generate the necessary 1ms streams. Again, the BLADE-4s support simultaneous transmit of 1/4 and 1ms and there are no limitations. This BLADE Mode selection does not exist on BLADE-4 and the use of 1 ms streams on BLADE-4 does not affect the utility mixer. Remember, you only need to enable translation if your AES67 device does not support 1/4 ms packet timing; other than Dante this is rare.

All of this work has been in preparation for connecting to AES67 devices, now let's do just that.

Example 1: Bringing in audio streams from an Axia xNode using 1/4 ms packet timing

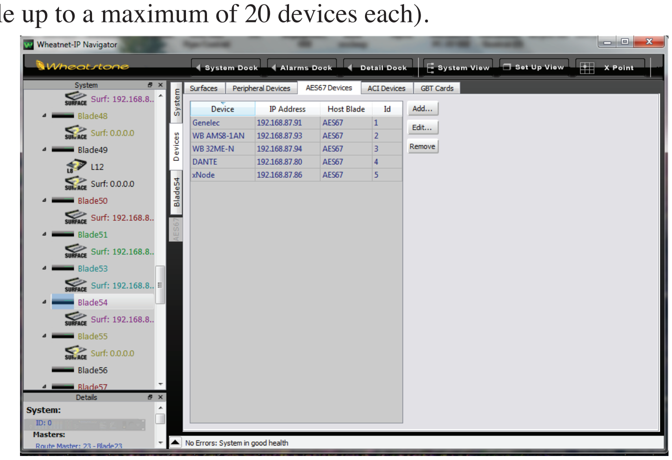
The first step is to set the xNode IP address into the WNIP system subnet.

- Open up a PC browser connection and log into the xNode. Consult your Axia documentation if you don't know how to do this. If the IP address of the xNode is not already on the WNIP subnet, as is most likely, your PC will need to connect directly to the xNode.
- On the system page of the xNode configuration window assign the xNode an IP address within the subnet range being used by WNIP (typically .87) but not used by any other device. Since WNIP BLADEs default to address 192.168.87.101 and up and WNIP surfaces default to 192.168.87.201 and up, IP addresses below 192.168.87.100 are usually unused, the exception being computers and the network switches themselves which usually start at 192.168.87.1. But since IP addresses can be changed from the defaults during the installation you'll need to know what the IP address range of your WNIP system actually is and what addresses are unused and available. The System view window from Navigator that we described earlier is a good way to see your IP addresses in use with WNIP. Just remember it shows WNIP addresses and not non-WNIP devices that could be running on your network.



- After you've entered a new IP address you must click on the "Apply" button to enable it. Of course as soon as you do that be mindful that the xNode will be on the WNIP subnet and your PC may no longer be connected to it until you add it to the subnet as well.
- Plug the xNode Ethernet to an available WNIP network switch port, and then click on the "Devices" tab on the left side of the Navigator screen. Choose the "AES67 devices" tab on the top. Here you manually add AES67 devices by choosing "Add" and filling in the device name and IP address and by choosing a WNIP BLADE to act as the host for this device (any BLADE will handle up to a maximum of 20 devices each).

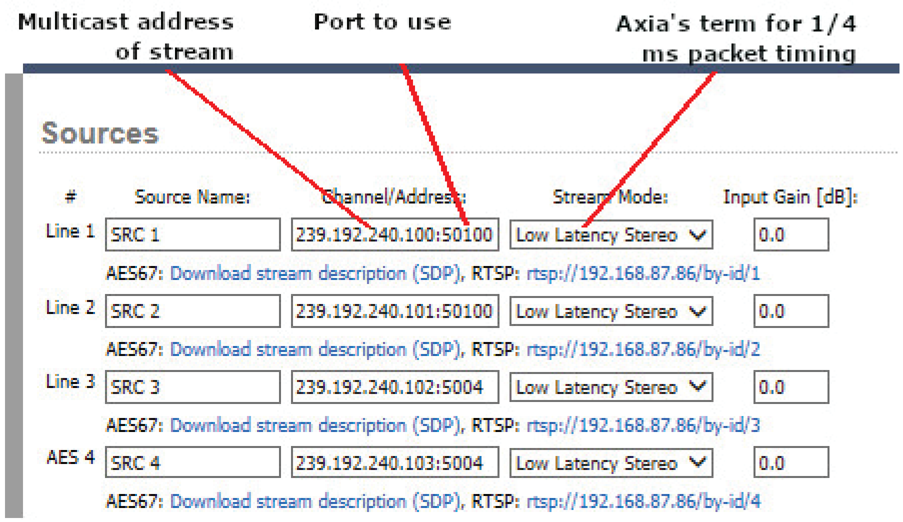
Here is a screen showing a number of different AES67 devices that have been added to the system.



Once you have added the device to the WNIP system, the next step is to specify the particular audio streams you want to have inter-operating between WNIP and your AES67 device. This is where you'll make use of the multicast address information you worked out previously. You'll need to configure both your xNode device and WNIP with this information. It makes no difference which you do first, only that you configure both with the same information.

Lets start with the xNode. Open a browser interface to the xNode (remember to use its newly configured IP address we set previously) and choose the "Sources" menu item.

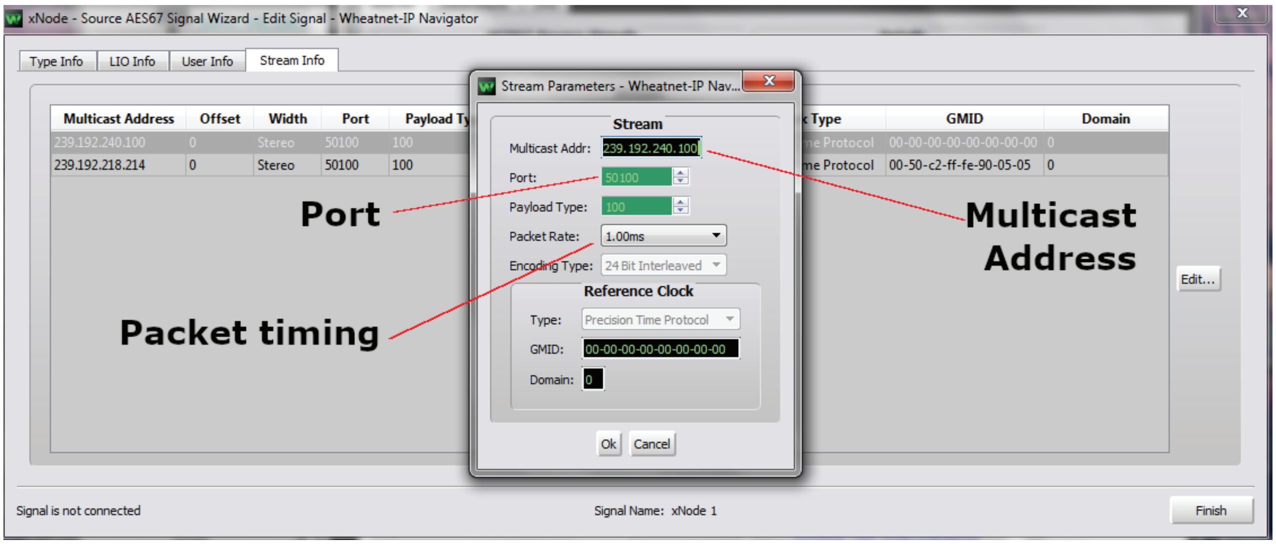
You'll see a screen that looks like this. Here we've configured the four xNode channels to make AES67 compatible streams.



Off course, you'll need to use your own multicast address here. For the port you can choose the default WNIP of 50100 or the AES67 default of 5004. Either will work as long as the WNIP side is configured to match.

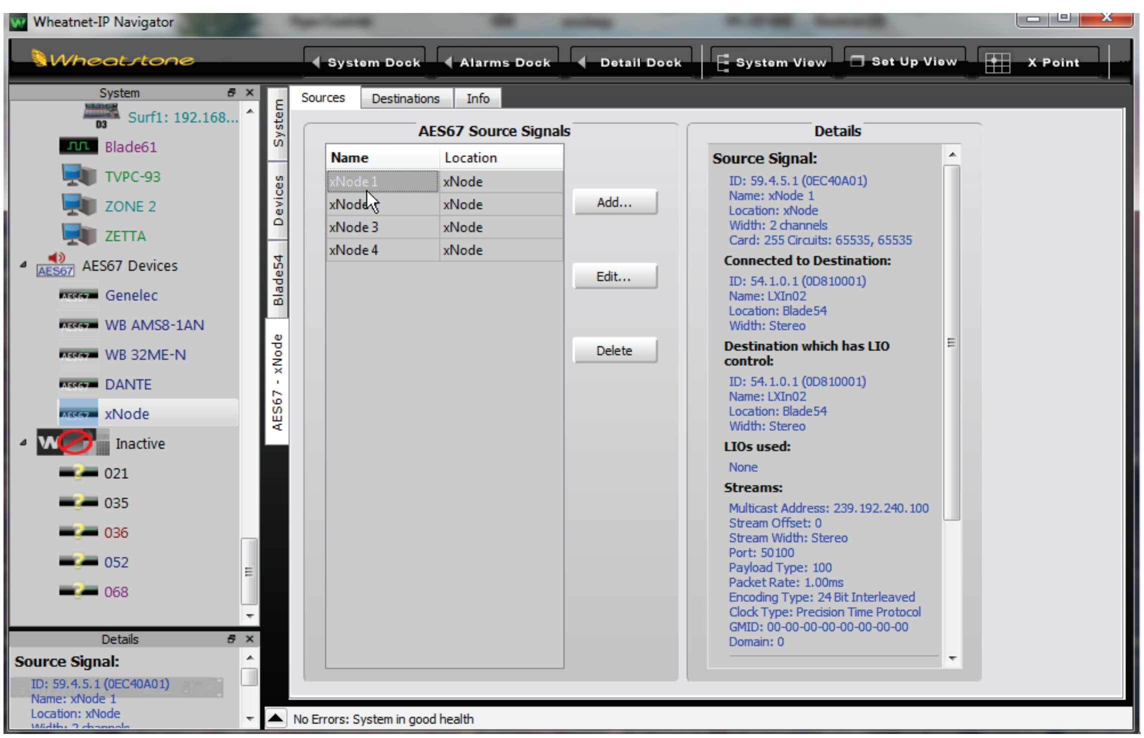
Once you've configured your streams on the xNode, you can exit your browser session (don't forget to hit "Apply" first) and move on to the WNIP side.

In Navigator, click on the AES67 Devices tab and choose the xNode device you previously defined. Then click on the "Sources" tab. Here is where you define the streams to match what you defined for the xNode sources. Click on the "Add" button to define each stream (you can name it anything you like, this is the name that will show up in the Navigator crosspoint grid so choose a name that will be useful) and then click the "Stream Info" tab to open a window to define the stream parameters.

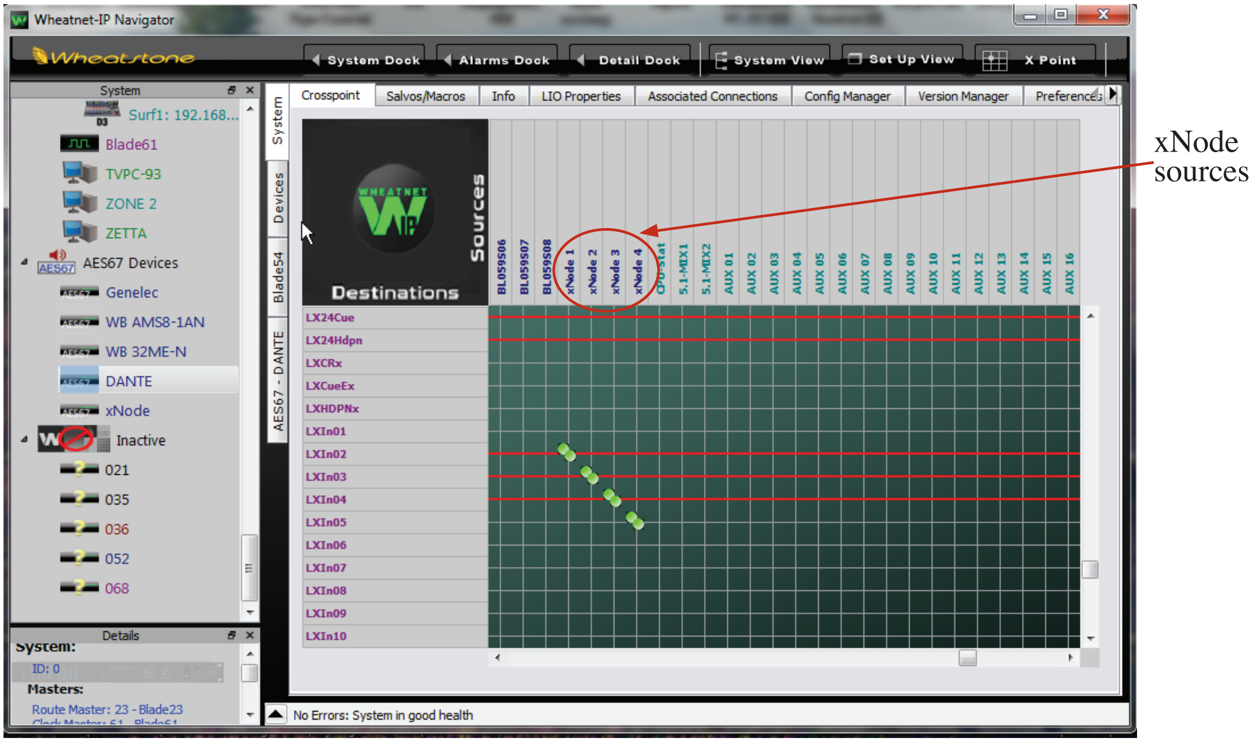


Be careful to match what you previously entered in the "Sources" window on the xNode; the WNIP definition here must match or you won't receive the stream you want.

Be sure to click "Finished" when you are done. Repeat the process for each stream you want to use and when you are done, the Devices --> AES67 devices --> xNode --> Sources window should look something like this:



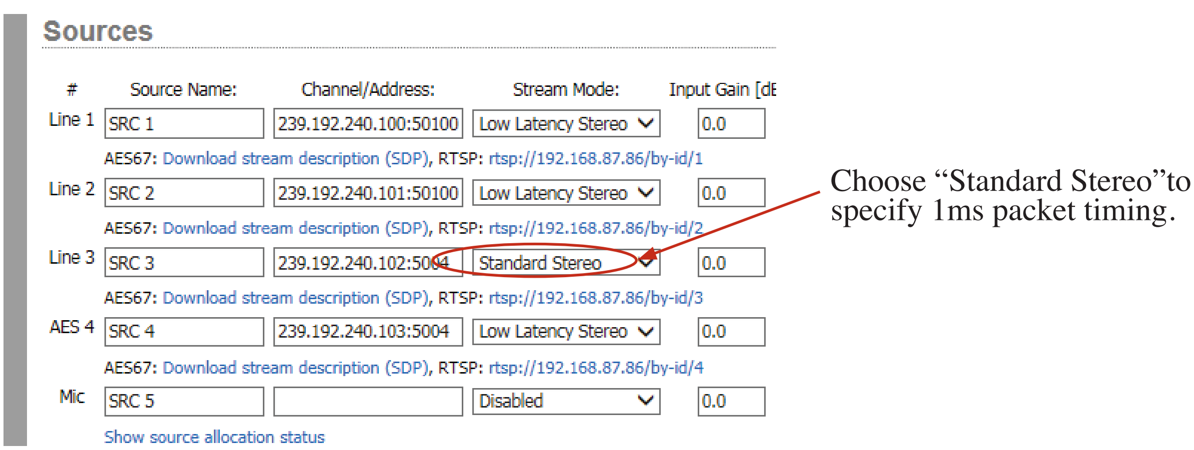
Your WNIP Navigator crosspoint grid will show these newly defined xNode sources ready to connect to any WNIP destination. Click crosspoints and your AES67 device will stream to the appropriate destination(s) in WNIP.



Example 2: Bringing in audio streams from an Axia xNode using 1ms packet timing

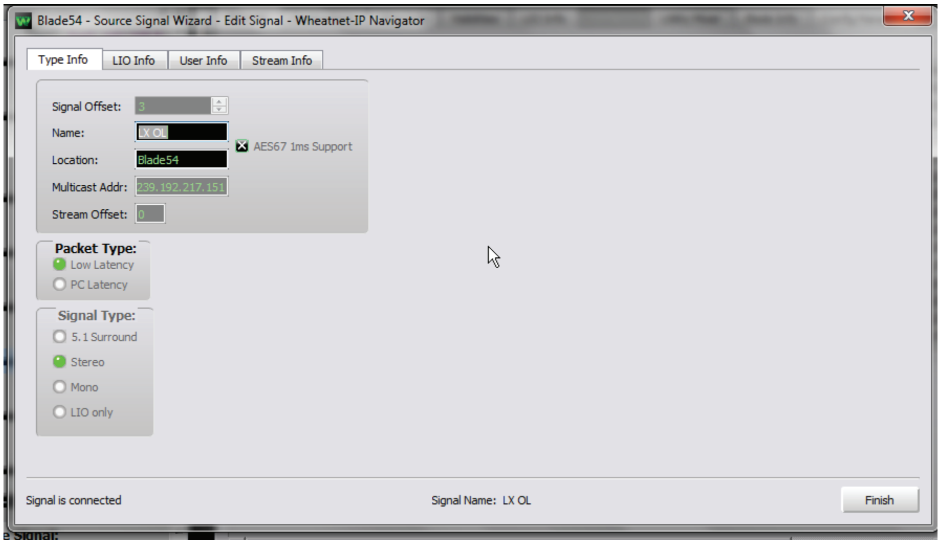
This process is exactly the same as the previous example with the added step of utilizing packet timing translation, to ingest the AES67 stream with 1ms packet timing and translate it to 1/4 ms for use across the WNIP network.

For this example we'll simply edit one of the previously defined AES67 source streams to show the added step of packet translation. All of the steps to define the devices and streams are the same as in Example 1 with these changes:



- When defining the sources in the xNode, choose "Standard Stereo" as the stream mode; this is Axia's method of specifying 1ms packet timing.
- On the WNIP side, in Navigator right-click on the desired xNode source in the crosspoint grid header and choose

Modify--->Edit to open the source stream configuration window. Click on the AES67 1ms support check box; this will tell WNIP to utilize the translation function you activated earlier when you first set up to use AES67 devices (page 9 of this addendum) for this stream.

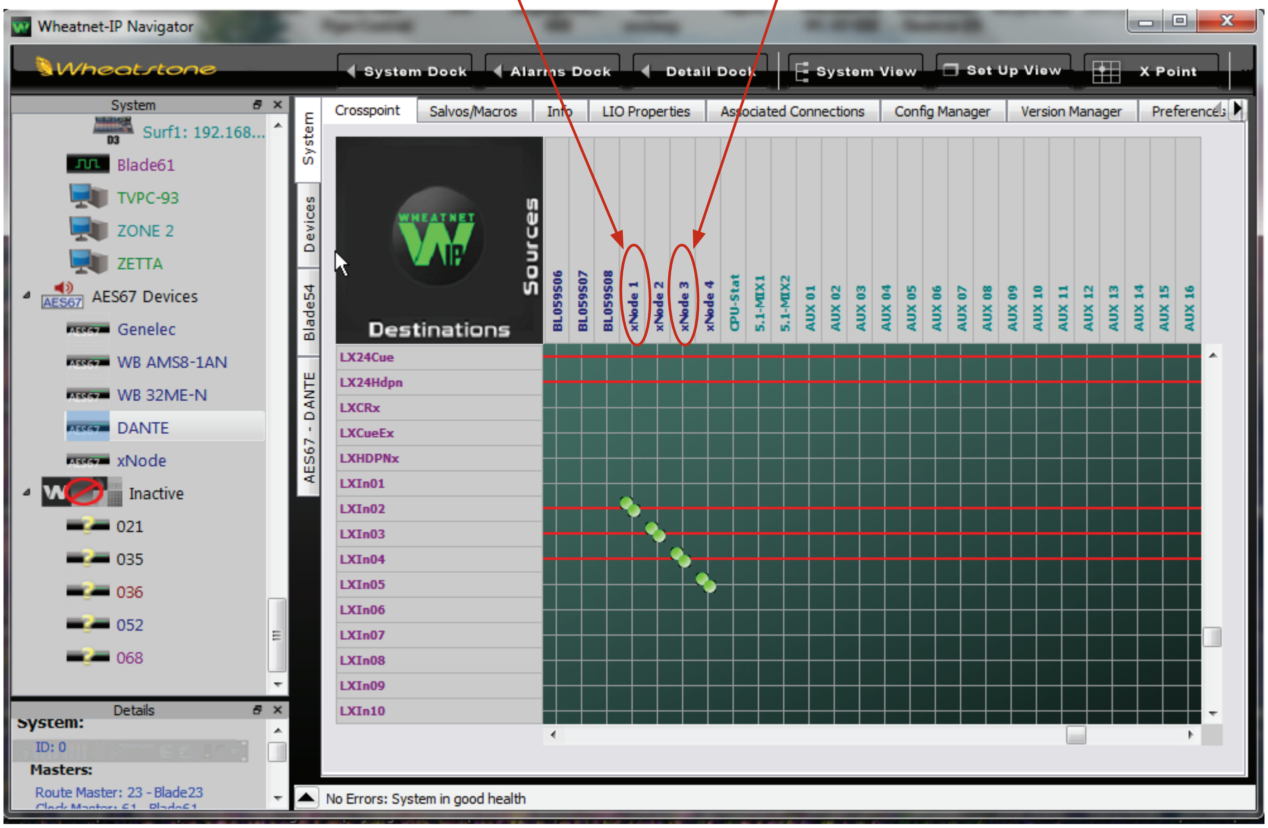


- Once you do this and click "Finish" WNIP creates a translated copy of the AES67 1ms stream and makes it available to all of the WNIP system destinations.

The Navigator crosspoint grid will work as normal, the AES67 device stream still appears as a source signal in the system and WNIP destinations will connect to it by clicking on the crosspoint just as you are used to. The intelligence built into WNIP will realize which packet timing your specific connection request will need and under-the-hood connect your destination to the appropriate stream, 1ms or 1/4 ms, without the user having to specify it. The same is true with source controllers on Wheatstone consoles or other hardware controllers making it easy for users; the source name will appear to users and they can select it without having to know anything about packet timing and translation.

Source with 1/4ms packet timing

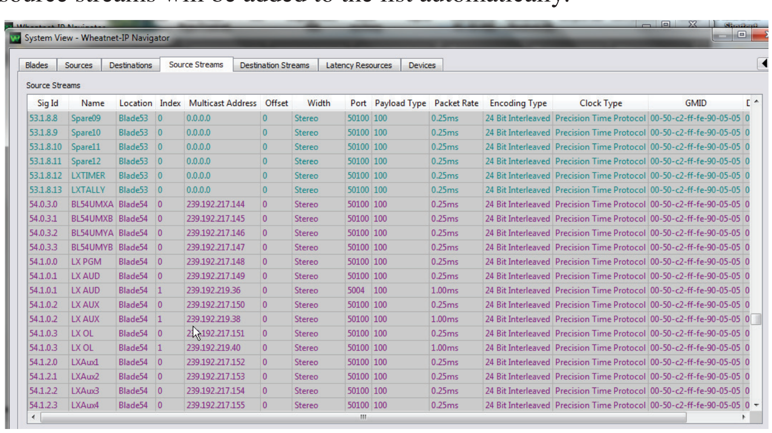
Source with 1ms packet timing



Example 3: Sending a WNIP audio stream to an Axia xNode using 1/4 ms packet timing

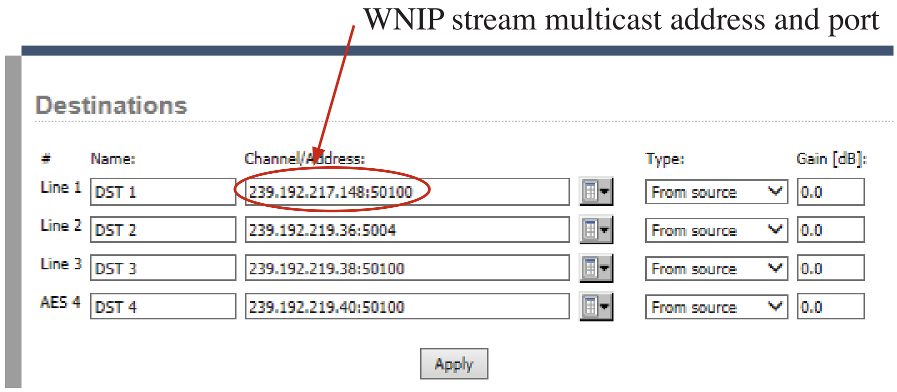
In this example, the process is very similar to the first example, except that the devices are reversed: WNIP AES67 is the source device and xNode is the destination.

For 1/4 ms packet timing the tasks are simplified because WNIP automatically creates streams for every WNIP source as soon as it enters the system. Again, the sources and their stream details are shown in the Navigator--->System View--->Source Streams window. All WNIP sources in the system will show in this window, and any time you add new WNIP devices their source streams will be added to the list automatically.



So the first step in this example is to decide which stream(s) you want to send to the xNode and copy their multicast address(es).

Once you've identified the desired WNIP streams and copied their multicast addresses, open a browser window on the xNode device and choose the "Destinations" menu item.



In the xNode destinations window, enter the desired WNIP stream information for the destination.

Use the format multicast address:port number.

Once you've entered the information and hit "Apply," you can exit the browser session and you're ready to start streaming from WNIP to xNode. First, though, it's important to have a clear understanding of the differences between sources and destinations in AoIP.

A source is a physical audio device that makes its audio available to any and all other devices that want to receive it. In other words, a source is destination agnostic; it makes no difference which devices want to receive the audio. In fact a source has no knowledge of where its audio is going to go. It simply puts out its audio stream and the network switches are responsible for getting it to the desired receivers via multicast and IGMP. A source stream can go to one destination or one hundred and it makes no difference to the source.

A destination is a physical audio device that receives one and only one specific audio stream. A destination is not source agnostic in the sense that it cares very much what audio it is receiving and needs to be specifically told what stream to be listening to. That's what we just finished doing in the xNode. In the example above we told it to receive a stream with the multicast address of 239.192.217.148 on port 50100.

Because the AES67 standard provides no method of discovery and connection management there is no standardized method to control which stream a destination should be receiving; different vendors use different methods and without a standard there is no way to control this.

The fall out from this is that unlike AES67 sources, connections to all AES67 destinations cannot be managed from a crosspoint grid. Not with WNIP, Axia, Ravenna, Dante, or any other routing application. Destination stream connections must be managed from within the AES67 device's own configuration tools, as we did with the xNode destinations window in the example above.

While unfortunate, this is not too much of a problem for routes that are mostly static (like for instance a program feed to your on-air processor). But for routes that are frequently changing (remotes, codecs, and so far) this can be unmanageable. You have to open the destination device configuration tool and manually enter the desired source stream data every time you wanted to receive a different stream.

With a WNIP system there is a very handy work around for this problem. Here's how you do it.

When you are entering the source stream information into the AES67 device destination, don't use the actual desired source information. Instead chose an output from one of the many Utility Mixers in the WNIP system (there are two Utility mixes available in each BLADE) and enter the stream information for the Utility Mixer into the AES67 destination device.

It sounds counter-intuitive; why tell a destination device to receive a stream different from the one you actually want?

Here's how it works. By having the AES67 device receive the Utility Mixer stream, you can then connect any system device to the Utility mixer inputs and your routing system is once again dynamic. You can change whatever you wish to send to the AES67 destination by clicking sources on the crosspoint grid anytime you want without having to type in new stream parameters. You can even mix sources together and turn them on and off remotely with this Utility mixer technique making it a very powerful way to control AES67 destination signal routing.

There's an additional benefit: by assigning various WNIP sources to the Utility Mixer channels and mapping that

Utility Mixer to your AES67 device, you've in effect created an AES67 hot button controller. With sources assigned to the Utility Mixer channels you can quickly switch between them by turning the Utility Mixer channels On or Off by clicking on them, mapping them to LIO ports wired to switches, or using soft buttons or scripts to trigger them. That's really handy for managing AES67 destinations.

One final note about AES67 destination routing. WNIP devices do not normally send out streams unless there is a destination requesting them. This is a deliberate feature that limits unnecessary network traffic and helps reduce the network switch requirements to keep switch expenses down. Since an AES67 device does not speak the "WNIP" control messages language, something must be done to cause the WNIP source stream to start if it is not in use by WNIP elsewhere in the system.

For AES67 1ms-translated streams this is not an issue. Since you've "told" WNIP that you are creating an AES67 stream by activating translation, the stream will start (both the 1/4 msec and 1 msec versions) immediately, no need for any other actions.

But for standard WNIP 1/4 msec streams that you may want to use with 1/4 ms-capable AES67 devices you must "tell" WNIP to start the stream.

There are a few ways to accomplish this:

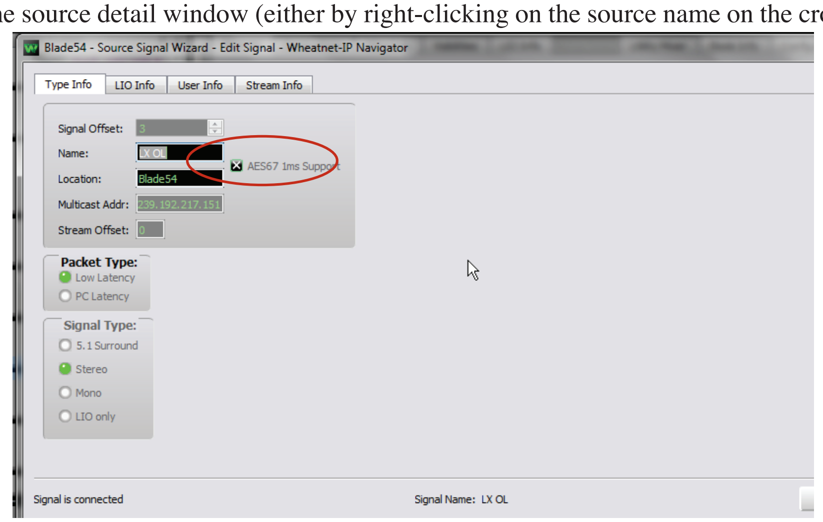
- Route the desired WNIP source stream (in this case the Utility mixer output) to an additional WNIP destination that would be useful. For example, a logger.
- Route the WNIP stream to a destination not necessarily useful, but not harmful. Something like an unused BLADE destination, BLADE front panel headphone jack destination, Windows driver input channel, etc.
- Our favorite: Route the WNIP Utility Mixer source stream (the one you are sending to the AES67 device) to input 8 of that same Utility mixer. Since the Utility Mixer source is a WNIP device it will start streaming because of the connection request from the WNIP destination (Utility Mixer channel 8) and the stream will be available for the AES67 device. We like this approach because you're not likely to need that destination for anything else. You'll still have 7 channels of the Utility Mixer available for source selection and/or mixing. Just remember to keep that Utility Mixer's channel 8 turned Off and potted down to avoid potential feedback.

Example 4: Sending a WNIP audio stream to an Axia xNode using 1ms packet timing.

In this case everything is the same as in Example 3, except once again we must make use of packet translation.

Rather then reiterating everything form scratch, let's simply edit our settings from Example 3. Since we'll be using 1ms packet timing in this example we need to use WNIP translation services.

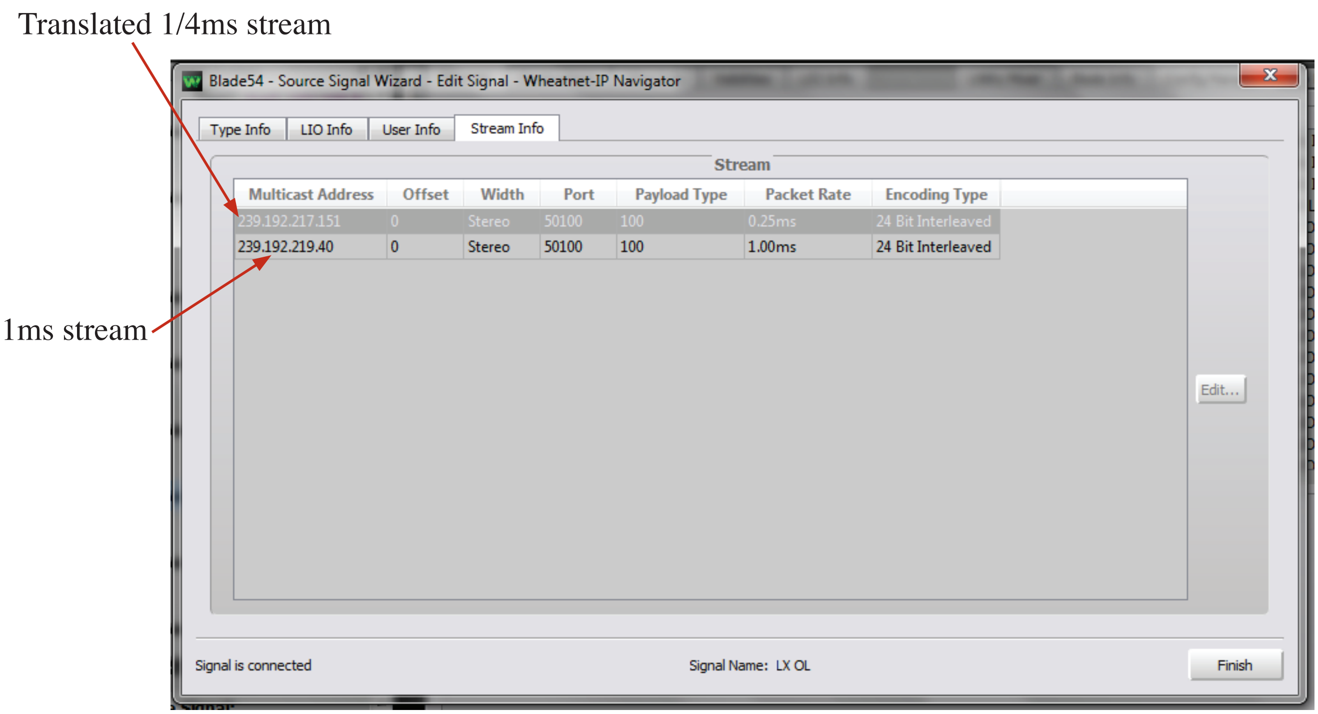
In Navigator, choose the desired source. If you've followed our suggestion in Example 3 the source will likely be a Utility Mixer output. Open the source detail window (either by right-clicking on the source name on the crosspoint grid or choos-



ing BLADE-->Sources--->Edit) and turn on “AES67 1ms support” for that source.

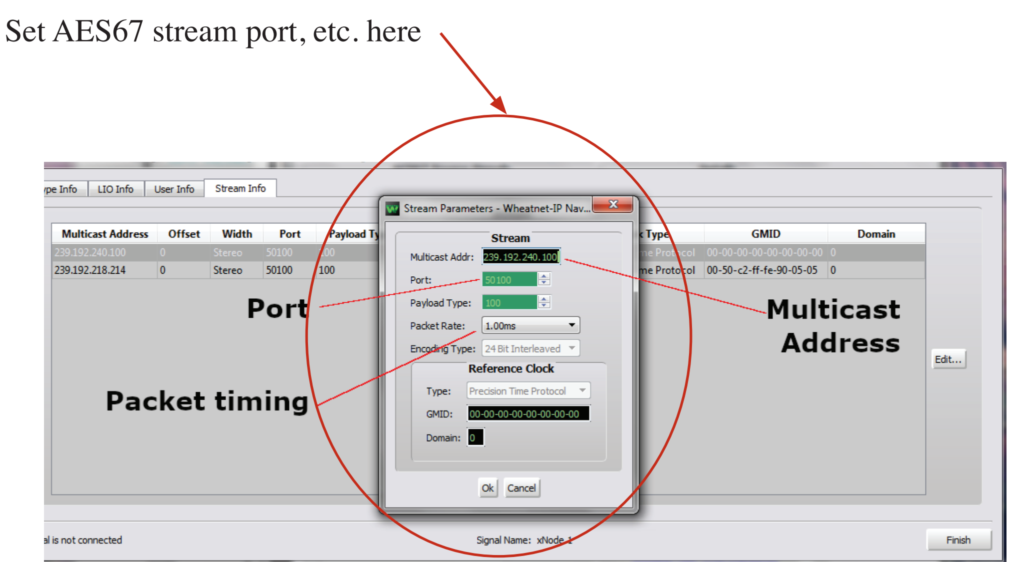
After you’ve checked the box and clicked “Finish,” WNIP will create a translated copy of the source stream with 1ms packet timing.

Clicking on the “Stream Info” window will now show two streams for the source, the standard 1/4 ms WNIP stream and the translated 1ms version.

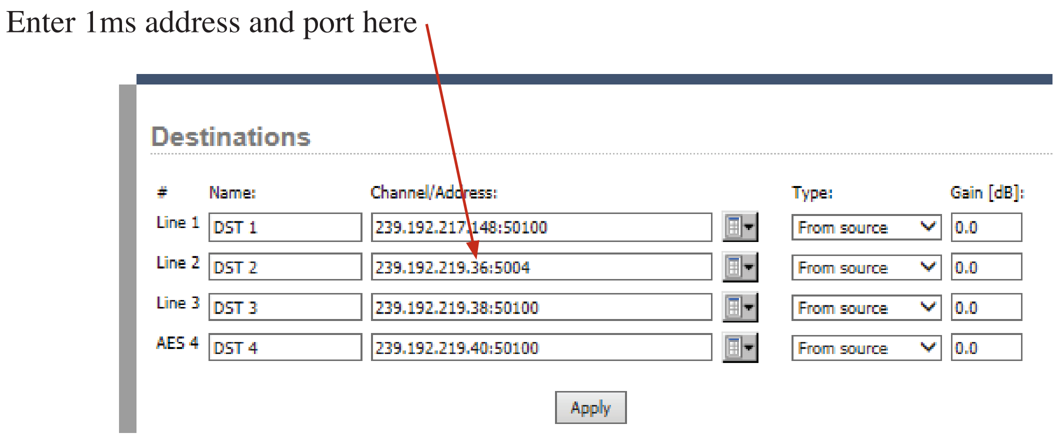


It’s very important to notice that the translated 1ms stream has its own unique multicast address, auto-generated by WNIP. Make a note of this multicast address.

Also, you can click on this new stream and choose “Edit” if you need to change ports to the default AES67 5004. There’s a practical reason to use 5004 as the port for AES67 streams even if your AES67 device does not require it. In the System View---->Source Streams window you can click on the “Port” column and the streams will be sorted by port#. This allows you to quickly see all of your AES67 streams in one place which can be handy in a system with hundreds of signals.



Once you have configured the AES67 1ms stream, you just need to open a browser window into the xNode and enter the multicast address for it into the xNode destinations window and you're all set as in Example 3. With devices that don't require 1ms packet timing we recommend that you stick to 1/4 ms for best latency performance; you'll need this translation technique only for devices like Dante that don't support it.



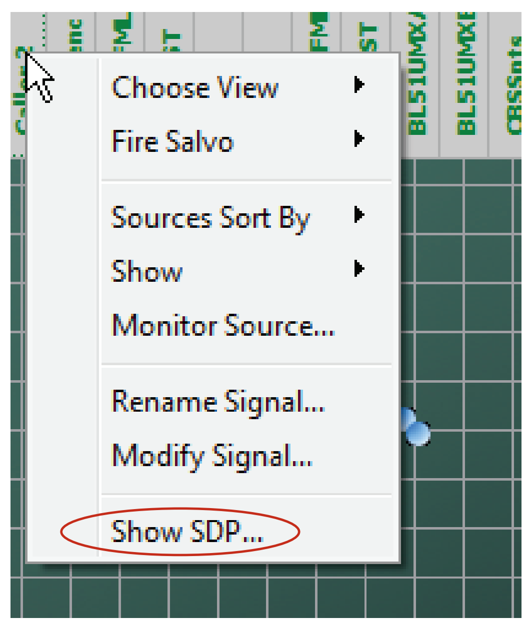
SDP Files

The AES67 standard provides a way for stream transmitters to encapsulate all of this multicast address/IP address/port/packet timing/format information about their AES67 streams in a standardized way; the so called SDP file.

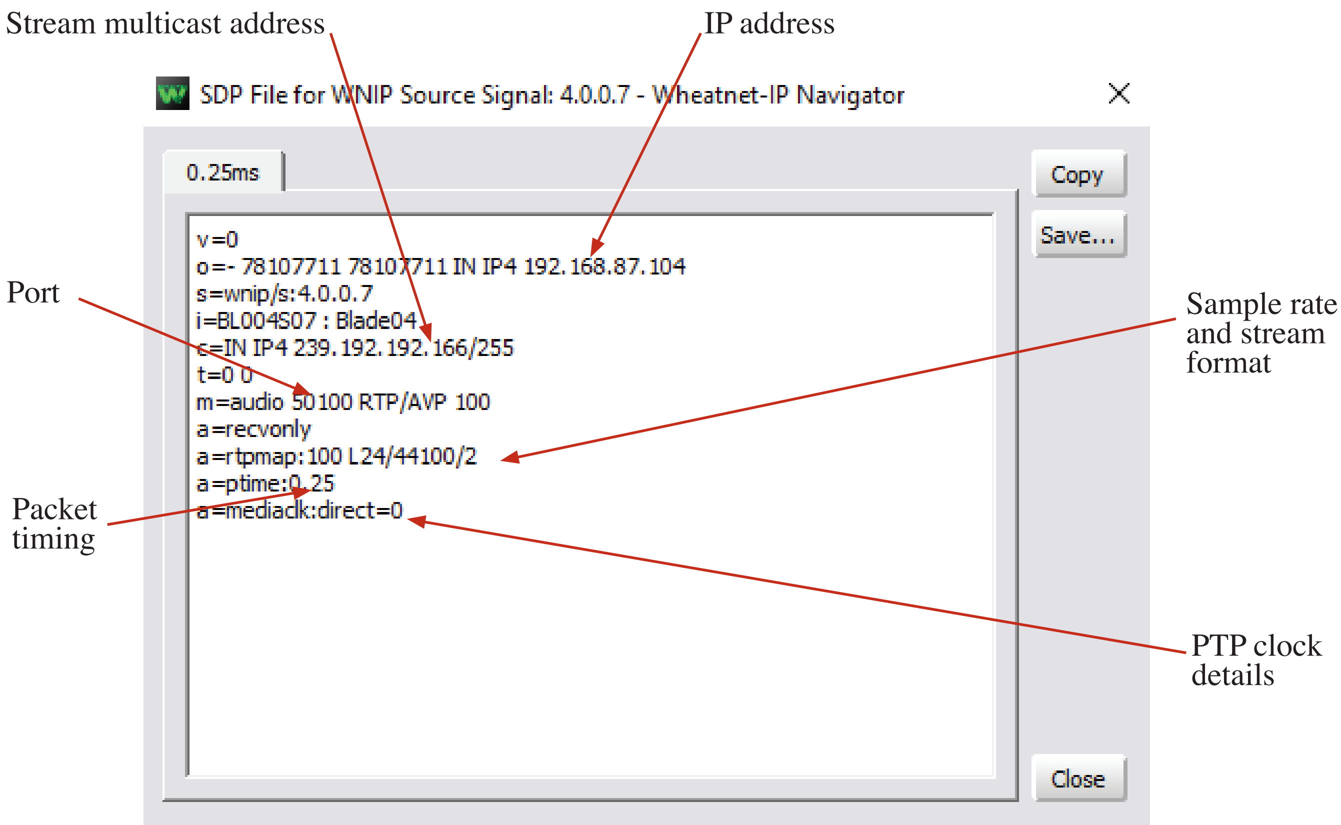
Some AES67 devices will not let you manually mange streaming details as we have done in the previous examples. Although it is the same information, these type devices can only ingest it in the form of this SDP file.

WNIP provides a simple mechanism to create an SDP file for any desired WNIP stream for AES67 devices that require one.

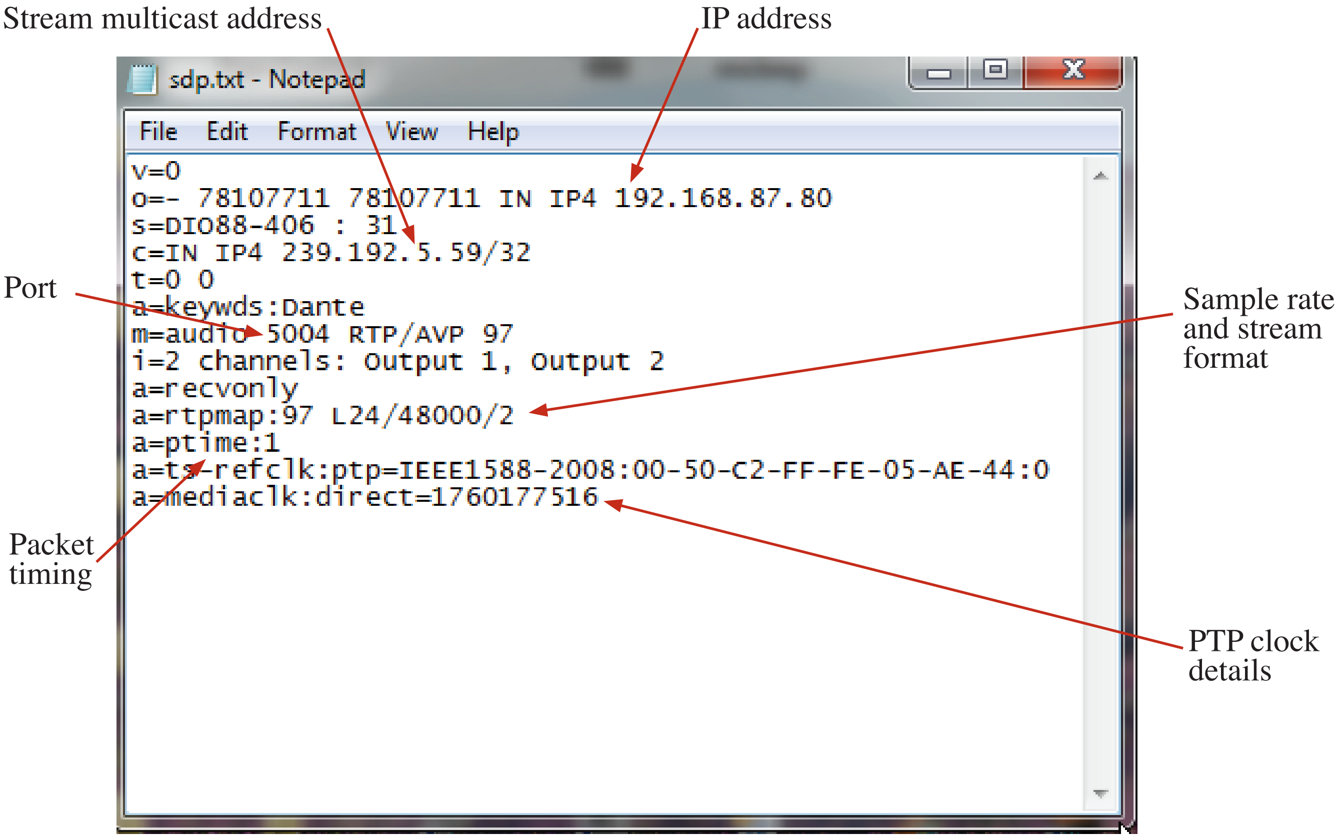
To create an SDP file for a WNIP stream, right-click on the desired source stream's name on the Navigator crosspoint grid. This will open a window that will allow you to create the file.



SAMPLE SDP file from WNIP



SAMPLE SDP file from Dante



Summary

In this Appendix we've shown how to inter-operate AES67 devices with a WNIP system. While the process is somewhat cumbersome due to the nature of the AES67 standard and its lack of stream discovery and connection management specs, it is practical and it works.

Once you've set it up its very reliable and if you do so wisely and use our suggestion for destination source control via Utility Mixer, your set-up efforts will only be needed once.

Our examples here are for a specific AES67 device (Axia xNode) but the techniques are universal and will work with any AES67 device as far as the WNIP side is concerned. Each vendor has their own way of configuring their own devices and you will need to understand and use them as far as the individual devices are concerned. The methods vendors use are quite varied and may take a bit of studying to understand but the principles are the same:

- Provide a PTPv2 master clock source by using a Master Clock.
- Assure all devices are on the same IP subnet as multicasting does not normally cross subnet boundaries.
- Configure the desired multicast addresses, port, packet timing, and payload type for Source streams.
- Configure Destinations with the stream details for the desired stream to receive.

In the examples we've shown, we used devices (WNIP and xNode) that allow direct editing of stream details/parameters so as to provide a clear sense of what is happening under the hood. Not all AES67 device vendors allow such direct editing, but the principles are the same. Some venders depend on the reception of an SDP file for each stream. Some even require the stream details to be "announced" in their specific stream discovery protocol. This is an unfortunate consequence of the incomplete nature of the AES67 standard and one we have to live with if we want to inter-operate with AES67 based devices.

You'll need to know exactly how the device you want to use with your WNIP system is meant to be configured in order to be successful. Obviously we have not interfaced with every single AES67 compatible device out there, but we have worked with a good number of them in our shop and at various AES sponsored Interop workshops. We've successfully inter-operated with all of them and you will too.

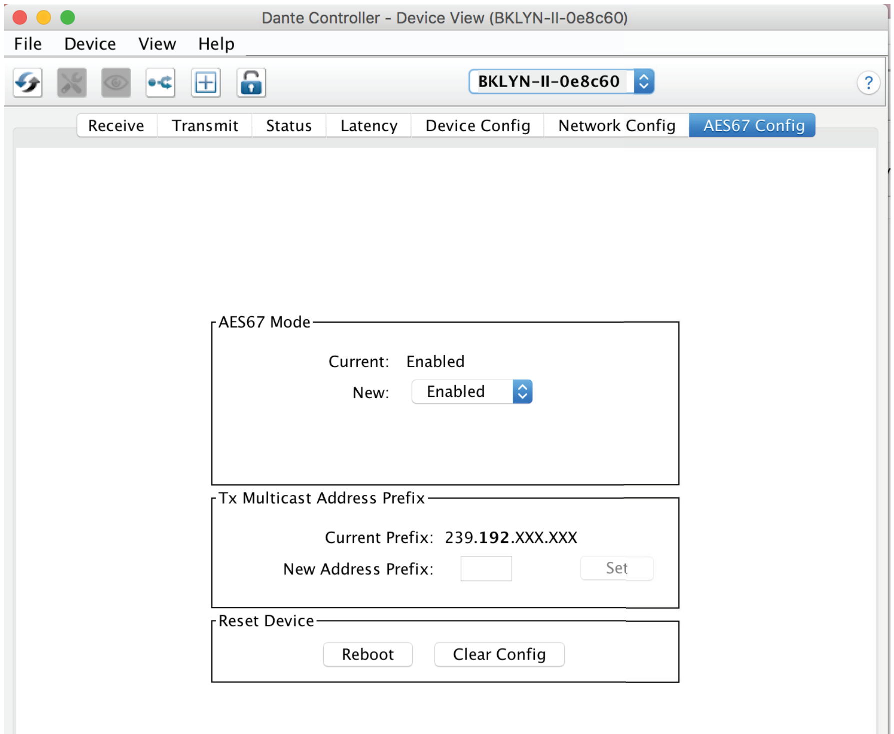
That's not to say that there aren't any problem with AES67. Beyond the stream discovery and connection management issues already discussed there are still a number of shortcomings.

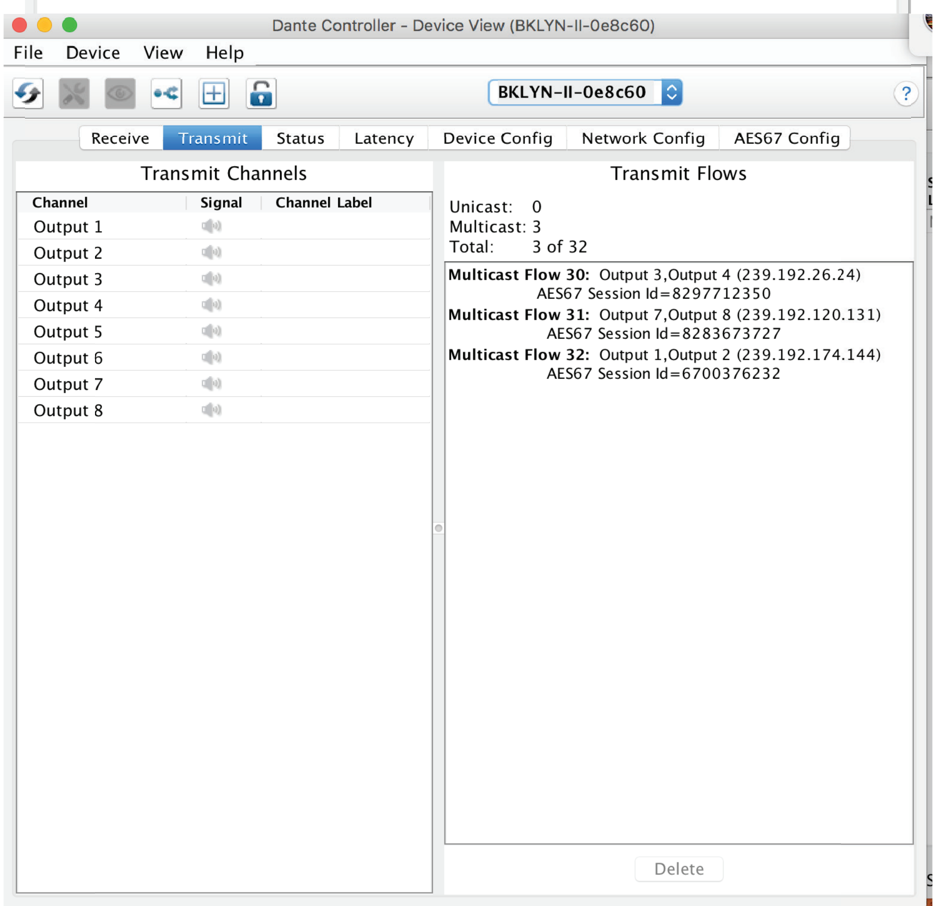
WNIP has been designed to be a dynamic AoIP system, not just an I/O device. All WNIP devices communicate lots of system level information on the network. Change a source name in Navigator and every WNIP device in the system instantly updates the source name it will show the user. Want to change the gain of the mic preamp in a BLADE somewhere? Turn the gain knob on your console. Want some logic control function to be mated to an audio signal (say like Machine Start) and have the function follow wherever the audio is routed? WNIP does that. How about a crosspoint grid that lets you manage every connection in the system, with connection dots that turn red if the audio level gets too hot? Or a Salvo that can change dozens of connections at once with the click of one button. Silence detection and automatic switch over is another WNIP feature as is audio processing on any signal in the system.

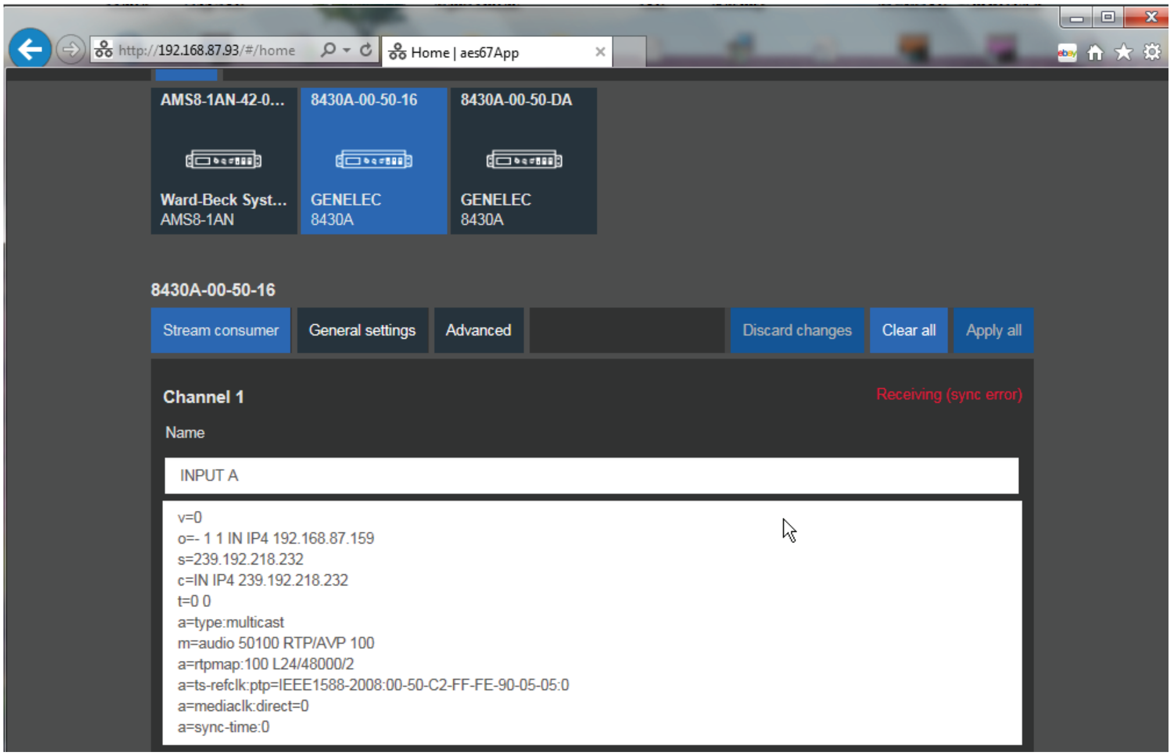
Add an AES67 device to your WNIP system and it won't do any of that. But the AES67 compatibility we've built into WNIP and described above means that you can add any AES67 compatible device to your system and be confident you can stream audio to/from it.

Here's to success inter-operating with AES67!

More Vendor Config Screen Examples



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GENELEC
8430A
8430A-00-50-16
Stream consumer
General settings
Advanced
Discard changes
Clear all
Apply all
Channel 1
Receiving (sync error)
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s=239.192.218.232
c=IN IP4 239.192.218.232
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