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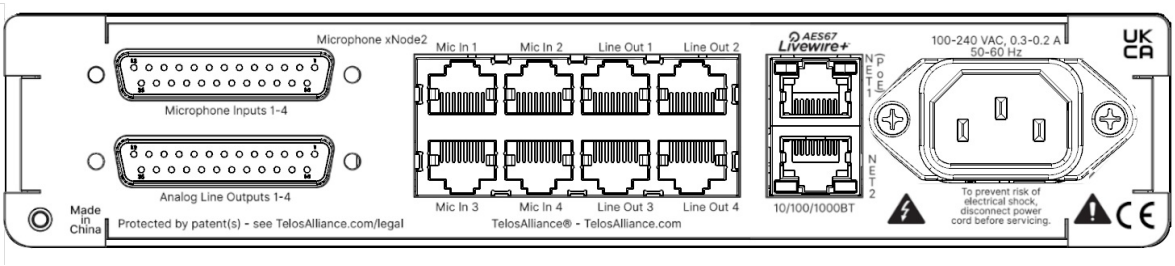
Microphone xNode2

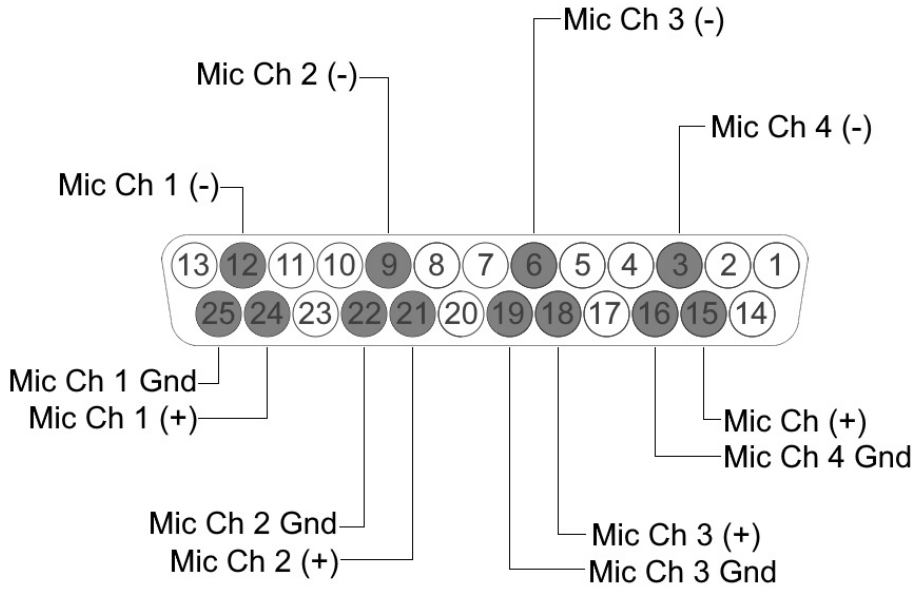
The Microphone model is composed of 4 Mono Microphone or line level inputs and 4 stereo line level outputs. The inputs and outputs can be wired with the DB25 connectors or the RJ45 connectors. The top DB25 connector is for the inputs while the bottom DB25 is for outputs. **A bank of 4 RJ45 is for Mic inputs and a bank of 4 RJ45 is for outputs.**

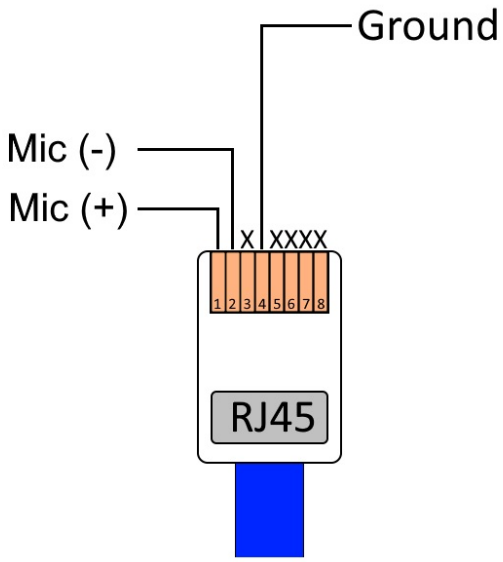


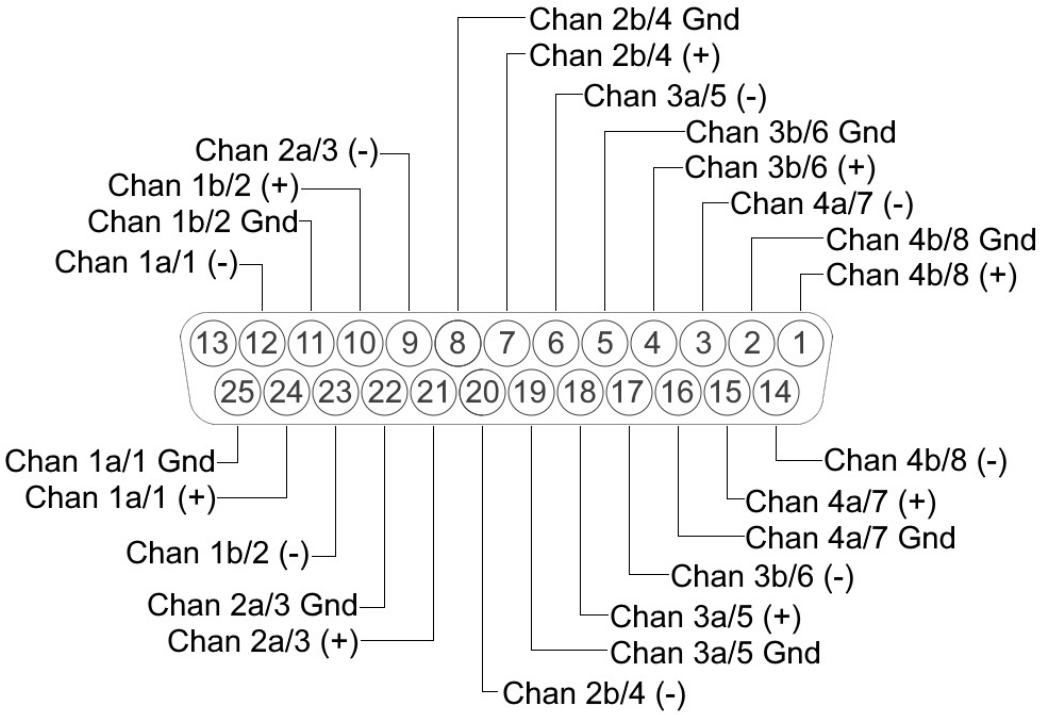
Important !

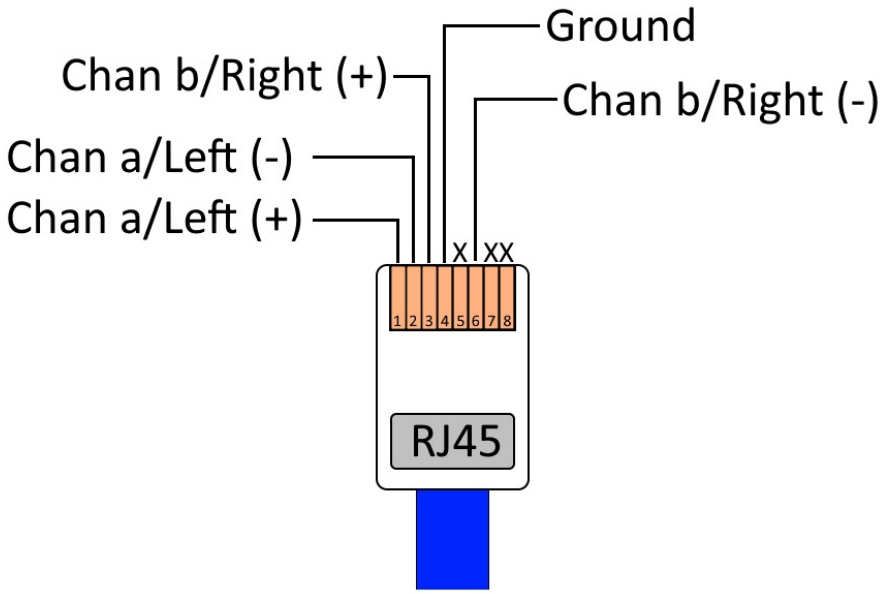
The connector layout in the microphone model is different than any other xNode2. Traditionally the inputs are on the top RJ45s and outputs are on the bottom RJ45s. Due to the large difference in signaling between the input and output (microphone level vs line level), the design was changed where the microphone signals are isolated from the line output to reduce the risk of cross talk between the channels. Please make note of this change and use the rear silkscreening as reference on where the inputs are vs the outputs.

Power to the model is either with an AC power input or a PoE+ at the top network connection. The bottom network connection is a non PoE+ interface used for management or streaming redundancy.


Mic Ch 3 (-)
Mic Ch 2 (-)
Mic Ch 4 (-)
Mic Ch 1 (-)
13 12 11 10 9 8 7 6 5 4 3 2 1
25 24 23 22 21 20 19 18 17 16 15 14
Mic Ch 1 Gnd
Mic Ch 1 (+)
Mic Ch (+)
Mic Ch 4 Gnd
Mic Ch 2 Gnd
Mic Ch 2 (+)
Mic Ch 3 (+)
Mic Ch 3 Gnd


Ground
Mic (-)
Mic (+)
X XXXX
1 2 3 4 5 6 7 8
RJ45

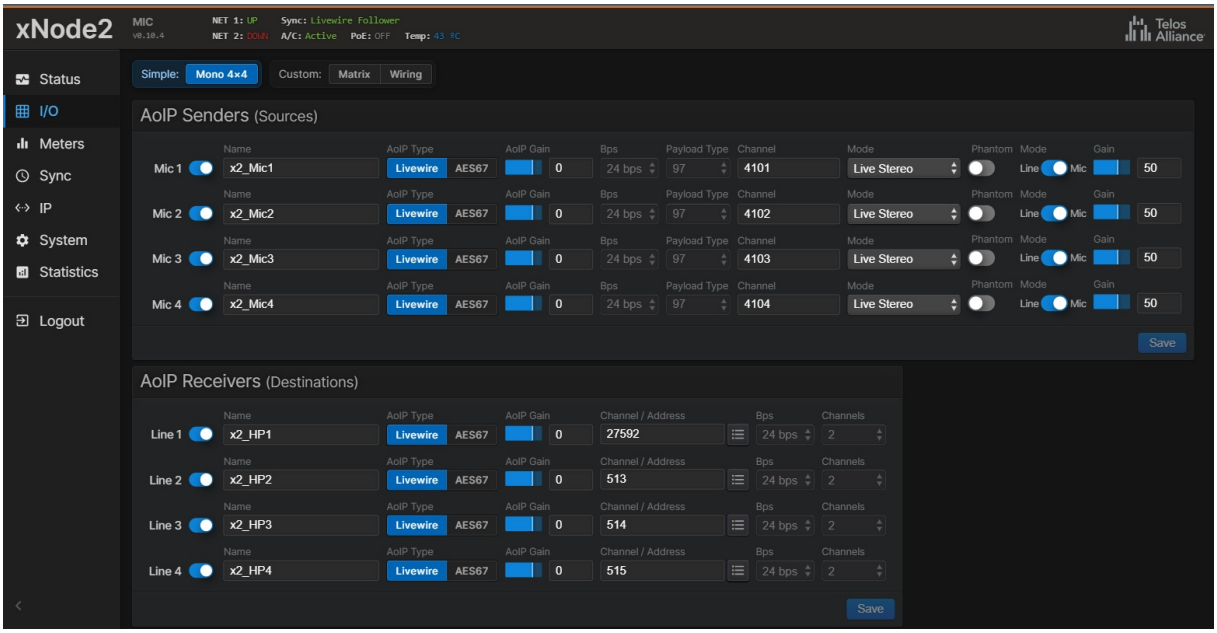

Chan 2b/4 Gnd
Chan 2b/4 (+)
Chan 3a/5 (-)
Chan 3b/6 Gnd
Chan 3b/6 (+)
Chan 4a/7 (-)
Chan 4b/8 Gnd
Chan 4b/8 (+)
Chan 2a/3 (-)
Chan 1b/2 (+)
Chan 1b/2 Gnd
Chan 1a/1 (-)
13 12 11 10 9 8 7 6 5 4 3 2 1
25 24 23 22 21 20 19 18 17 16 15 14
Chan 1a/1 Gnd
Chan 1a/1 (+)
Chan 1b/2 (-)
Chan 2a/3 Gnd
Chan 2a/3 (+)
Chan 2b/4 (-)
Chan 3a/5 Gnd
Chan 3a/5 (+)
Chan 3b/6 (-)
Chan 4a/7 Gnd
Chan 4a/7 (+)
Chan 4b/8 (-)


Ground
Chan b/Right (+)
Chan b/Right (-)
Chan a/Left (-)
Chan a/Left (+)
X XX
1 2 3 4 5 6 7 8
RJ45

Setup

Chapter Two describes how to assign an IP address to the xNode2. Chapter Three, In-Depth, describes the various pages available in the xNode2. Once you have your inputs inserted into the connector of choice, DB25 or RJ45, login to the HTML interface and select the I/O link. Give each AoIP Sender a name that describes the audio source. This becomes useful when browsing the network. Assign any gain needed for the source or leave at the default unity gain of 0. Each sender on the network needs a unique channel between 1 and 32767. A common model is to use the last octet of the IP address as a preamble to the channel number. For example, and address of 192.168.2.201 could utilize the channels 2011 - 2014. Figure out a scheme that works for your facility deployment. Define if the stream shall be a Live Stereo or Standard Stereo (likely Live since these are Microphone inputs). Determine if the microphone connected is a condenser microphone and if so you will need to apply phantom power to the microphone. The mode of the input is assumed to be microphone, but there is the option to switch it to line. Determine an appropriate mic gain that provides suitable audio. Press the Save button and now the xNode2 is streaming AoIP into the network.

The AoIP Receivers portion of the I/O page is similar in that the name field is useful for documenting what is connected to the xNode2 and thus receiving the audio in the AoIP stream. Define any gain values needed for each receiver or leave at the default unity gain. Use the channel picker to browse the network for the desired stream or type it in directly into the channel field if the channel number is known. Press the Save button and now the devices connected to the xNode2 are receiving audio (assuming there is audio in the received audio streams).



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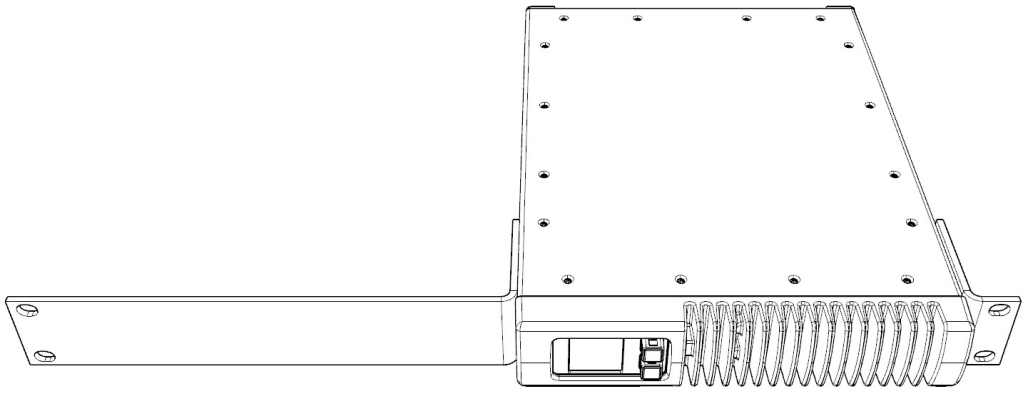
Configuration

The xNode2 is designed as an AoIP interface where *baseband* is converted to AoIP and vice versa. The target placement is in an equipment rack. The ½ RU device can be racked individually or joined with another to make a full RU assembly.

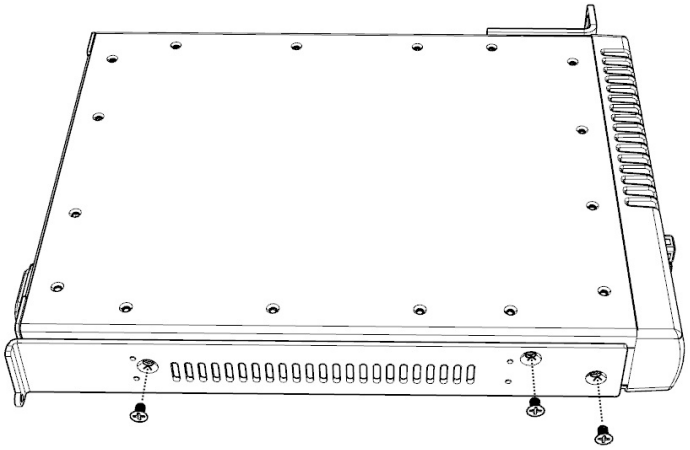
Single (1/2 RU) Mounting

Connect a single short rack ear (1451-00671) with two flat head screws to the left or right side of the xNode2.
Connect the long rack ear (1451-00670) to the other side with two flat head screws.

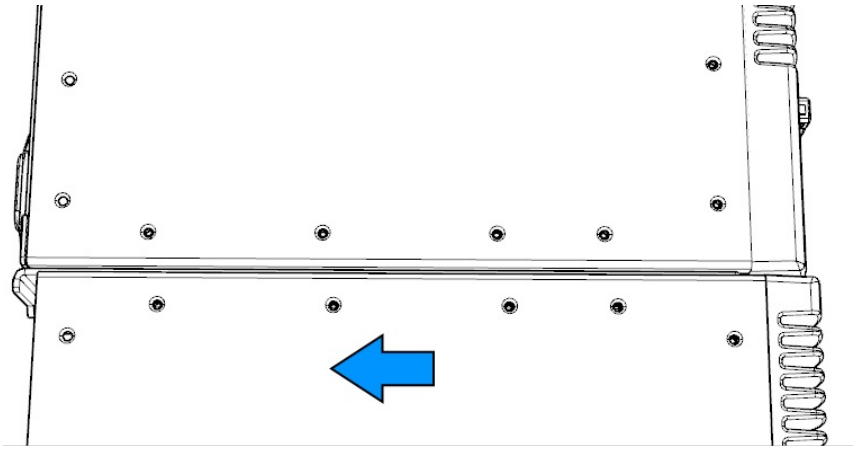


Dual (1 RU) Mounting

Fasten the L-Bracket (1771-00128) to the left side of the xNode2 with three flathead screws.



Place the second xNode2, so that the shoulder screws of the bracket fit into the keyholes. Slide the xNode2 into place. **NOTE: The shoulder screws may require adjustment for better fit.**



Lock the xNode2 in place with a screw secured to the back.

Fasten the two short rack ears (1451-00671) to either side with 2 flathead screws each.

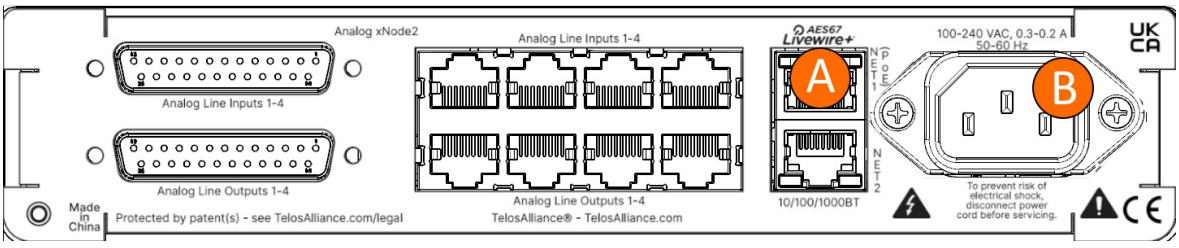
Quick Start Guide

This guide assumes

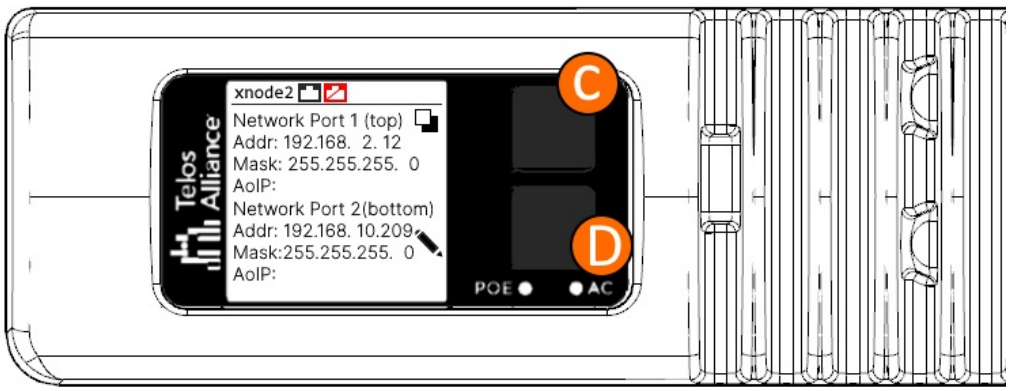
- Basic networking knowledge
- An approved network switch is appropriately configured for use with AoIP traffic.

Connect the configured network to the xNode2 with a patch cable (A). If the network connection offers PoE+, the xNode2 will boot. Otherwise, connect AC power to the IEC connector (B).

> The xNode2 will boot within 40 seconds.



Press the top button (C) from the front panel once so the display shows the network settings. The soft key indicator of a writing utensil will appear, indicating the bottom button can trigger an edit. Press and hold the bottom button (D) for 5 seconds to enter edit mode.



Use the top button to increment the value by one or the bottom button to move the cursor to the next slot. Set an IP address for Network Port 1 and the appropriate netmask value. Continue to move the cursor through all the slots. Once passed through all the slots, a pop-up will ask to confirm the IP change. Press the top button (C) to highlight **Yes,** followed by the bottom button (D) to confirm. The device will reboot with the assigned IP address, which you can use to access the device's configuration pages.
Begin by launching a web browser and entering the IP address you just assigned to the xNode2. The device will ask for authentication.

> ***The following authentication will be in place at initial release to maintain similarity to the previous xNode, but will change at a future date.***

The username will be user, and there is no password.
Refer to the in-depth chapter or the chapter related to the model you use for detailed configuration options.

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In-Depth

This chapter covers details that are common to all models within the xNode2 family. Rack mounting of a xNode2 is covered in chapter 2. Following chapters will cover details specific to each model.

Front Panel Interface

The LCD screen and two power LEDs provide basic operational status. The two buttons next to the display allow for navigating the pages and editing some properties. Setting up the IP address of the device would be done from the front panel.

Power LEDs

Two LEDs identify if power is available from the source. The two sources are PoE+ and AC. If present the LED will be illuminated. Labeling on the lens indicates the source.

Buttons

Two buttons allow for paging through different views and triggering action. The top button is typically for paging between views. The bottom button is a soft key and the screen will indicate its feature. When in editing mode, (i.e. Network Configuration), the icons near the buttons will indicate the function of the button. In the editing mode, the top button becomes an increment function while the bottom button becomes a next function.

Page to next screen

ID

Initiate a bootp request

Edit (hold down for 5 seconds to initiate edit mode)

+1

Increment a value by 1

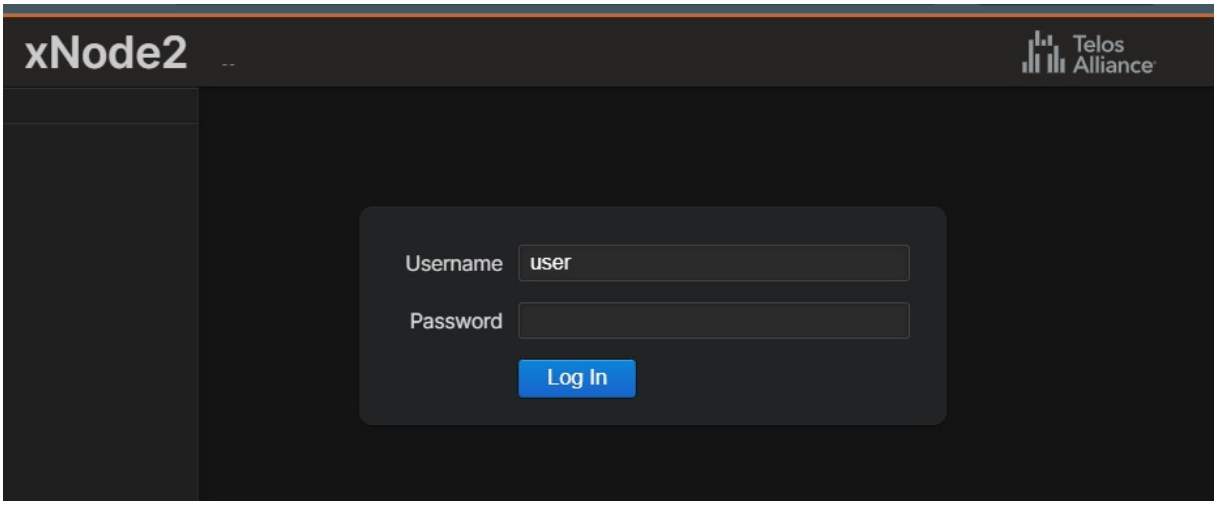
Move cursor to next position

LCD Display

The LCD display is a color display that will dim brightness after a period of no operation. To awaken the display, max brightness, press one of the buttons.

Web Interface

With a known IP address established from the front panel, access to further configuration is done from the web interface. Accessing the IP will initiate a request to login.

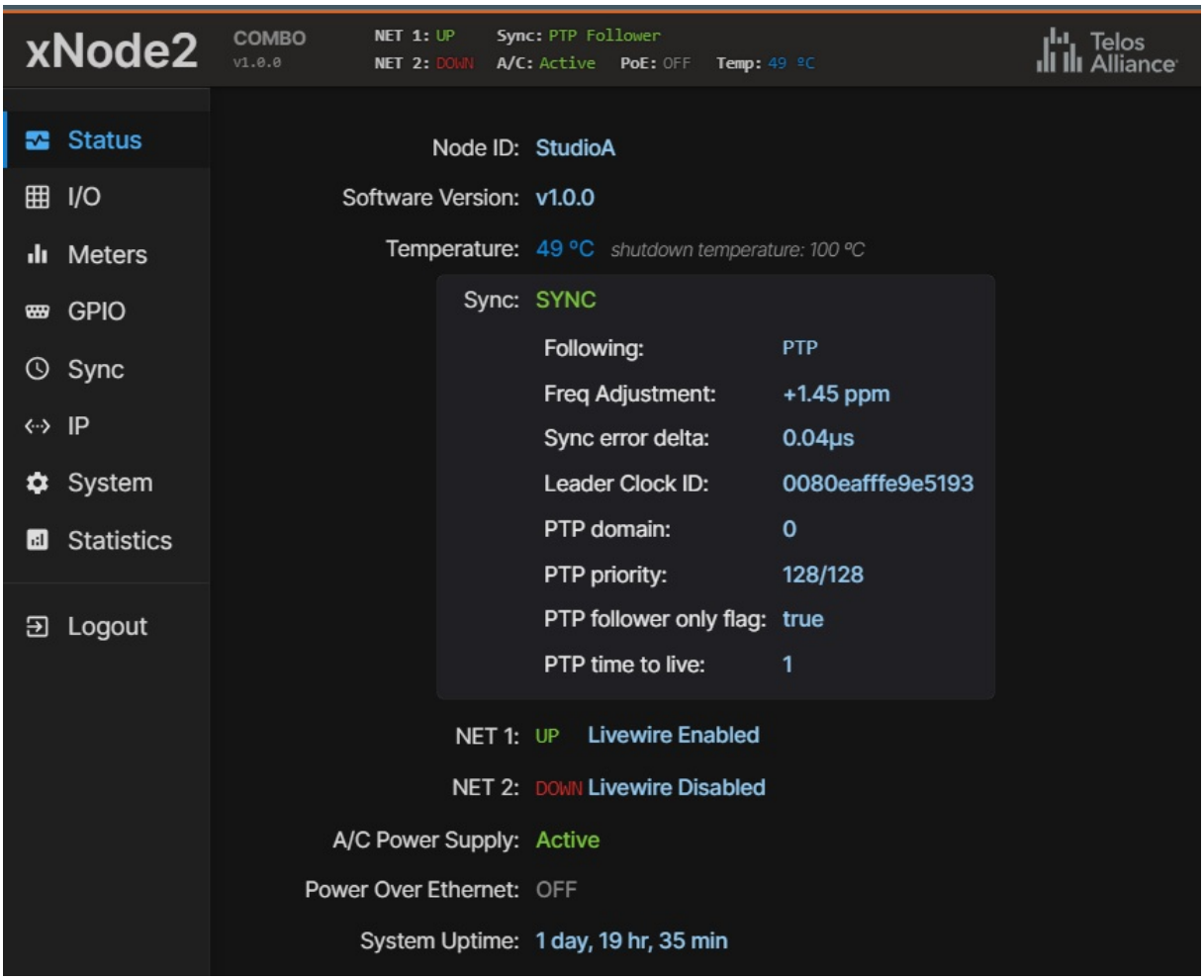


The authentication is a username of **user** with a password that is empty.

> **info**
>
> > ***The following authentication will be in place at initial release to maintain similarity to the previous xNode, but will change at a future date.***

Home Page

Once authenticated, the screen will default to a status page or “home” page.



The page is composed of a Navigation menu on the left side that can be compressed or expanded (arrow on bottom left). The navigation menu options will vary a little between model of xNode2.

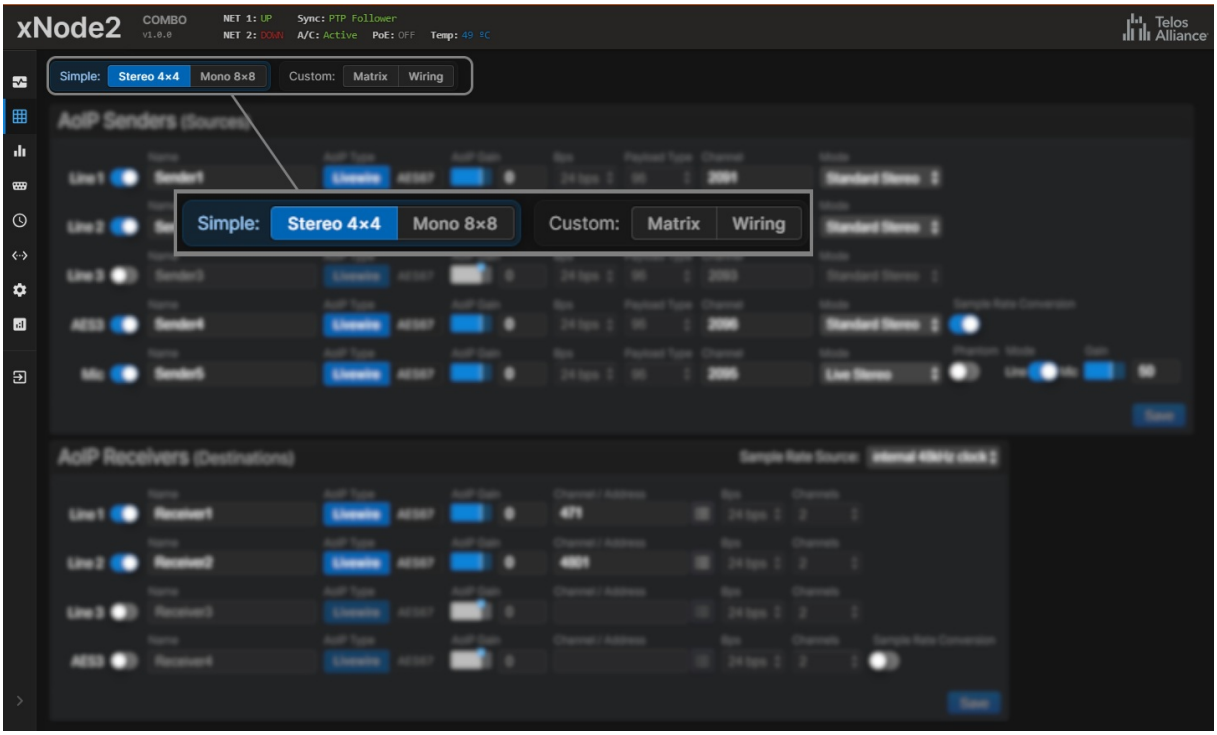
The center section is the general system information which key properties are duplicated on the header so a view of them is maintained as you go to other menu options.

- NodeID: This is the hostname of the unit which has a default value and can be changed from the IP page.
- Software Version running. Software changing is managed through the System page.
- Temperature of the CPU will be colored based on how hot it is getting. Above 85C would be a high temperature warning and at 100C would cause shutdown

- Synchronization status
  The sync section will indicate if the device is a source of clock (Leader) or is following and thus is synchronized (SYNC). When following, information on the state of synchronization is shown. Delta [δ] is the phase error. It shows the differential between the local time of the xNode2 compared to network time recovered from the leader. Sigma [σ] is a spread around the mean of the differential. It shows how noisy the signal is. A healthy network is expected to be +/- 1uS.
- Network interface status
- Power supply status
- System Uptime

I/O

I/O page shows an audio control view for the model of xNode2. There are two categories of views to select from, simple and custom.



Simple Views

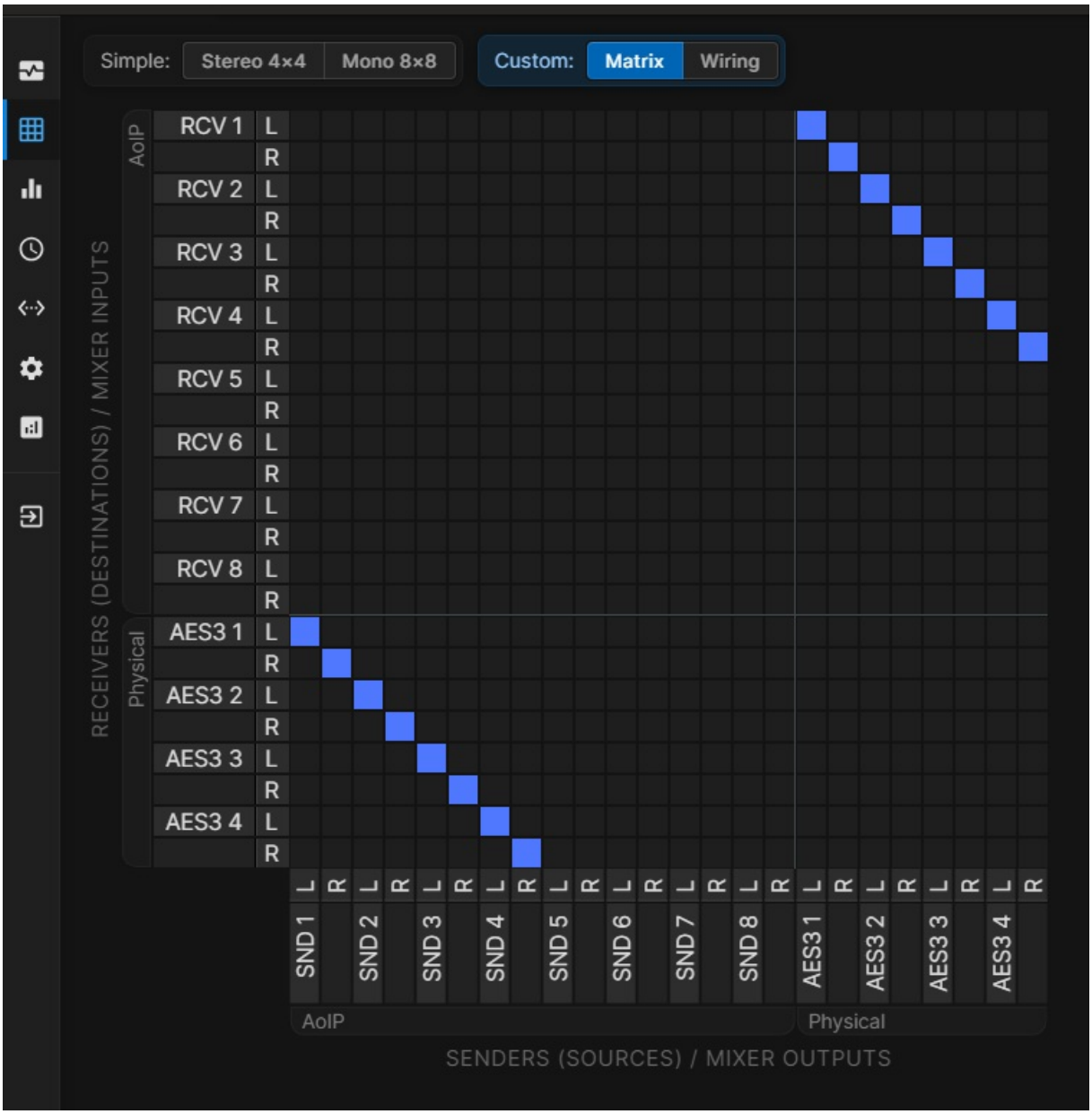
Simple is for basic operation of the xNode2 where you need to convert baseband audio to AoIP streams and streams to baseband. Stereo view will give a view that allows you to configure 2 channel inputs (or stereo inputs) into streams and give you control of the properties related to those inputs and streams. Your inputs will turn into AoIP Senders (or Sources in legacy Axia parlance). Likewise, you will have a view of the AoIP Receivers (Destinations in legacy Axia parlance) which allows for selecting the network streams that will be assigned to the 2 channel (or stereo) ports at the rear of the xNode2.

The Mono 8×8 view is similar in nature to Stereo except the controls are treating the 2 channel i/o as mono channels. If your audio system is mono, you can insert the single channel and define the single stream that contains that audio.

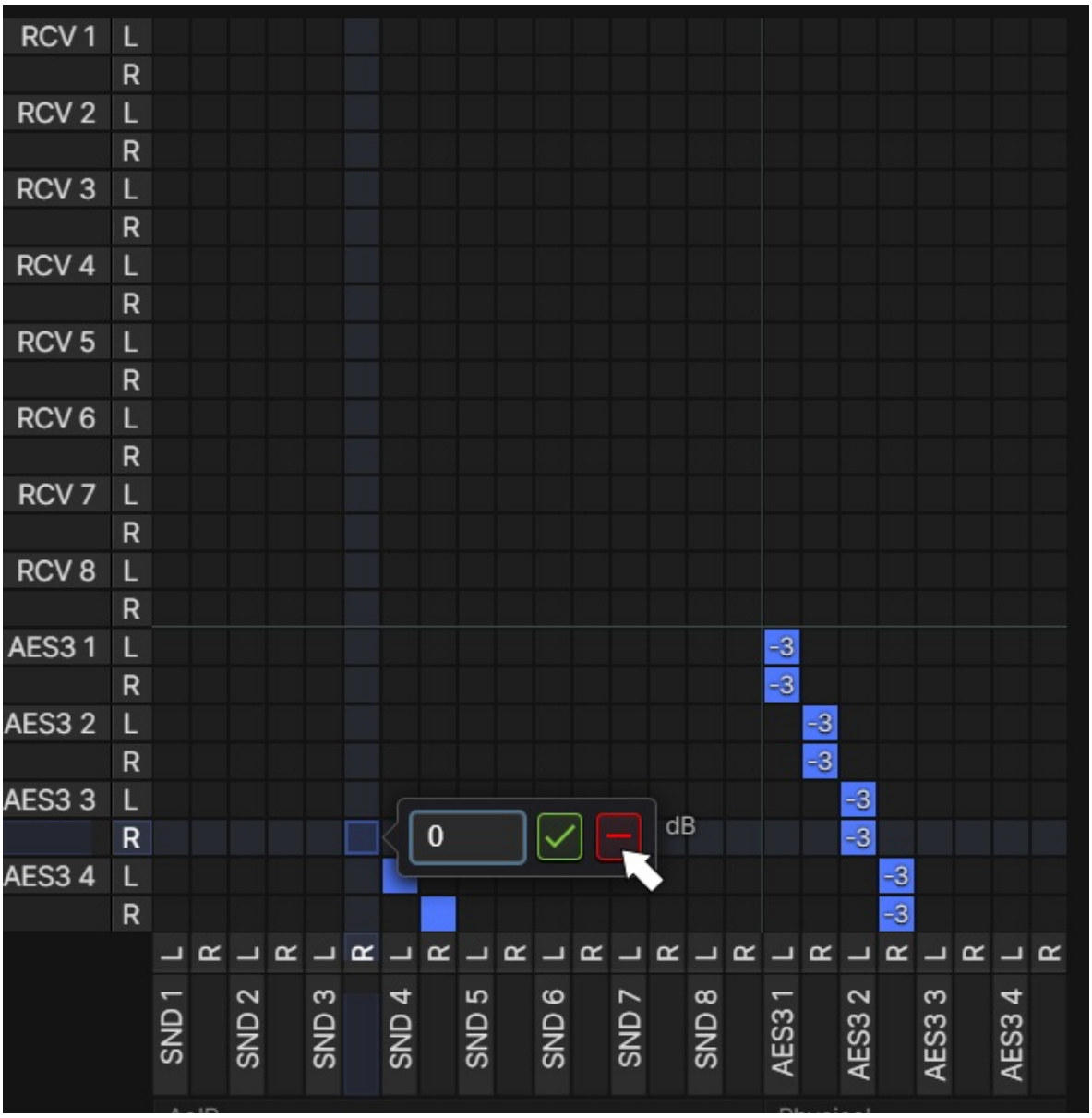
Custom Views

The two custom views are Matrix and Wiring. The views provide the same functionality, but in different views.

The matrix view offers a grid presentation where the inputs into the mixer are listed on the left had side and these are composed of AoIP streams, 8 receivers, and physical inputs related to the model of xNode2. The bottom of the mixer represents the outputs composed of AoIP streams, 8 senders, and physical outputs associated with the model of xNode2. The view allows you to define (or route) how the inputs go to outputs. The below view shows the default 4×4 stereo routing of a Digital (AES3) model. Four AoIP Receivers are assigned (routed) to the four physical 2-channel outputs and the physical 2-channel inputs assigned (routed) to four AoIP Senders.



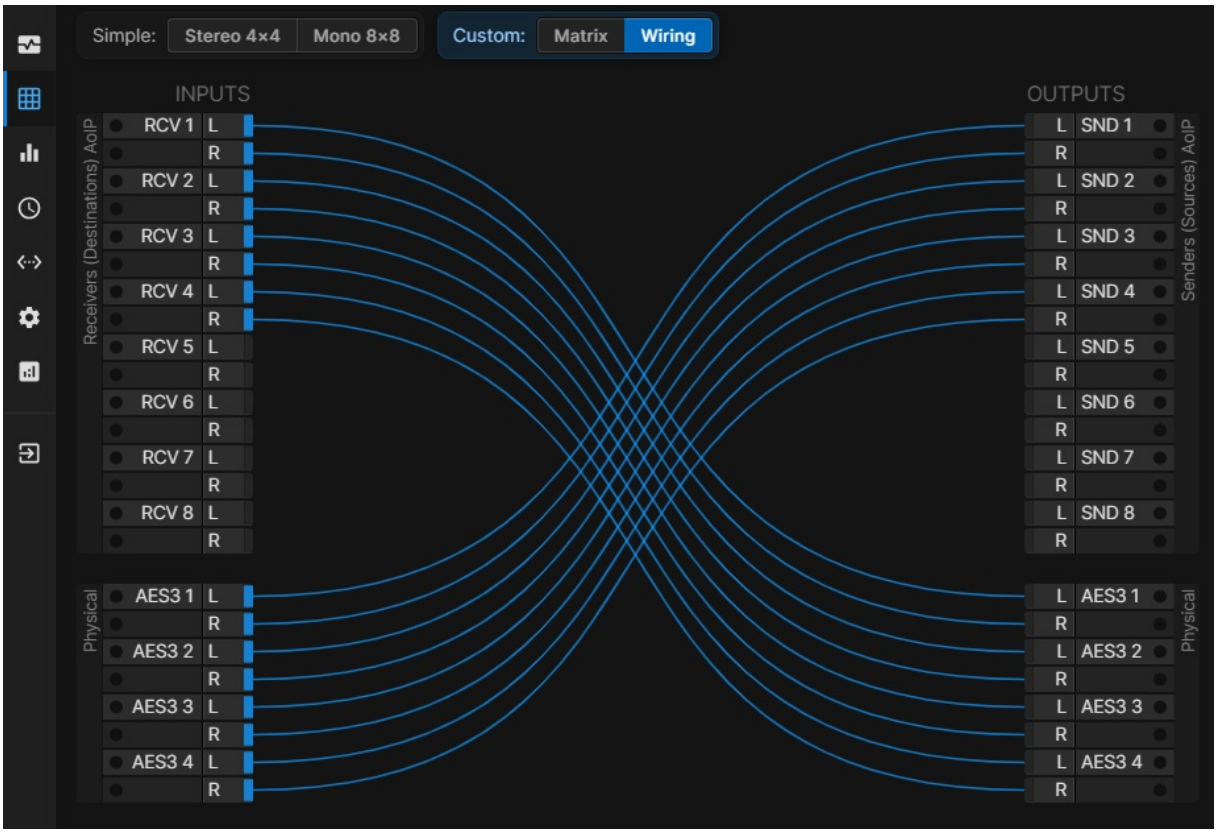
To edit the assignment (or routing), place the mouse at the cross connection point and press the left button which will open an edit pane where a gain value, a check (confirm) button, and a minus (remove) button will be presented. To change the matrix such that the four AES3 inputs get mono summed to a channel of an AES3 output and the AoIP streaming functionality is not utilized, the connections between the physical inputs and outputs would be created by selecting them, adding the -3 gain value and pressing the check button and selecting the connections between AoIP streams and AES3 io and pressing the negative button (to remove).



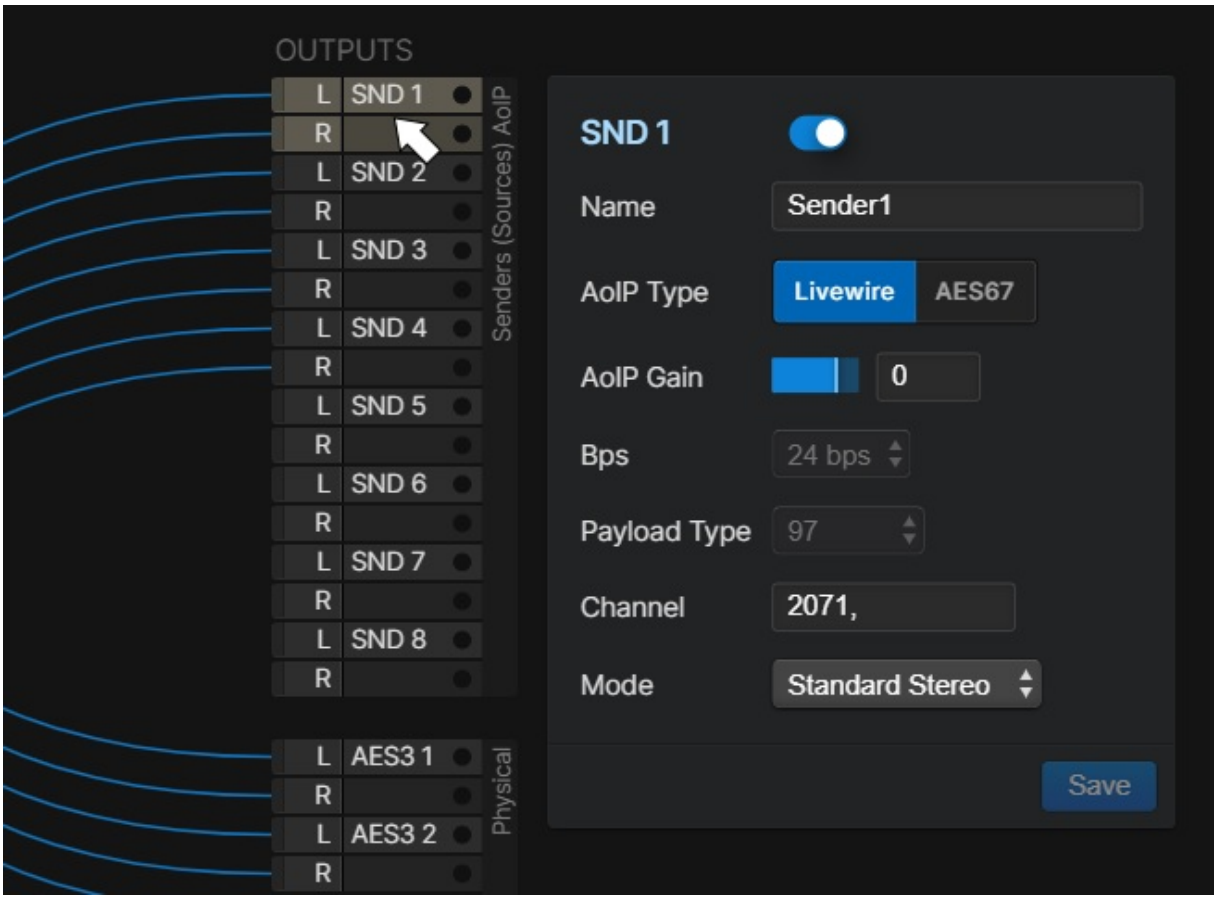
Why would you do this? I'm not sure, but if you wanted or needed to, you can!

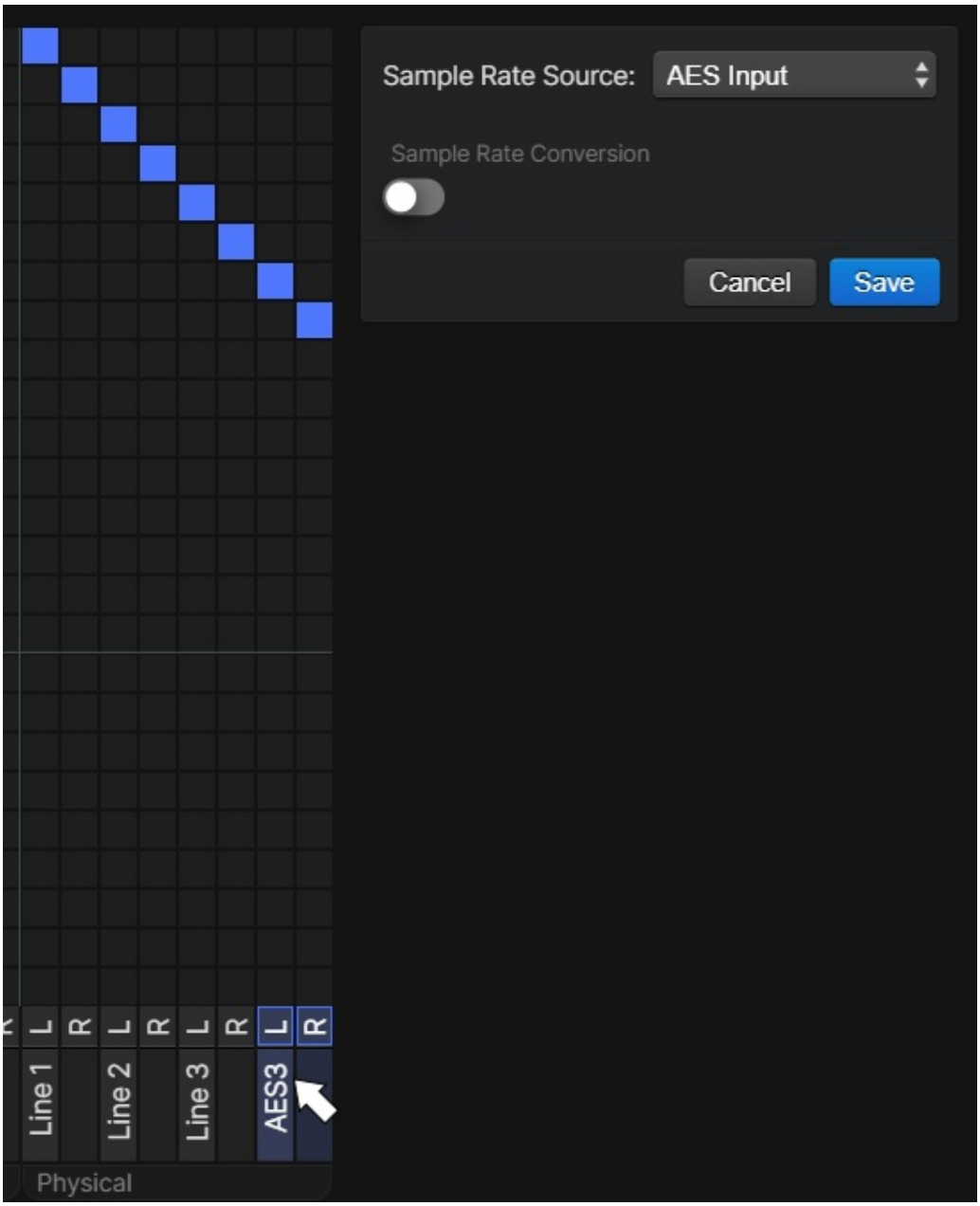
> **Quick Tip**
>
> Holding down the Ctrl key (Option key) while selecting the cross connect will toggle it between active and removed.

The wiring view is similar in how the audio can be routed within the xNode2, but in a line presentation. The view below is the default Stereo routing where four AoIP Receivers are assigned (routed) the the four AES3 output ports and four AES3 input ports are assigned (routed) to four AoIP Senders. To remove a wire, have it selected and press the Del key on the keyboard.



With both the Matrix and Wiring view, the properties of a Sender, Receiver, physical input, and physical output can be edited by selecting the item. Available space in the window will populate with the editable properties of the object selected.


OUTPUTS
L SND 1
R
L SND 2
R
L SND 3
R
L SND 4
R
L SND 5
R
L SND 6
R
L SND 7
R
L SND 8
R
Senders (Sources) AoIP
L AES3 1
R
L AES3 2
R
Physical
SND 1
Name
Sender1
AoIP Type
Livewire
AES67
AoIP Gain
0
Bps
24 bps
Payload Type
97
Channel
2071,
Mode
Standard Stereo
Save

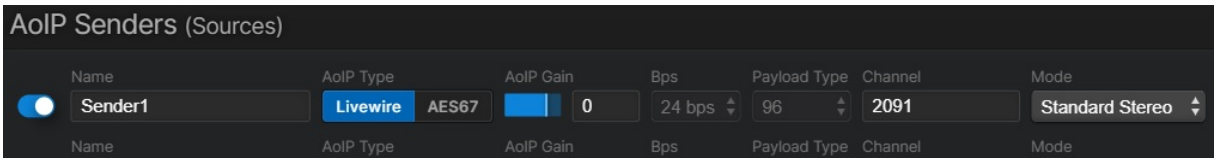


In some cases the object will not have any properties, for example analog line inputs, and nothing will appear when selecting the object.

Object Properties

From any of the IO views the properties of objects can be edited. In the custom view those items are hidden until they are selected. In the simple view, the properties are on display.

AoIP Senders (Sources) have the following properties



- Enable/Disable switch: This will turn off the stream if set to disabled. If configured without stream properties, it will set itself to disabled.
- Name: A human friendly text field that will assign the stream a name that will be used in advertisement information to make it easier to find the desired stream within the network.
- AoIP switch: Depending on the intended use, the selected item will present (or hide) additional controls. For example, Livewire has a fixed use on port 5004. This control item is hidden from view when Livewire is selected so not to dirty the display with unneeded information. Livewire has two modes of streams, Standard stereo or Live Stereo. These modes define the packet time, but the UI doesn't complicate the configuration with technical details that may not fully be understood, like 5ms ptime or 0.25ms ptime. Simple terms like Live Stereo and Standard stereo are much more recallable and understood.
- Gain: This is a digital gain applied to the audio prior to streaming. The lowest gain (attenuation) that can be set is -72dB and a maximum gain is 24dB. Don't worry, you don't need to recall these values as the UI will tell you if you enter an invalid value.
- Channel: In Livewire parlance, streams are defined as a simple channel number. The permissible values are 1-32767. Each audio stream in the network needs a unique number.

  info

  Livewire channel numbers get translated into multicast address values. When Livewire was created in early 2000s, Telos Alliance recognized that multicast addressing was a little complicated for the broadcast industry at the time. The decision was made to simplify the management of 100s of streams (maybe even 1000s!) by defining a simple number that would translate to a multicast address. Basically the address used is 239.192.x.y where x and y are calculated from the Livewire number. The value x or y is an 8-bit number, so a 255 limit.
  So a channel of 200 would equate to 239.192.0.200.
  A channel of 2091 would be 239.192.8.51.
  In full disclosure, Livewire also uses a range of 239.193.x.y for streams that originate from DSP engines and are known as backfeeds.
  For further information on multicast addressing in general, one can find various information on the internet, like this one from **Wikipedia**.

- Mode: The options are Live Stereo or Standard stereo. Basically if it is a microphone, it should likely be Live Stereo and everything else Standard Stereo. This isn't a hard rule and experience will vary. Technically this defines the ptime (packet time) or the amount of audio in each packet. This value impacts the delay in audio. The selection is a trade off between efficiency and delay. Standard Stereo packets utilize the maximum amount of data allowed in a packet. This is more efficient data transfer because each packet requires headers, checksum, etc which are required to traverse the Ethernet switches. In contrast, Live Stereo mode has a very small amount of data (audio) in each packet. It takes 20 Live Stereo packets to equal the amount of audio in a single Standard Stereo packet. Each of those 20 packets have header and checksum bits. So audio that is Live Stereo takes up more bandwidth to deliver the same audio as Standard stereo. The reason to choose Live over Standard is when the generator of the audio would be listening to the audio. Example is a host speaks into a microphone, the stream would traverse the network, pass through a DSP cycle, and return to the host as audio they listen to in headphones. Unsuitable amount of delay in the audio will be challenging for the host. In contrast, an audio file that is a recording of the same host can be delivered (played out of a PC) with maximum packet efficiency (lower bandwidth consumption) and host will not be bothered when listening.

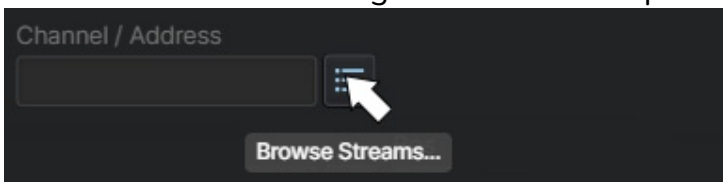
When the AoIP Type has AES67 selected, the controls change a little for orientation of AES67 use cases.

- Payload type: RTP streams have a payload type and between vendors or facilities the value can have specific importance. For example some facilities may use a payload type for audio and another payload type for video.
- Address: Define the specific multicast address assigned to the stream. AES67 uses the technical multicast address and not channels as Livewire does (see above information on how a channel equates to an address).
- pTime: Packet time or the amount of audio in the packet. Generally speaking this is 1ms.

AoIP Receivers (Destinations) have the following properties

- Enable/Disable switch: Disabling the receiver will stop the request to receive the multicast stream from the network.

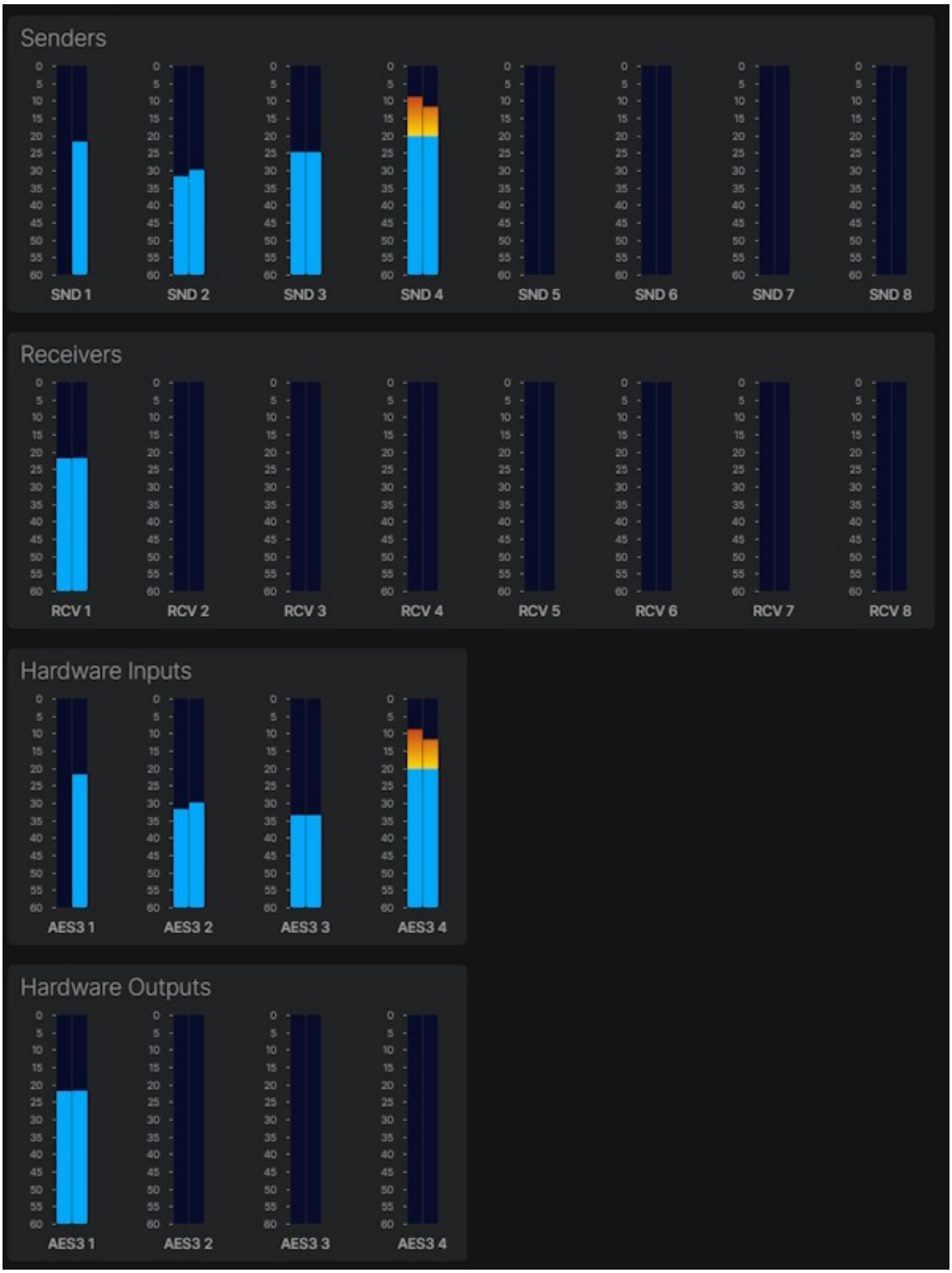
- Name: A human friendly text field that is used to define the receiver for purposeses to identify it in control protocols. For example the name could be StudioSpeaker and this would populate in the Livewire Routing Control Protocol so a controller like Pathfinder would be able to identify to the user that the network location would feed audio to the Speakers in the Studio.
- Gain: A digital gain applied to the audio before it is sent to the baseband audio output. Again the lowest gain (attenuation) that can be set is -72dB and a maximum gain is 24dB.
- Channel/Address: This defines the stream that will be received from the network. The channel number or the multicast address can be manually entered into the text field. Alternately, the *Channel Picker*, a button to the right of the text field, can be used to find and assign a stream. On pressing the button, a larger pane will appear which give a list of stream discovered through advertisement protocols.



Physical object properties will be covered in the unique chapters dedicated to each of the specific models.

Meters

The meter page is available in audio xNode2s (excludes GPIO model). The meter page provides peak metering for the Senders, Receivers, Hardware Inputs and Hardware Outputs. These meters are confidence metering so you know what state the audio is on the various objects.



Sync

The sync page has two “tabs” to chose from which defines the type of sync the xNode2 will participate in. The options are Livewire or PTP.

Livewire

The clock mode option has several options that you can select to fit the need of your facility (use case). The default setting is typically good enough for most. Each xNode2 has a high precision crystal which is good to be a source of clock for a Livewire system. Within the xNode2 is a decision tree on if it should be a leader or a follower of sync. The first item in the tree is what priority does the xNode2 have. The second item in the tree is if there are clock packets already on the network. In cases of conflict, start comparing priorities and in cases of ties, give priority to lowest MAC address.

- Livewire follower: This is priority 0 or never try to be a leader of clock.
- Livewire clock priority 1: Lowest priority to me a leader of clock
- Livewire clock priority 2
- Livewire clock priority 3: This is the default setting. Middle of the range.
- Livewire clock priority 4: Called the secondary leader. So if you were creating a hierarchy of leaders, one could be a 4 and another could be
- Livewire clock priority 5: Called the primary leader in a hierarchy of capable xNode2.
- Livewire clock priority 6: For those time you need to push an xNode2 above in the hierarchy.
- Livewire clock priority 7: Called always leader. This priority setting creates clock packets without regard to what is happening on the network. This is a brute force take leadership role and should be used with care. You might place into 7 and once the offending leader has turned off, move priority to 6 to keep the unit as leader, but not in brute force mode.
- Livewire STL Snake Leader: This is a special use case designed for two nodes operating in snake mode over a wireless network or other not as stable network. Fast clock packets (used by Studio Engines) are not generated and only slow clocks used by node devices is generated.
- Livewire STL Snake Follower: The other end of the special use case that should also be more forgiving with jitter.

The basis of Livewire clock is to allow an existing leader to maintain that role. If a network link is fragile and the xNode2 on the other side of said link is designated to be a leader, the algorithm will not allow the xNode2 to be a leader (unless priority 7 was selected). The reasoning here is keep a stable clock driving the network instead of having a clock come and go and have the network continually renegotiating a leadership role when the designated leader (say Priority 5) flickers on and off due to a fragile link.

PTP

Precision Time Protocol (PTP) is used in AES67 devices. It is strongly suggested to have a dedicate device to act as a PTP grandmaster and have xNode2 follow that device. For small networks or demonstration purposes, xNode2 includes an ability to be a leader of PTP.

Clock mode defines the participation of the xNode2 within a PTP network

- PTP/IEEE 1588 ARB clock class 248: This defines the xNode2 to be an arbitrary leader of PTP per the settings below the Clock Mode.
- PTP/IEEE 1588 ARB clock class 248 + Livewire secondary leader: Defines the xNode2 to be an arbitrary leader of PTP and Secondary Livewire clock for an Axia product that do not support PTP sync.
- PTP/IEEE 1588 ARB clock class 248 + Livewire primary leader: Defines the xNode2 to be an arbitrary leader of PTP and Livewire clock for an Axia product that do not support PTP sync.
- PTP/IEEE 1588 follower only (AES67 Recommended): Defines the xNode2 will follow a PTP source from the network.
- PTP/IEEE 1588 follower only + Livewire secondary leader: Defines the xNode2 will follow a PTP source from the network and will additionally act as a secondary source of Livewire clock, effectively allowing legacy livewire devices to sync from a network PTP source.
- PTP/IEEE 1588 follower only + Livewire primary leader: Defines the xNode2 will follow a PTP source from the network and will additionally act as a source of Livewire clock that legacy livewire devices can sync to the common source.

Domain number (0-127) is a method in which PTP devices make association within a network by having common numbers for domains. Your source of PTP will have a domain number and the followers should be assigned to the same domain number.

Delay Mechanism is not used at this time and may be introduced at a later time.

Clock Priority (0-255) is used to determine a Grandmaster within a network of leaders in the network. Lower numbers have more priority.

Clock sync interval is the rate for sending messages. Two options are available, 16 times a second or 8 time a second.

Time to Live or TTL is a number that defines how many router hops the packets are permitted. A value of 1 would not allow the packet to be routed to another network.

Announce Interval is the rate at which a message is sent for data advertising the leader clock type, accuracy and priority levels. The Announce message is used by the BMC algorithm to determine the most accurate leader for the PTP network.

> **What is an arbitrary PTP leader?**
>
> PTP includes real time information, date and time. Typically a PTP device designed to be a network leader will have options to sync to time, such as GPS, and transmit this in the packets. xNode2, not designed for this functionality, will not transmit real time information and is thus referred to as an arbitrary clock. This is why we do not suggest using an xNode2 as a PTP leader and instead use an actual device designed for he role of a PTP leader. If the network will be a mix of PTP and Livewire sync devices, use an xNode2 to follow the PTP leader while also being a leader of the Livewire sync packets.

IP

IP settings are for the properties related to the network interfaces.

- Hostname: A name applied the machine that would be used to help identify the machine within the network as well as used in Advertisement information.
- Network 1: The IP address/netmask of the top interface which is the default AoIP interface as well as the PoE+ port
- Network 2: The IP address/netmask of the bottom interface used for management if a separate LAN is used for management or for redundancy options.
- Gateway: A routed network needs a gateway device which routing occurs between LANs. Define the gateway device's IP.
- Redundancy Mode:
    - Independent: The top interface will be used for AoIP and the bottom interface could be used for management.
    - Bonded Failover: Redundant interface. If the active interface loses connectivity (switch failure or cable disconnect), the device will transition to the other network interface. This takes 30 seconds based on detection, switchover, and bring up streams on the new interface.
    - SMPTE 2022-7: Redundant stream based on the SMPTE standard.

> **Note**

> Having multiple network interfaces (NICs) on the same network or subnet can lead to various issues, including routing problems, unexpected behavior, and potential connectivity problems. While technically possible, it's generally not recommended and often results in a suboptimal behavior. If using the second network port, insure its configured for a different subnet or used in Bonded Failover mode.

System

Software Updates

Two banks are available for loading and running software updates. The field will inform which bank is running and the software loaded to said bank. A reboot button will permit rebooting the xNode2 the same software version. The other bank will permit loading (Update Software) of an alternate package or to reboot and run the package that is loaded.

Logging Settings

Define the state of local logging as well the the location of remote logging to a syslogger.

Download Logs

Download the quantity of logs as needed for troubleshooting issues.

Statistics

Three items are available through the statistics page, AoIP Receivers, AoIP Senders, and Audio Engine.

AoIP Receivers

- Receiver Active
- 48 Khz Frames Received
- Packets Received (Total, Good, Defects, Duplicates, Malformed)
- Packets Dropped
- Overflows
- Underflows
- Sequence Errors
- RTP Sequence Resets

- RTP ID changes

AoIP Senders

- Sender Active
- Last RTP Sequence number
- RTP Sync Source ID
- Packet send errors
- Packet Sent

Audio Engine

- Engine Task Rate
- Engine Jiffies
- Hard-RT Avg
- Hard-RT Max
- Hard-RT Min
- User Switch Time
- Latency Jitter
- Latency

Logout

Remove the authenticated state to the device.

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Appendix A: Axia GPIO tables and GPIO circuits

The following logic tables come from Axia consoles. Axia consoles have profiles for sources which define many things and one of those properties are GPIO controls. Each table is titled by the source profile type. The functionality is fixed and if the GPIO port is configured to the source number, the GPIO port will participate in the defined logic that is created by the console logic in those other products.

Operator and Control Room Producer Microphone

Designator	Name	Pin	Description
INPUTS			
IN-1	ON command	11	Turns channel ON
IN-2	OFF command	12	Turns channel OFF
IN-3	TALK1 command (to Studio)	13	Routes Mic audio to talkback mix and inserts mix into the Studio 2 monitor mix
IN-4	MUTE command	14	Mutes channel
IN-5	TALK2 command (to sources in Preview or IFB)	15	Routes Mic audio to talkback mix and inserts mix into any backfeed source that is engaged in Preview (IFB)
OUTPUTS			
OUT-1	ON lamp	1	Active when the channel is ON unless TALK or MUTE are active.
OUT-2	OFF lamp	2	Active when the channel is OFF.
OUT-3	TALK1 lamp	3	Active when TALK to Studio is engaged
OUT-4	MUTE lamp	4	Active when MUTE is engaged
OUT-5	TALK2 lamp	5	Active when TALK to Previewed sources is engaged

Guest Microphone (Control Room or Studio)

Designator	Name	Pin	Description
INPUTS			
IN-1	ON command	11	Turns channel ON
IN-2	OFF command	12	Turns channel OFF
IN-3	TALK command (to CR)	13	Mutes channel and routes Mic audio to Preview mix
IN-4	MUTE command	14	Mutes channel
IN-5		15	*No logic associated with type*
OUTPUTS			
OUT-1	ON lamp	1	Active when the channel is ON unless TALK or MUTE are active.
OUT-2	OFF lamp	2	Active when the channel is OFF.
OUT-3	TALK lamp	3	Active when TALK is engaged
OUT-4	MUTE lamp	4	Active when MUTE is engaged
OUT-5		5	*No logic associated with type*

Line

Designator	Name	Pin	Description
INPUTS			
IN-1	ON command	11	Turns channel ON
IN-2	OFF command	12	Turns channel OFF
IN-3	Preview command	13	Turns the channel's Preview (IFB) ON
IN-4	RESET command	14	Turns channel OFF while not triggering STOP pulse
IN-5	READY command	15	Enables the OFF button to be illuminated if "GPIO ready" feature is enabled in source profile
OUTPUTS			
OUT-1	ON lamp	1	Active when the channel is ON
OUT-2	OFF lamp	2	Active when the channel is OFF and READY (if enabled)
OUT-3	PREVIEW lamp	3	Active when PREVIEW (IFB) is engaged
OUT-4	Start pulse	4	100 msec pulse when the channel status changes from OFF to ON
OUT-5	STOP pulse	5	100 msec pulse when the channel status changes from ON to OFF

Codec

Designator	Name	Pin	Description
INPUTS			
IN-1	ON command	11	Turns channel ON
IN-2	OFF command	12	Turns channel OFF
IN-3	TALK1 command (to CR)	13	Mutes channel and routes audio to Preview mix
IN-4	MUTE command	14	Mutes channel
IN-5	TALK2 command (to SOURCE)	15	Triggers the TALK TO SOURCE function routing Operator Mic to codec
OUTPUTS			
OUT-1	ON lamp	1	Active when the channel is ON unless TALK or MUTE are active.
OUT-2	OFF lamp	2	Active when the channel is OFF.
OUT-3	TALK1 lamp	3	Active when TALK to control room is engaged
OUT-4	MUTE lamp	4	Active when MUTE is engaged
OUT-5	TALK2 lamp	5	Active when TALK TO SOURCE is active

Telephone

Designator	Name	Pin	Description
INPUTS			
IN-1	ON command	11	Turns channel ON
IN-2	OFF command	12	Turns channel OFF
IN-3	Preview command	13	Turns the channel's Preview (IFB) ON
IN-4	RESET command	14	Turns channel OFF while not triggering STOP pulse
IN-5	READY command	15	Enables the OFF button to be illuminated if "GPIO ready" feature is enabled in source profile
OUTPUTS			
OUT-1	ON lamp	1	Active when the channel is ON
OUT-2	OFF lamp	2	Active when the channel is OFF and READY (if enabled)
OUT-3	PREVIEW lamp	3	Active when PREVIEW (IFB) is engaged
OUT-4	Start pulse	4	100 msec pulse when the channel is first turned ON or PREVIEW (IFB) is selected.
OUT-5	STOP pulse	5	100 msec pulse when the channel is turned OFF or PREVIEW (IFB) is disengaged.

Computer Playout

Designator	Name	Pin	Description
INPUTS			
IN-1	ON command	11	Turns channel ON
IN-2	OFF command	12	Turns channel OFF
IN-3	Preview command	13	Turns the channel's Preview (IFB) ON
IN-4		14	*No logic associated with type*
IN-5	READY command	15	Enables the OFF button to be illuminated if "GPIO ready" feature is enabled in source profile
OUTPUTS			
OUT-1	Next Pulse	1	100 msec pulse when the ON button is pressed
OUT-2	OFF lamp	2	Active when the channel is OFF and READY (if enabled)
OUT-3	PREVIEW lamp	3	Active when PREVIEW (IFB) is engaged
OUT-4	Start pulse	4	100 msec pulse when the channel status changes from OFF to ON
OUT-5	STOP pulse	5	100 msec pulse when the channel status changes from ON to OFF

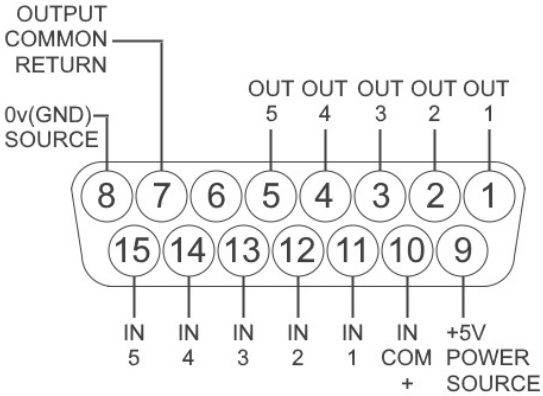
Monitors (Control Room)

Designator	Name	Pin	Description
INPUTS			
IN-1	MUTE Command	11	Mutes monitors and preview
IN-2	DIM Command	12	Dimming is applied to monitor
IN-3	EXT PREVIEW command	13	Routes external preview defined source into PREVIEW
IN-4	TALK TO EXTERNAL command	14	Enables TALK TO EXTERNAL where Operator Mic is routed to the Talk to External output
IN-5		15	*No logic associated with type*
OUTPUTS			
OUT-1	ON AIR lamp	1	Active when the Monitor is muted
OUT-2	DIM lamp	2	Active when the Monitor is DIMMED
OUT-3	PREVIEW lamp	3	Active when PREVIEW (IFB) is engaged
OUT-4	TALK TO EXT lamp	4	Active when TALK TO EXT is engaged
OUT-5	Talk to CR	5	Active when a source is active in talking to Control Room

Monitors (Studio)

Designator	Name	Pin	Description
INPUTS			
IN-1	MUTE Command	11	Mutes monitors
IN-2	DIM Command	12	Dimming is applied to monitor
IN-3	Trigger timer	13	Resets Count-up timer
IN-4	Tigger countdown timer	14	Resets Count-down timer
IN-5		15	*No logic associated with type*
OUTPUTS			
OUT-1	ON AIR lamp	1	Active when the Monitor is muted
OUT-2	DIM lamp	2	Active when the Monitor is DIMMED
OUT-3	Timer trigger lamp	3	100ms pulse when timer is started
OUT-4	Countdown trigger lamp	4	100ms pulse when countdown timer is started
OUT-5	TALK TO STUDIO lamp	5	Active when TALK TO STUDIO is active

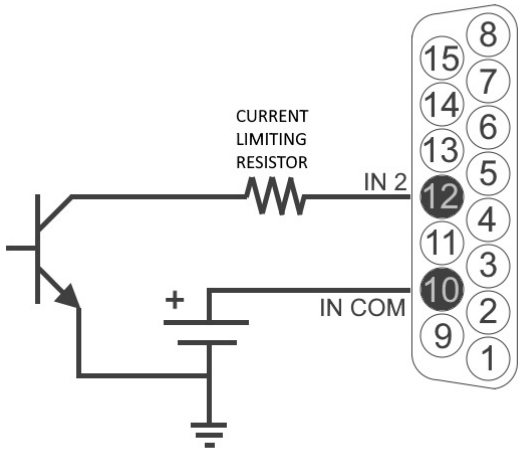
The connector pinout for the DA15 is composed of 5 inputs, a common return, 5 outputs, an in common, a 5 volt DC source, and a source ground.



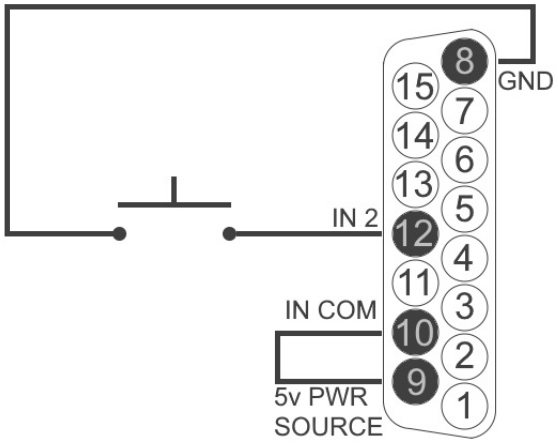
The maximum allowed external power supply for logic is 48 volts DC. The use of current limiting resistor is required for some voltages.

INPUT	
VDC	**External Series Resistor**
5	0
6	0
12	680 @ ¼ watt
24	1.8k @ ½ watt
48	3.9k @ 1 watt

A sample circuit if using an external supply.

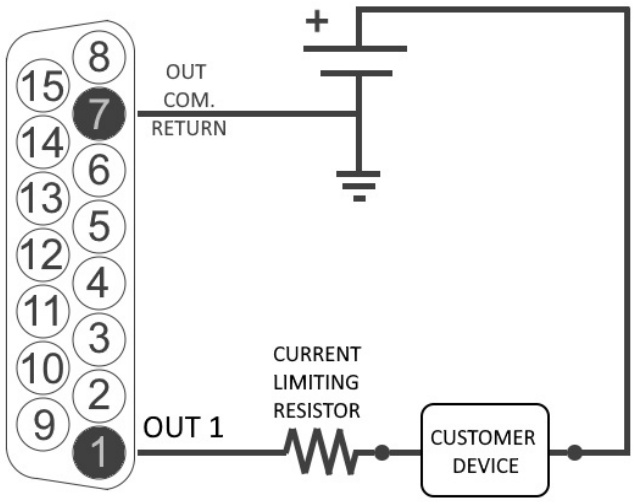


Take note to use current limiting resistor per the previous chart if the voltage supplied is above 6vDC. The intention is to limit the current to 20mA for each GPI pin. If the equipment being connected is electrically isolated, then the use of the GPIO port's power supply is acceptable.

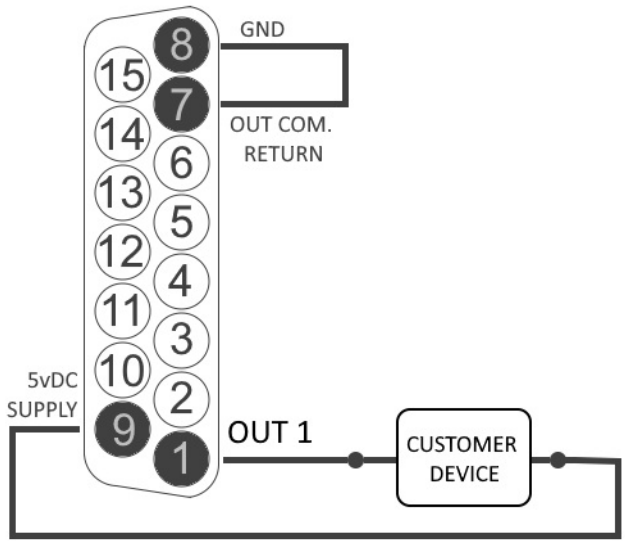


Axia GPIO accessory modules are designed to interface directly to the GPIO port. The DA15 connector on the back of an accessory module is a direct pin-to-pin match to the GPIO port of the xNode2. Premade cables of this configuration are commonly available through companies that specialize in interconnect cable assembly products.

The GPO pins are solid state relays. Current should be limited to a combined 100mA through all the pins of a port. A connection with an external power supply would appear as follows.



If the device being connected is electrically isolated, than the 5vDC supply can be used, maintaining a 100mA limit on current drawn.



The Axia accessory modules use the 5vDC supply to illuminate LED based buttons. So a one-to-one pin connection is all that is needed between any accessory modules and a GPIO port.
All the inputs and outputs on a specific GPIO port are “grouped together”. The 5 outputs are on 5 separate output pins, however, they share the same Common Return connection on pin-7. Similarly, the 5 inputs pins would be pulled to ground to activate them, and they share a common pin for a high-side rail on pin-10. If more than one connected device is to be connected to a single 15 pin port , you must make sure that the two units in question have the same ground potential or ground loops will occur. It is recommended that only one remote device be connected to each port to assure complete electrical isolation.

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Appendix B: xNode2 Specifications

Microphone Preamplifiers

- Source Impedance: 150 Ohms
- Input Impedance: 4k Ohms minimum, balanced
- Input type: Line or Microphone
- Microphone PreAmp Gain: Adjustable, 14 dB to 68 dB
- Phantom power: +48VDC, switchable Analog Line Inputs
- Input Impedance: >40k Ohms, balanced
- Nominal Input Range: +4 dBu
- Input Headroom: 20 dB above nominal input

Analog Line Inputs

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

Analog Line Outputs

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

Digital Audio Inputs and Outputs

- Reference Level: +4 dBu (-20 dB FSD)
- Impedance: 110 Ohm, balanced
- Signal Format: AES3 (AES/EBU)
- AES3 Input Compliance: 24-bit with sample rate conversion
- AES3 Output Compliance: 24-bit
- Digital Reference: Internal (network timebase) or external reference 48 kHz, +/- 2 ppm
- Internal Sampling Rate: 48 kHz
- Input Sample Rate: 32 kHz to 192kHz

- Output Sample Rate: 44.1 kHz or 48kHz
- A/D Conversions: 24-bit, Delta-Sigma, 256x oversampling
- D/A Conversions: 24-bit, Delta-Sigma, 256x oversampling

Frequency Response

- Any Input to Any Output: +/- 0.5 dB, 20 Hz to 20 kHz

Latency

- Analog Input to Analog Output, 4ms including network, converters, and mixing process
- Digital Input to Digital Output, 3.5ms including network mixing engine (ASRC off)

Dynamic Range

- Analog Inputs to Analog Outputs 104dB referenced to 0dBFs, 111dB A-weighted
- Analog Inputs to Digital Outputs 110dB referenced to 0dBFs, 113dB A-weighted
- Digital Inputs to Analog Outputs 110dB referenced to 0dBFs, 115dB A-weighted
- Digital Inputs to Digital Outputs 126dB

Equivalent Input Noise

- Mic Pre Input to Analog Output: < 0.005%, 1 kHz, -36dBu input, +18dBu output
- Analog Input to Analog Output: < 0.005%, 1 kHz, +18dBu input, +18dBu output
- Analog Input to Digital Output: < 0.004%, 1 kHz, +18dBu input, -6dBFs output
- Digital Input to Analog Output: < 0.004%, 1 kHz, -6dBFs input, +18dBu output
- Digital Input to Digital Output: < 0.0003%, 1 kHz, 0dBFs

Crosstalk Isolation, Stereo Separation and CMRR

- Analog Line Stereo Separation: < -90dB, 20Hz to 20kHz
- Analog Line Input CMRR: < - 85dB, 20Hz to 20kHz

- Microphone Input CMRR: < -70 dB , 20 Hz to 20 kHz

Power Supply AC Input

- Auto-Ranging Supply, 95VAC to 260 VAC, 50Hz to 60Hz, IEC Receptacle, Power Consumption: 16 Watts

Operating Temperatures

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

Dimensions

- 8.5” (22 cm) wide; two may be mounted side-by-side in a standard 1RU rack space; 1.72” (4.4 cm) height, 11.75” (30 cm) depth