

xNode

Installation & User's Guide



Manual Rev 1.2.2 - June 2014
p/n 1490-00081-001

USA Class A Computing Device Information To User. Warning:

This equipment generates, uses, and can radiate radio-frequency energy. If it is not installed and used as directed by this manual, it may cause interference to radio communication. This equipment complies with the limits for a Class A computing device, as specified by FCC Rules, Part 15, Subpart J, which are designed to provide reasonable protection against such interference when this type of equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference. If it does, the user will be required to eliminate the interference at the user's expense.

NOTE: Objectionable interference to TV or radio reception can occur if other devices are connected to this device without the use of shielded interconnect cables. FCC rules require the use of only shielded cables.

Canada Warning:

“This digital apparatus does not exceed the Class A limits for radio noise emissions set out in the Radio Interference Regulations of the Canadian Department of Communications.” “Le présent appareil n'émet pas de bruits radioélectrique dépassant les limites applicables aux appareils numériques (de la classe A) prescrites dans le Règlement sur le brouillage radioélectrique par le ministère des Communications du Canada.”

CE Conformance Information:

This device complies with the requirements of the EEC Council Directives: 93/68/EEC (CE Marking); 73/23/EEC (Safety – low voltage directive); 89/336/EEC (electromagnetic compatibility). Conformity is declared to those standards: EN50081-1, EN50082-1.

Important Safety Information

ELECTRICAL WARNING

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired. The installation and servicing instructions in this manual are for use by qualified personnel only. To avoid Electric Shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so. Refer all servicing to trained service personnel.

When using this equipment, the following safety precautions should always be followed to reduce the risk of fire, electric shock, and injury to people.

- Read and understand all instructions.
- Follow all warnings and instructions marked on the equipment.
- Installation must be performed in accordance with

Caution: DOUBLE POLE/NEUTRAL FUSING

The xNode power supply incorporates an internal fuse. Hazardous voltages may still be present on some of the primary parts even when the fuse has blown. If fuse replacement is required, replace fuse only with same type and value for continued protection against fire.

This product's power cord is the primary disconnect device. To prevent risk of electric shock, disconnect power cord before servicing. The outlet to which this equipment is connected must be installed near the equipment, and must always be readily accessible. The unit should not be positioned such that access to the power cord is impaired. If the unit is incorporated into a rack, an easily accessible safety disconnect device should be included in the rack design.

This equipment has an autoranging line voltage input. Ensure that the supply voltage is within the specified range.

This equipment is designed to be operated from a power source that includes a third “grounding” connection in addition to the power leads. Do not defeat this safety feature. In addition to creating a potentially hazardous situation, defeating this safety ground will prevent the internal line noise filter from functioning.

MOISTURE WARNING:

This equipment is intended for INDOOR USE ONLY and can be hazardous if immersed in water. To reduce the risk of electrical shock, do not expose this product to rain or moisture. Keep moisture away from the ventilation openings in the top and front of the unit. To avoid the possibility of electrical shock, do not use this equipment when you are wet. If you accidentally drop the equipment into water, do not retrieve it until you have first unplugged all cords. Do not reconnect this equipment until it has dried thoroughly. Do not shower or bathe with the unit.

Ventilation Warning

This equipment requires the free flow of air for adequate cooling. Do not block the ventilation openings in the top and front of the unit. Failure to allow proper ventilation could damage the unit or create a fire hazard. Do not place the units on a carpet, bedding, or other materials that could interfere with any panel ventilation openings.

Customer Service

We support you...

By Phone/Fax.

- You may reach our 24/7 Support Team anytime around the clock by calling +1 216-622-0247. For billing questions or other non-emergency technical questions, call +1 216-241-7225 between 9:30 AM to 6:00 PM USA Eastern Time, Monday through Friday.

By E-Mail.

- Non-emergency technical support is available at **Support@AxiaAudio.com**.

Via World Wide Web.

- The Axia Web site has a variety of information which may be useful for product selection and support. The URL is **<http://www.AxiaAudio.com>**.

Feedback

We welcome feedback on any aspect of the Livewire products or this manual. In the past, many good ideas from users have made their way into software revisions or new products. Please contact us with your comments.

Updates

The operations of xNodes are determined largely by software. Periodic updates may become available - to determine if this is the case, visit our web site periodically, or contact us for advice concerning whether a newer release is more suitable to your needs.

We recommend joining the Axia Tech mailing list to ensure that you receive immediate updates regarding new software or documentation releases. You can do so by clicking the "Sign Up Here" links at the top of the Axia Download and Manuals pages at AxiaAudio.com/manuals/ and AxiaAudio.com/downloads/.

Trademarks

Livewire is a trademark of TLS Corporation. All other trademarks are the property of their respective holders.



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Notice

All versions, claims of compatibility, trademarks, etc. of hardware and software products not made by Axia mentioned in this manual or accompanying material are informational only. Axia makes no endorsement of any particular product for any purpose, nor claims any responsibility for operation or accuracy.

Warranty

This product is covered by a Two Year limited warranty, the full text of which is included in the rear section of this manual.

Service

You must contact Axia before returning any equipment for factory service. Axia will issue a Return Authorization number, which must be written on the exterior of your shipping container. Please do not include cables or accessories unless specifically requested by the Technical Support Engineer at Axia. Be sure to adequately insure your shipment for its replacement value. Packages without proper authorization may be refused. US customers please contact Axia technical support at +1 (216) 241-7225. All other customers should contact their local representative to arrange for service.

We strongly recommend being near the unit when you call, so our Support Engineers can verify information about your configuration and the conditions under which the problem occurs. If the unit must return to Axia, we will need your serial number, located on the rear panel.

Credit Where Credit's Due

It's a pleasure to be a part of this organization. Thanks to all of the engineers, architects and designers that made this product a reality - you know who you are. *cn*

Feedback is welcome

At Axia, we love to hear your feedback. If you find anything in this manual that you feel needs clarification or correction, please let us know by sending an e-mail to cnovak@AxiaAudio.com.

About This Manual

This manual covers the details of the xNodes. To learn more about AoIP, you may wish to read *Introduction to Livewire: System Design Reference and Primer* and *Audio Over IP: Building Pro AoIP Systems with Livewire* by Steve Church and Skip Pizzi, available from Elsevier Press.

In these publications we explain the ideas that motivated Livewire and how you can use and benefit from it, as well as nitty-gritty details about wiring, connectors, and the like. Since Livewire is built on standard networks, we also help you to understand general network engineering so that you have the full background for Livewire's fundamentals. After reading this reference material, you will know what's up when you are speaking with the network guys that are often hanging around radio stations these days.

Although we strive for accuracy, some features and operational characteristics may differ in actual use from their descriptions herein. We invite feedback and corrections from our clients.

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A Note From The Vice President of Axia

2013 marks a banner year for Axia — this year marks the first decade of the Connected Studio.

In retrospect, it's hard to believe it's been 10 years since a start-up division of Telos grabbed everyone's attention with a radical idea about building radio studios using Ethernet. At a time when "state of the art" meant discrete digital audio, and a routing switcher was something only the richest stations could afford, Axia shocked everyone with the idea that studio peripherals from the console to the audio processor could be networked, and that everyone could have the benefits of a routing switcher — for about a third of the cost of traditional technology.

When we launched Axia, Telos founder Steve Church made a prediction. "Three things will happen," Steve told us. "First, people will say that 'it will never work.' When they're proven wrong, they'll say 'It works, but you don't need that.' And finally, as they see Axia becoming successful, they'll say 'IP-Audio? We do that too!'"

Steve, as always, was right on the money. In 10 years, Axia Livewire has become the world's most popular IP-Audio networking technology, and our mixing consoles are the world's best-selling — they're on-air in over 4,000 studios, and counting. You'll find Axia equipment everywhere: at privately-owned stations, and large clusters run by big conglomerates. At established public broadcasters, and at newly-licensed International stations. At government broadcast facilities, and podcast studios. Needless to say, we're humbled by the trust broadcasters place in us — and by your enthusiasm!

Being first with new technology is nice, but we've never been content to rest on our laurels. So the Telos R&D team continues to innovate and expand the scope

of IP-Audio. Axia consoles are the first and only IP-Audio consoles with a pre-configured network switch built in, to save broadcasters the effort and expense of procuring and programming third-party switches. Our compact xNode AoIP interfaces feature one-button setup, and can run on mains power or Power over Ethernet (PoE) for flexibility and redundancy. We've even developed our own zero-configuration Ethernet switch for Livewire — xSwitch — to make deploying IP-Audio easier than ever.

More than 45 Livewire partners believe in the vision of the Connected Studio too. Collectively, they make dozens of hardware and software products (ranging from telephone systems to audio processors to program automation) that interoperate directly with Axia networks via Ethernet — making the connections "smart", and eliminating the need to purchase audio conversion devices. We've also partnered with the high-performance audio standard RAVENNA to expand broadcasters' networking options even further. And there are a lot more great new ideas in the cooker — so watch this space!

In the final analysis, Axia's success isn't due to our efforts. It's you, the broadcast professional, who has embraced our vision, used our technology in ways we never dreamed of, and raved about Axia products to everyone who'd listen. We owe you a huge debt of thanks. And we promise to never stop trying to amaze and delight you.

So here's to the next 10 years.
Onward and upward!

Marty Sacks
Vice President, Axia Audio



The ten thousand things

How long do they persist? Gates

and RCA, gone

Chapter One:

Introducing the xNode

xNodes are a family of compact half-rack Livewire audio and logic interfaces with advanced features.

The xNode family:

- Analog Input/Output xNode: 4 Stereo Analog Line-level Inputs, 4 Stereo Analog Line-level Outputs
- AES/EBU Input/Output xNode: 4 Stereo Digital AES-3 Inputs, 4 Stereo Digital AES-3 Outputs
- Microphone Input/Output xNode: 4 Mic Inputs, 4 Stereo Analog Line-level Outputs
- GPIO Logic xNode: 6 GPIO Ports, each with 5 Opto Inputs and 5 Opto Outputs
- Mixed Signal Input/Output xNode: 1 Mic/Line Analog Input, 2 Analog Line Inputs, 1 AES-3 Input, 3 Analog Line Outputs, 1 AES-3 Output, 2 GPIO Ports, each with 5 inputs and 5 outputs.
- Each of the xNodes support IEEE 802.3af power over Ethernet (PoE) .
- xNodes have a front panel OLED display for setup and status.
- The rear panel contains the audio input/output connectors, the Ethernet connectors and an IEC AC input connector.
- The xNodes are in small form factor, 1U Half-Rack.
- Two mounting kits are available as options; Surface-mount or Rack-mount.
- Dual 100BT Ethernet ports, usable as mirroring redundant ports or as a single Livewire port and separate management port.
- Thermal sensor monitors temperature and provides notification of over-temp condition.
- IEEE 1588 synchronization support
- Ravenna stream routing support



Figure 1-1: xNode Front Panel

The Front Panel

The xNode uses the OLED display on the left hand side to provide status information and assist with initial-setup.

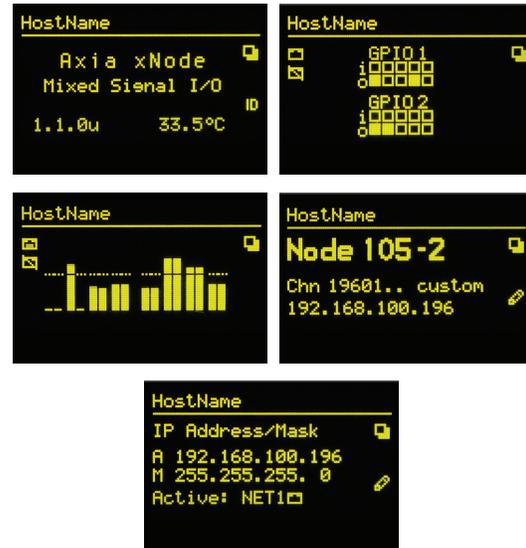


Figure 1-2: xNode OLED Display

Rear Panel

The rear panel will vary between the xNodes. xNodes will have an IEC connector and two Ethernet ports.

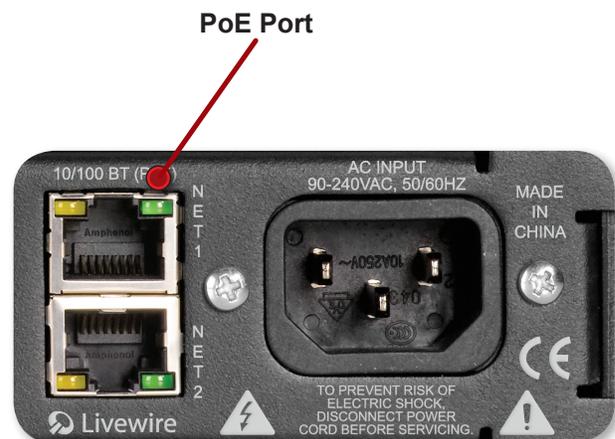


Figure 1-3

The top Ethernet port accepts PoE power and the lower port does not.

The remainder of the rear panel will depend on the model of xNode.



Analog

Four stereo inputs and four stereo outputs are available in parallel through the RJ45 ports or the DB-25 ports. Pinout information is available in **Chapter 4**.



AES/EBU

Four AES-3 inputs and four AES-3 outputs are available in parallel through the RJ45 ports or the DB-25 ports. Pinout information is available in **Chapter 5**.



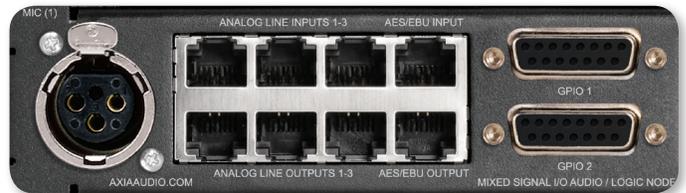
MICROPHONE

Four Microphone inputs and four stereo analog line-level outputs available on RJ45 or DB-25 connector. Pinout information is available in **Chapter 6**.



GPIO

6 DA-15 ports, each with 5 Opto Inputs and 5 Opto Outputs. Pinout information is available in **Chapter 7**.



Mixed Signal

- 1 Mic/Line Analog Input
 - 2 Analog Line Inputs
 - 1 AES-3 Input
 - 3 Analog Line Outputs
 - 1 AES-3 Output
 - 2 GPIO Ports, each with 5 inputs and 5 outputs.
- Chapter 8** covers pin outs of the mixed xNode.

HTML Interface

xNodes provide basic configuration from the front panel interface. Further setup or maintenance is available through an HTML interface (otherwise known as a web interface). Accessing this interface requires a PC that is on the same network as the xNode and has an IP address within the same subnet. Using a web browser, the IP address of the xNode is typed into the URL request field. Upon accessing the device, an authentication process is required.

The default username and password are:

Username: user

Password: (none)

What is meant by subnet?

In this text, the term subnet is used to designate the network portion of an IP address. An IP address, 192.168.1.15, has a network prefix and a host number. Where one ends and the other begins is defined by the subnet mask. A common class C network will have a "netmask" of 255.255.255.0. Compining these two values, 192.168.1.15 255.255.255.0 defines the network prefix (subnet) as 192.168.1 and defines the host number as 15. So two devices within the same subnet would have the same prefix, but required to have different host numbers. 192.168.1.15 and 192.168.1.25 for example.

The home page will show system information.

Node ID: (shown if ID assigned): An xNode can be assigned an ID which is used to assist with IP addressing and channel numbering.

Software Version: The code version which is used by the xNode.

Temperature: The temperature reading of the internal sensor. Alarm status will appear if the temperature is above acceptable limits.

Sync (in audio xNodes): Indication if the device is receiving sync from the network. A solid SYNC indication represents synchronization with the network.

Net1 and 2: Status of the network ports and which is the active port.

Offline Power and Power Over Ethernet: Status of power sources.

System Uptime: The amount of time since the last bootup.

From the Home page are links to other options. These links are covered in **Chapter 3-8**.

Using iProbe will allow a user to see all devices on the network. A left click on a device icon will enable the user to open the configuration user interface (UI). This UI is presented on the screen of iProbe and is the HTML interface as mentioned here. Authentication is the same through iProbe as with a web browser.

*CAT.6, small and light
yet sound and data pour forth.
What magic is this?.*

Chapter Two:

Configuration

There are different options for how the xNode can be configured; iProbe, assigning an ID to the xNode, or manually configuring the IP address. In the fast setup, we will use the ID method. Following subsections of this chapter will cover the other methods in detail.

Fast Setup

- Apply power to the xNode and wait for the boot process to complete showing you a home screen identifying the xNode and version.
- Press the top button, the screen button, twice to reach the ID page which shows you a Node ID with no value, Channel numbers 1-8 and no IP address (shown in Figure 2-1)
- Press the second button, pencil icon, for 10 seconds to enter into edit mode.



Figure 2-1

- With the cursor shown, you can use the top button (I+) to increment value and the bottom button (▶) to move the cursor to the next position. Press “next” button twice and press the increment button once to give the ID value of 1 to the xNode. (You’ll give a different ID number to each xNode you install.)
- Pressing the move button one additional time completes edit mode and automatically configures the xNode with IP address 10.216.0.101 and channel numbers of 101 – 108.
- That’s actually the end of fast setup! With IP and channel numbers configured, you can attach the xNode to your network and begin connecting sources. But let’s continue on for some quick customization.

- Connect a cross over cable between a computer and the xNode or connect the xNode to the appropriately configured switch.
- Set a static IP address to your computer that has a link to the xNode directly or through a network switch. (an IP address of 10.216.0.100 would be suitable)
- Open a browser and type in the IP address of the xNode (10.216.0.101) into the URL field.
- Default Authentication is:

Username: user

Password: (there is no password)

- Select the Simple Setup button to enter into a simple configuration screen for the xNode. The options available will vary based on the xNode.
- Enter descriptive text in the *Source Name* fields which describe what devices are connected to the xNode (e.g. CD player, Turntable, PC Out-1, Aux Input)
- Enter descriptive text into the *Name* field under the Destination section which documents what is connected to the xNode’s outputs (e.g. Control Room Monitors, Headphone, CF Recorder, STL input)

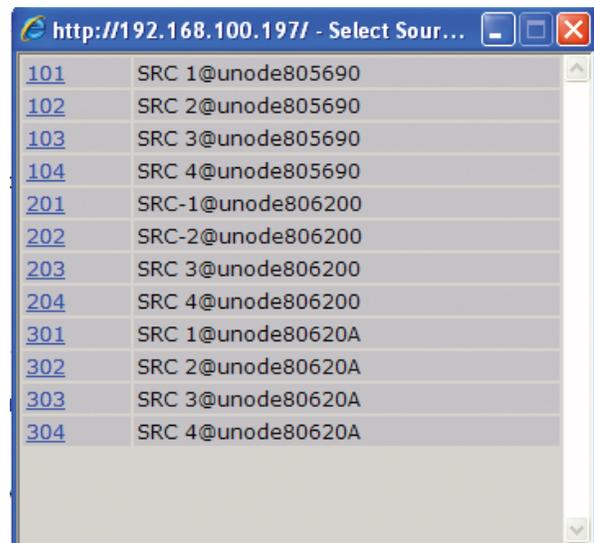


Figure 2-2

- The next step would be to define the audio that is present at the output. This is done by choosing the browse button next the channel text box. A popup will appear with a list of sources that are present on the network. A sample of three xNodes freshly installed into a network is shown in figure 2-2. At this point, not many sources have been configured with

valuable descriptive names. Hopefully you see the value of the good practice in using the naming fields. Once you have configured all your xNode sources and other Livewire devices, this browse popup will have more descriptive information which will help you locate the correct source to assign to an output (Destination).

If you notice in figure 2-2, the three xNodes are showing a default host name which provides little assistance to the end user. To resolve this you can select the *System* link under the *Advanced Options* to change the host name to something more descriptive (e.g. Studio1-MICs, TOC-AES1, SATRCK-GPIO1). With a descriptive host name applied to the xNode, a listing of available audio streams will be displayed in a more descriptive manner, i.e., HostMic@Studio1-MICs Guest1@Studio1-MICs CD1@Ctrl1-AES WXYZ-tune@TOC-ANA1, etc.

You're done! These steps were designed to get you up and running quickly, but if you need more details on other configuration options, please continue to read this chapter.

For additional information on a particular xNode, look at the following chapters which are dedicated to each model.

Assigning an IP address manually

If the IP value assigned in the previous steps do not fit within your Livewire network plan or you wish to configure by manual process, you can assign an IP address from the front panel by pressing the page button (top button) until the IP page is shown.

Press and hold the edit button (bottom button) for 10 seconds.



Figure 2-3

A cursor will appear in the Address field. Use the top button to increment and the bottom button to move the cursor to the next position. After 30 seconds of no activity the Edit view will cancel back to the status view. Edit the IP address to your needs. Press the next button (bottom) to move the cursor to the next line which is the Netmask setting. Use the top button to increment the mask to your needs. Press the next button to move to the next line. The NET is highlighted. Pressing the top button will toggle between the two ports allowing you to select which port is active. Press the next button (bottom) one more time to complete the edit process. If the cursor returns to the address field, then an incorrect value has been entered.

NOTE: You can change the node ID but maintain the same IP address by pressing the increment button when the IP address is highlighted in the Node ID page. This will toggle between a custom address or the new address created through the auto configuration process.

Once the xNode has the desired IP value, you can log into the HTML interface with a PC that has a static IP value within the same subnet as the xNode and connected to the same network. Later in this chapter the Simple Setup HTML interface is covered. Each following chapter is dedicated to a specific xNode and covers in detail the HTML pages. .

Assigning an ID

The method of setting an xNode with an ID was covered in the Fast Setup. Some details of this option were left out. To review the ID method: After the xNode has booted, the title page should show on the OLED display, showing the name of the node and the software version running. The top button acts as the page toggle function. Press the top button until the Node ID page is shown. Press and hold the lower button (represented by the pencil icon) for 10 seconds. A cursor appears following the word Node. Use the top button to increment the cursor value and use the lower button to move to the next position. After 30 seconds of no activity, the edit page will reset back to the status page. Select a unique ID for the xNode. Press the lower button one last time to finalize the edit and return to the status view. The node has now

been given an IP address and the inputs have been given unique channel numbers.

MORE ON ID VALUES: Number ranges of 1-99 (nn) support small-to-medium networks with up to 99 nodes. The node ID determines the IP address (10.216.0.1nn) and the source channel numbers (nn01-nn08).

Number ranges of 100-319 (abc) support large networks with up to 2299 nodes. When the 3 digit ID is being used, a second level identifier becomes available with range of d=<0-9>. The node ID determines IP address in range: 10.216.ab.1cd. Channel numbers: abcd1-abcd8.

Once the xNode has been assigned an ID value, the device has an IP address that can be used to access its HTML configuration interface. Each input has been assigned a unique Livewire channel number. The next configuration steps are to enter in descriptive names to the inputs and outputs and to assign Livewire sources to the destinations. The Simple Setup page is covered later in the chapter and details of each xNode are available in following chapters.

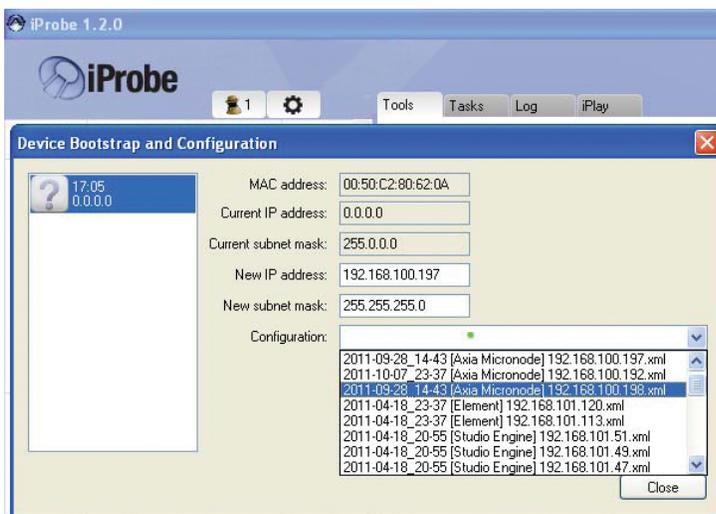


Figure 2-4

iProbe configuration

When an xNode boots and it has no configuration, it will broadcast a bootp request within 4 seconds. The broadcasts will continue with an increasing delay between messages and randomization until a configuration

is set. iProbe includes a bootp function which will observe the request and provide an option to respond or ignore.

A counter at the bootstrap configuration button will appear when a bootp request is received by iProbe (version 1.2). Clicking on the  button will open the Device Bootstrap and Configuration window.

From the window view, select the device that has issued a bootp request. The configuration options will appear allowing you to push a *New IP address*, *New subnet mask*, and a *Configuration*. If you have no backup configuration to send, then apply an IP address and proceed to log into the device through the iProbe interface, and configure it per the “web interface configuration”.

Web interface configuration (“Simple setup”)

Initially accessing the user interface of the xNode will require authentication. The default authentication is:

Username: user

Password: (none)

The initial page is the Home page. Select the “Simple setup” button.

The setup page will vary based on what xNode you are configuring. If it is an audio xNode, there will be a section for Sources and a section for Destinations. If GPIO (General Purpose Input/Output) functionality is on the xNode, there will be section for GPIO.

In the Sources section you will provide a name value to help identify the audio source in network advertisements. If a unique ID was assigned to the node, the sources were automatically given channel numbers. Sources are the xNode’s audio inputs. These inputs are known within the network as sources and go to Destinations.

Destinations of the xNode are the audio outputs. The Name field is used for documenting what is connected to the audio output port. Channel field is where you se-

lect an audio stream from the network to provide audio for the output. If you don't know the channel number, use the browse button immediately to the right to search the network for the desired source. Selecting the source from the pop-up window will populate the channel value of the Destination field.

The GPIO section provides a name field for documenting the purpose of the port. The channel field is used to either enter in another node's IP and port for GPIO routing, or a Livewire channel for Control surface logic. More on this topic is covered in Chapter 7.

Restoring Defaults

Performing factory reset will clear all configurations and return the xNode to a "blank canvas". To restore default, execute the following steps.

- Disconnect all power from the xNode, then press and hold the two front panel buttons.
- Apply power to the xNode while continuing to press the buttons.
- xNode will show a countdown timer for factory reset. When the timer reaches 0, release the two buttons.

Chapter Three:

The xNode in depth

This chapter covers details of the xNode family that are shared in common. The xNode is a 1U half-rack device that can be mounted to a flat surface or in an equipment rack with optional accessories.

All xNodes have a common user interface with settings for advanced configuration and maintenance..

Mounting

Optional Surface Mount kit

The optional surface mount kit (p/n 2011-00077) consists of two brackets that are used to secure the xNode to a wall, under a desk, or almost any flat surface.

The brackets secure to the side of the xNode, towards the front panel. There are four holes which are used for securing metal work to the xNode.



Figure 3-1

Secure the bracket to the xNode with included screws in the desired configuration.



Figure 3-2 Outward configuration



Figure 3-3: Inward configuration

Optional Rack Mount kit

The optional rack mount kit (p/n 2011-00076) provides the ability to secure the xNode into an equipment rack.



Figure 3-4: Short rack ear



Figure 3-5: Long rack ear

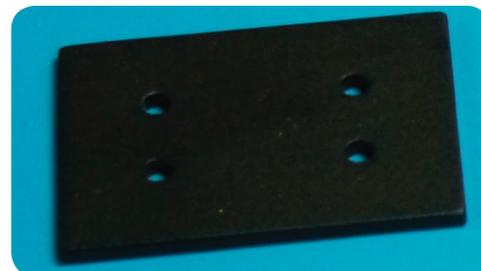


Figure 3-6: Spacer

Single xNode

Secure the short rack ear to one side of the xNode.
Secure the long ear to the opposing side of the xNode.



Figure 3-8

Double xNode

Remove the top lid from both xNodes. Place two xNodes side by side. Place the spacer between the two xNodes.

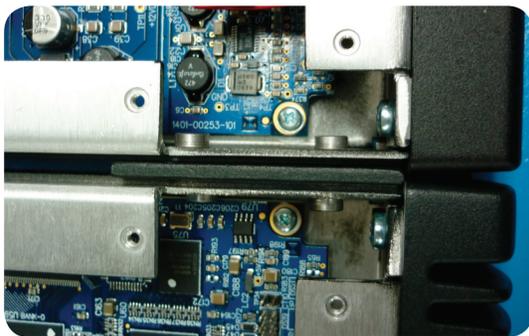


Figure 3-9a

Use the four(4) screws provided to secure the two nodes together.

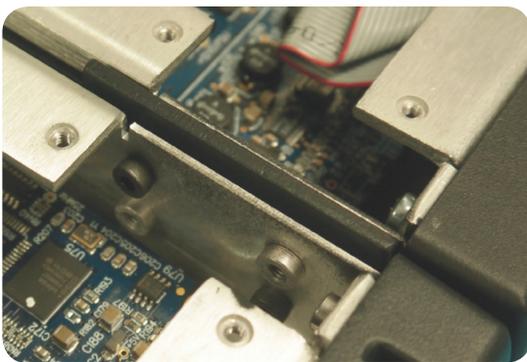


Figure 3-9b

Replace the lids on the xNodes. Secure the short rack ears to either side of the two xNodes.



Figure 3-10

Web interface (System options)

The first time an HTML request is issued to a xNode, a login and password is requested. The default authentication is:

Username: user

Password: (none)

Home

The home page shows system information and acts as the default page for xNodes.

Node ID (shown if ID assigned): An xNode can be assigned an ID which is used to assist with IP addressing and channel numbering.

Software Version: The code version which is used by the xNode.

Temperature: The temperature reading of the internal sensor. Alarm status will appear if the temperature is above acceptable limits.

Sync (in audio xNodes): A solid SYNC indication represents synchronization with the network.

Net1 and Net2: Shows the status of the xNode's Ethernet ports and indicates which port is active.

Offline Power and Power Over Ethernet: Status of power sources.

System Uptime: The amount of time since the last boot up.

The Home page also has a button, "Simple Setup", which links to the Simple Setup page.

Simple Setup

Simple Setup aggregates all of the xNode's basic config settings on one page, such as ID, source and destination names, and GPIO assignments.

Chapter 4-8 will provide more detail on the simple setup for the xNode in question.

Web interface (Advanced options)

Advanced options are mainly used in Audio xNodes. The following are the links that are found under the Advanced classification.

System

The System page provides network settings, SNMP settings, Syslog settings, authentication password, and firmware control.

Host name: Name of the device on the network. Up to 12 characters using only letters, numbers, or hyphens (no spaces or special characters). Host name is auto populated when you assign an ID to the xNode providing a unique name. You may customize this field if you desire.

Network address: The IP address of the device, as configured either manually or via the Setup button or iProbe software. The address can be changed here, but once you apply the changes, you will lose connection and will need to connect to the device with the new IP address you just assigned.

Beginning with software version 1.2, you may configure a management port. By default, NET2 address will be assigned to 0.0.0.0, which defines the second port as a redundant network port. If you'd rather forsake redundancy for a separate management port which does not pass Livewire audio, then set an IP address for the NET2 field, then define which port is the management port and which is the Livewire port.

Mask: The netmask is a filter to which helps to define the subnetwork. This is a topic covered in networking material widely available. For simplicity, a value of 255.0.0.0 is a wide open filter and a value of 255.255.255.254 is a very narrow filter. If you are not familiar with how subnetting works, please refer to your

network administrator. A value of 255.255.255.0 is usually suitable for most cases.

Gateway: The gateway is a device that handles requests and responses from devices that are in different subnets. A gateway is what is needed when dealing with more than a single subnet. If creating a Livewire network on a dedicated local area network (LAN), then the value of the gateway can likely be ignored. If not familiar with the function of gateways, please ask your network administrator.

Livewire enabled ports: Default setting is for NET1 and NET2 to be Livewire enabled ports. This provides redundant network ports for audio and control to the same IP address. If you'd rather forsake redundancy to have a separate management port which is removed from the high bandwidth audio traffic, then apply a value to NET2, then select which port is to be Livewire enabled, and which is the management port.

NTP server: Specify the sync server if using NTP as the synchronization source. This mode of sync is only good for Standard streams and used for unique applications.

System location: Define system location for SNMP

System contact: Define system contact for SNMP

SNMP community name: Define the community for SNMP functionality

Syslog server: IP address of the computer which is running a syslog server application.

Syslog severity level filter: The 8 standard syslog levels are available for selection.

User password: The authentication password can be changed by entering in the password twice in the two fields.

Firmware version: The xNode uses two storage banks to store software for the xNode. Switching to a new version of software is done by selecting the other radio button and pressing Apply button.

NOTE Selecting a new version of software to operate under requires a reboot of the xNode. Rebooting will cause any audio streams to be interrupted until the reboot completes.

If Bank 1 is empty, you will use the Browse function to locate the desired software that has been downloaded to your computer. Once the file is selected, pressing the Apply button will upload the software into the bank. The process will not interrupt the operation of the xNode. Once complete, the System page will return and the two banks will show versions of software.

If operating with Bank 1, and you wish to upload a different version, you will select the “commit this version to Bank 0” and press Apply button. This will move the code to Bank 0 and empty Bank 1.

QOS (Audio xNodes)

Synchronization: Livewire’s clocking system is automatic and largely transparent to end users. If no clock is present on the network, Axia devices negotiate a master by means of priority settings and the lowest MAC address. If a device comes online into a network that has a clock present, it will not generate clock unless it has priority setting of 7. The xNode does permit variance in determining the source of clock.

Clock mode: Livewire IP low rate (the default setting) is suggested for a typical Livewire network. Livewire IP “STL” is an option for an application where a node is at the remote end of an STL link (Live streams not supported while in this mode). Livewire IP high rate tasks the node to synchronize to the fast clock is not needed in most cases. Livewire Ethernet is a legacy sync method available for any customers still running obsolete systems (are there any out there still?). PTP/IEEE 1588 ARB clock class 248 is the option to enable the xNode to participate in the execution of the best master clock algorithm for a PTP (Precision Time Protocol) network (enabling it to be a master PTP clock). PTP/IEEE 1588 slave enables the xNode to synchronize to a PTP network. NTP slave for special applications that synchronize from an NTP source (Live streams not supported under NTP mode).

If an xNode becomes PTP master and the Livewire clock master priority is set to a value greater than 0, the xNode will change its priority to 7. This allows for the xNode to also become master source for Livewire clock. Making a single source of clock in the network.

Livewire clock master priority: In a Livewire network, higher priority is given to nodes with a higher priority setting. A value of 0 will never generate clock. A value of 7 will always generate clock. Values between will generate clock if no clock is received from another device, and the system will elect a master source based on priority settings. 7 (Always master) “STL snake” – used for cases where the xNode is one end of a wireless link. This mode will cause the node to generate clock and will suppress the generation of fast clock. The default priority is three(3) which allows any device to become source of clock with equal priority.

PTP characterizations

PTP domain number: (0 – 127) A domain is one or more PTP devices communicating with each other. A domain association is used to define communication messages. A value of 0 is standard.

PTP delay mechanism: (E2E or P2P) PTP supports two methods of time correction which alter messaging between devices. All devices within the network should use the same mechanism. The recommended setting is to use End-to-End (E2E) since more networked devices prefer to support this option.

PTP clock priority1/priority2: Priority setting from 0-255 is used in the best master clock algorithm (BMC) to determine a Grandmaster. Lower numbers have higher priority.

PTP clock sync interval: Is the time for sending synchronization messages. A setting of -4 is 16 messages in 1 second. A setting of 1 is 1 message in 2 seconds. The default setting is 0, 1 message per second.

Meters (Audio xNodes)

The meter page uses a Java script to provide real time meter representation of the audio at the inputs and outputs. The meter page shows a stereo channel or a mono channel based on the configuration of the xNode and the amount of channels enabled. The meters are represented in dBFS. Below the meters are gain adjustment buttons which allow for 1dB adjustment (Large button) and 0.1dB adjustment (Small button).

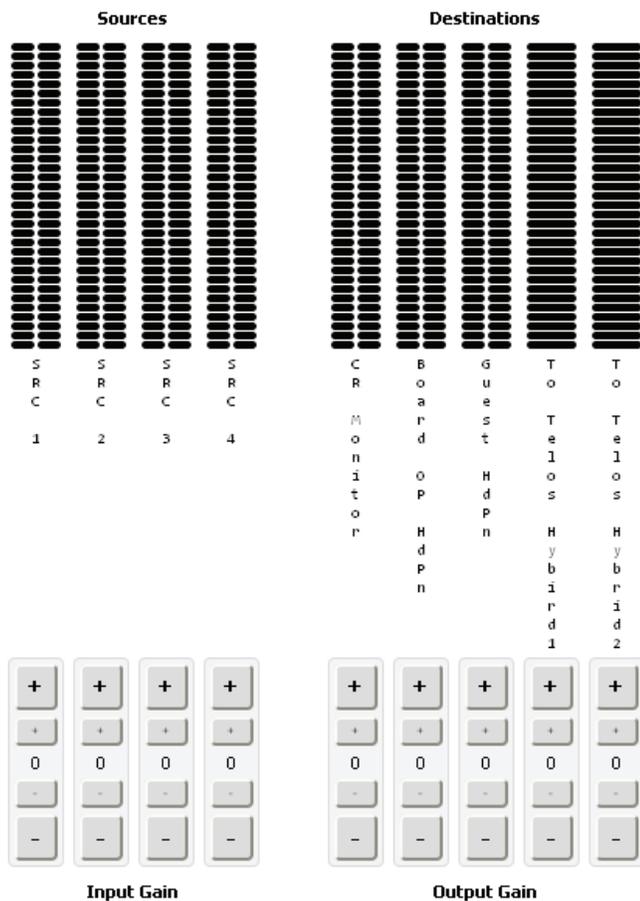


Figure 3-12

Destinations (Audio xNode)

Destination page defines the audio outputs of the xNode. An xNode has 4 stereo audio output ports, with the option to split each stereo channel into two mono outputs.

Destinations

#	Name:	Channel:	Type:	Gain [dB]:
1	CR Monitor	3311 <CR_Monitor@DSP	From source	0.0
2	Board OP HdPn	3315 <Headphone@DSF	From source	0.0
3	Guest HdPn	3318 <GuestHP@DSEn	From source	0.0
4-L	To Telos Hybrid1	19604 <To:Caller1@DSF	To source - Left	0.0
4-R	To Telos Hybrid2	19608 <To:Caller2@DSF	To source - Right	0.0

Figure 3-13

The first column is the name field which is used for documenting the output. For example, SpeakerAMP could document that the destination is to the amplifier for speakers. Channel column is used to define the network source which exits as the audio output of the xNode. You may type in the channel number or use the browse button to search the network for the desired source. Type column defines if the output should behave as stereo or mono and if the output is the audio from the source you define or a special dynamic return audio known as a backfeed. A backfeed is a channel automatically generated by Axia consoles for talkback, mix-minus, etc. Gain column provides adjustment for the outputs from the range of -72dB to +24dB.

Sources (Audio xNode)

Sources page defines the audio inputs of the xNode. An input of the xNode is given a name and a unique channel number that is used to distribute through the network. The xNode provides an auto numbering process when you ID the xNode through the node ID process described in Chapter 2.

Source Name column is used to identify the device that is connected to the xNode input (for documentation sake!!) and is also used in source advertisement through the network.

Channel column is the unique number for each source. This will auto populate based on the ID given to the xNode. It is critical that each source in the network has a unique number, not shared with any other source.

Stream mode column defines the source as a stereo source or a mono source and how the packet is formed.

Live stereo (or Live mono) is the original Livewire stream intended for Microphone or other live audio content that needs a lower delay. A packet contains 12 samples or 250ms of audio. Low Latency Stereo (or mono) is an option for support of Ravenna and X192 standards. The packet contains 1ms of audio (48 samples). Standard Stereo (or mono) is the high efficiency stream that contains 240 sample (5ms of audio), maximizing the packet size at 1522 bytes. This option is intended for suitable sources such as playback machines that can use the higher efficiency with slightly more latency (not more than 100msec).

Input gain column provides adjustment of -72dB to +24dB for line level audio and +77dB for microphone audio inputs.

When a source is enabled through the stream mode, an RTSP link will appear under the Source row. This link can be given to a media player that supports RTSP as well as 24-bit PCM streaming audio for direct auditioning of the audio stream. VLC 1.1.11, for instance, is a cross platform media player which supports RTSP.

Chapter Four:

Analog xNode

There are 4 two-channel (8 one-channel) inputs with the analog xNode. With default settings, the xNode will generate 4 Livewire stereo sources. You may also configure the inputs separately as different sources and generate up to 8 Livewire mono sources.

Rear Panel

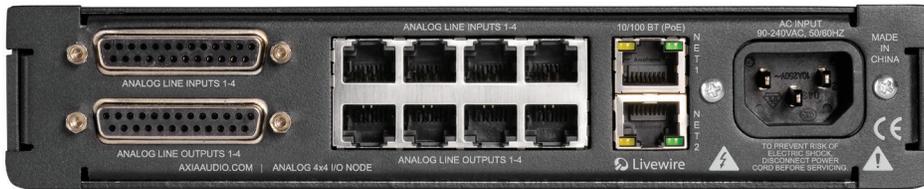


Figure 4-1: Analog xNode Rear Panel

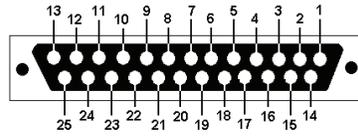
The analog xNode uses RJ45 style connectors and 25 pin D-sub connectors for audio I/O, providing an option to either use standard CAT5e patch cables or D-Sub breakout cables for audio wiring.

The top 4 RJ-45 style ports are line level analog inputs. The bottom 4 RJ-45 style ports are line level analog outputs.

The pinout of an RJ-45 port

PIN	FUNCTION
1	Left Channel Input/Output +
2	Left Channel Input/Output -
3	Right Channel Input/Output +
4	Ground
5	Not Used
6	Right Channel Input/Output -
7	Not Used
8	Not Used

The pinout of the DB-25



PIN	FUNCTION
1	Channel 4b/8 +
2	Channel 4b/8 Gnd
3	Channel 4a/7 -
4	Channel 3b/6 +
5	Channel 3b/6 Gnd
6	Channel 3a/5 -

PIN	FUNCTION
7	Channel 2b/4 +
8	Channel 2b/4 Gnd
9	Channel 2a/3 -
10	Channel 1b/2 +
11	Channel 1b/2 Gnd
12	Channel 1a/1 -
13	not used
14	Channel 4b/8 -
15	Channel 4a/7 +
16	Channel 4a/7 Gnd
17	Channel 3b/6 -
18	Channel 3a/5 +
19	Channel 3a/5 Gnd
20	Channel 2b/4 -
21	Channel 2a/3 +
22	Channel 2a/3 Gnd
23	Channel 1b/2 -
24	Channel 1a/1 +
25	Channel 1a/1 Gnd

The pinout of the DB-25 connector follows established Pro Audio conventions. Breakout cables can be acquired from your audio supply company.

Simple Setup

The Simple Setup page will provide an option to edit the Node ID and allow the setup of the Source channels based on the node ID given. Auto channel numbering follows the following rules:

- **Node ID in range nn=<1-99>** - Channel numbers: nn01-nn08.
- **Node ID in range abc=<100-319>**, with second level identifier d=<0-9> - Channel numbers: abcd1-abcd8

The Simple Setup page provides fields to give each active source a name. The name is useful in documenting what is wired to the input, but is also used in the source advertisement through the network. By default, 4 channels are enabled in stereo mode. If you desire to set some sources as mono, refer to the Advanced Web Interface Source section.

The Simple Setup page provides fields to give a name to each Destination. This is used to document what is wired to the xNode. The channel field is used to specify the network audio source that is to be routed to the output. Use the browse button to open a popup which will have a list of sources in the network. Picking a source from the popup window will immediately route that source to the destination (output).

If you are familiar with the channel number of a source to be routed to the Destination, you may manually enter the channel into the field and press the Apply button to enable the audio to the output.

Advanced Web Interface

Sources

The Sources page is dedicated to the audio inputs of the xNode. A single input to the xNode is given a name, a unique channel number, and a mode. These values define how the source audio is sent into the Livewire network. Default values are provided and an auto number-

ing process is achieved through the xNode ID process. The Sources page provides the ability to customize each value of an input.

Source Name column is used to identify the device that is connected to the xNode input and is also used in source advertisement through the network.

Channel column is the unique number for each source. It is critical that each source in the network has a unique number, not shared with any other device. Duplicate channel numbers cause problems!

Stream mode column defines the source as a stereo source or a mono source and how the packet is formed. Live stereo (or Live mono) is the original Livewire stream intended for Microphone or other live audio content that needs a lower delay. A packet contains 12 samples or 250ms of audio. Low Latency Stereo (or mono) is an option for support of Ravenna and X192 standards. The packet contains 1ms of audio (48 samples). Standard Stereo (or mono) is the high efficiency stream that contains 240 sample (5ms of audio), maximizing the packet size at 1522 bytes. This option is intended for suitable sources such as playback machines that can use the higher efficiency with slightly more latency (not more than 100msec).

NOTE: Live Streams provide low audio latency of a round trip delay of 2ms. Each packet takes 154 bytes on the wire where packets are sent at 4000 packets/s. Each Live stream requires 4.9Mbits/s bandwidth.

Standard Streams provide higher network utilization efficiency. Typical audio delay with Standard Streams is 100ms (determined by a buffer size). Each packet takes 1522 bytes on the wire (maximum allowed Ethernet frame size), at 200 packets/s. Each stream requires 2.5Mbits/s bandwidth.

Along with stream type, the mode option defines if the input should be treated as a stereo input or a mono input. Setting a channel as mono will define which portion of the input should be used. For example (in 1-L) defines Input 1 – Left as the source for the channel. Once you apply the mono selection, a new channel field will

appear allowing for the definition of an additional channel for the other input of the port.

Input gain column provides adjustment of -72dB to +24dB for line level audio.

When a source is enabled through the stream mode, an RTSP link will appear under the Source row. This link can be given to a media player that supports RTSP as well as 24-bit PCM streaming audio for direct auditioning of the audio stream. VLC 1.1.11, for instance, is a cross platform media player which supports RTSP.

Destinations

The Destinations page defines the audio outputs of the xNode. The analog xNode defaults to 4 stereo audio outs. The xNode provides the option to split the two-channel output as two independent mono outs. This is accomplished through the *Type* setting.

The *Name* field in the first column is used for documenting the output. This is helpful to recall what should be wired to the xNode or what source should be routed to the output.

Channel column is used to define the network source which is routed to the destination. You may type in the channel number or use the browse button to search the network for the desired source. When using the browse function, a popup will appear displaying all the sources in the network. Selecting a source will populate the channel information in the text field but the change will not take place until the Apply button is pressed. Selecting a “To:*” source from the network will automatically change the type field for you.

Type column defines if the output should behave as stereo or mono and if the output is the audio *from the source* defined in the channel field or a special dynamic return audio known as a backfeed (To Source). Backfeeds exist in the network because of an Axia control surface that may have generated the source due to a configuration present in that device. If you are comfortable

with the concept of backfeeds, you can manually change the option. If not familiar, simply picking the desired source from the browse function should be all you need to do.

If the desire is to convert the default stereo output to two single channel outputs, the Type option allows you to select the LEFT, RIGHT, or SUM of Left and Right, of the channel defined in the Channel field. After applying this change, a new Destination will appear allowing for the configuration of the other side of the port.

Gain column provides adjustment for the outputs from the range of -72dB to +24dB.

The cup steams, sweet scent

wafting lightly in the air.

Mmmmm... it is Earl Grey.

Chapter Five:

AES xNode

The AES xNode provides four inputs. By default this will generate 4 Livewire stereo sources. You may also separate the 2 channel AES inputs as different sources and generate up to 8 Livewire dual mono sources.

The AES xNode provides four AES outputs. By default the outputs will be an AES stream based on a single Livewire stream. The option is available to create an AES stream (Left and Right) which is composed from two different Livewire streams.

Rear Panel

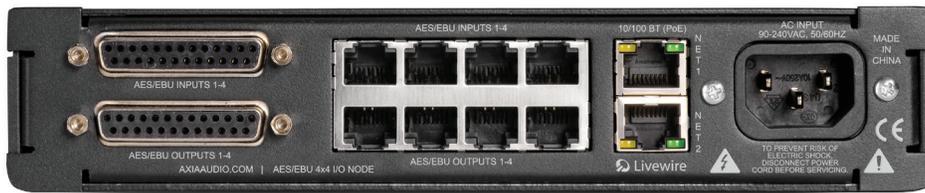


Figure 5-1: AES xNode Rear Panel

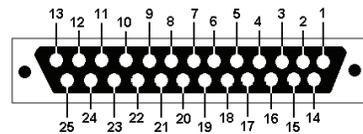
The AES xNode uses RJ45 style connectors and 25 pin D-sub connectors for audio I/O, providing an option to either use standard CAT5e patch cables or D-Sub connector breakout cables for audio wiring.

The top 4 RJ-45 style ports are AES/EBU inputs. The bottom 4 RJ-45 style ports are AES/EBU outputs.

The pinout of an RJ-45 port

PIN	FUNCTION
1	AES Input/Output +
2	AES Input/Output -
3	Not Used
4	Not Used
5	Not Used
6	Not Used
7	Not Used
8	Not Used

The pinout of the DB-25



PIN	FUNCTION
1	Not Used
2	Not Used
3	Not Used
4	Not Used
5	Not Used
6	Not Used
7	AES Ch4 +
8	AES Ch4 Gnd
9	AES Ch3 -
10	AES Ch2 +
11	AES Ch2 Gnd
12	AES Ch1 -
13	Not Used
14	Not Used

PIN	FUNCTION
15	Not Used
16	Not Used
17	Not Used
18	Not Used
19	Not Used
20	AES Ch4 -
21	AES Ch3 +
22	AES Ch3 Gnd
23	AES Ch2 -
24	AES Ch1 +
25	AES Ch1 Gnd

Simple Setup

The Simple Setup page will provide an option to edit the Node ID and allow the setup of the Source channels based on the node ID given. Auto channel numbering follows the following rules:

- **Node ID in range nn=<1-99>** - Channel numbers: nn01-nn08.
- **Node ID in range abc=<100-319>**, with second level identifier d=<0-9> - Channel numbers: abcd1-abcd8

The Simple Setup page provides fields to give each active source a name. The name is useful in documenting what is wired to the input, but is also used in the source advertisement through the network. By default, 4 channels are enabled in stereo mode. If you desire to set some sources as mono, refer to the Advanced Web Interface Source section.

The Simple Setup page provides fields to give a name to each Destination. This is used to document what is wired to the xNode. The channel field is used to specify the network audio source that is to be routed to the output. If you are not familiar with the desired channel, use the browse button to open a popup which will have a list of sources in the network. Picking a source from the popup window will immediately route that source to the destination.

Any manual entries made into fields will require you to save the work by pressing the APPLY button.

Advanced Web Interface

Sources

The Sources page is dedicated to the audio inputs of the xNode. A single input to the xNode is given a name, a unique channel number, and a mode. These values define how the source audio is sent into the Livewire network. Default values are provided and an auto numbering process is achieved through the xNode ID process. The Sources page provides the ability to customize each value of an input.

Source Name column is used to identify the device that is connected to the xNode input and is also used in source advertisement through the network.

Channel column is the unique number for each source. This is likely already numbered based on the auto-number rules. It is critical that each source in the network has a unique number, not shared with any other device.

When a source is enabled through the stream mode, an RTSP link will appear under the Source row. This link can be given to a media player that supports RTSP as well as 24-bit PCM streaming audio for direct auditioning of the audio stream. VLC 1.1.11, for instance, is a cross platform media player which supports RTSP.

Input gain column provides adjustment of -72dB to +24dB.

AES Mode provides two options, asynchronous (default) and synchronous. In rare cases, where the facility has a complete AES house sync setup, does one want to run the entire AES system in synchronous mode. Setting the mode to synchronous will turn off the input sample rate converters and requires that your AES plant is in sync. Asynchronous is the suggested mode.

Destinations

Destinations page defines the audio outputs of the xNode. The AES xNode defaults to 4 stereo audio outs. The xNode provides the option to compose the 2 channel AES stream from two separate livewire sources.

The first column is the name field which is used for documenting the output. This is helpful to recall what should be wired to the xNode or what source should be routed to the output.

Channel column is used to define the network source which is routed to the destination. You may type in the channel number or use the browse button to search the network for the desired source. When using the browse function, a popup will appear displaying all the sources in the network. Selecting a source will populate the channel information in the text field but the change will not take place until the Apply button is pressed. Selecting some “To:*” source from the network will automatically change the type field for you.

Type column defines if the output should behave as stereo or mono and if the output is the audio *from the source* defined in the channel field or a special dynamic return audio known as a backfeed (*To Source*). Backfeeds exist in the network because of an Axia control surface that may have generated the source due to configuration. If you are comfortable with the concept of backfeeds, you can manually change the option. If not familiar, simply picking the desired source from the browse function should be all you need to do.

If the desire is to convert the default stereo output to two single channel outputs, the Type option allows you to select the LEFT, RIGHT, or SUM of Left and Right, of the channel defined in the Channel field. After applying this change, a new Destination will appear allowing for the configuration of the other side of the AES stream.

Gain column provides adjustment for the outputs from the range of -72dB to +24dB.

*Crimping the spade lugs,
the smell of soldering flux —
they'll be missed. (Not much.)*

Chapter Six:

Microphone xNode

The microphone xNode has four mono inputs.

The microphone xNode provides four analog 2-channel outputs, line level. By default the outputs will be stereo audio from an audio source from the network. This may be configured differently so that the 2 channel analog output delivers two mono streams.

Rear Panel

The microphone xNode uses RJ45 style connectors and 25 pin D-sub connectors for audio I/O, providing an option to either use patch cables or breakout cables for audio wiring to either use standard CAT5e patch cables or D-Sub connector breakout cables for audio wiring.

The pinout of an RJ-45 port

PIN	FUNCTION
1	MIC +
2	MIC -
3	Not Used
4	Ground
5	Not Used
6	Not Used
7	Not Used
8	Not Used
shld	GND

The pinout of the DB-25

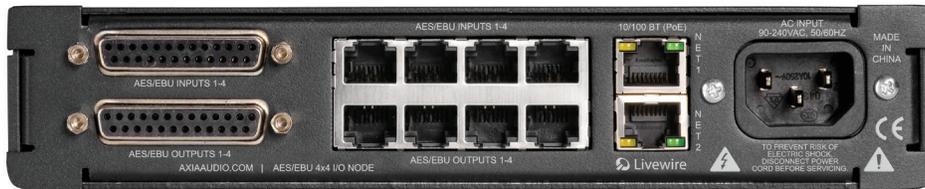
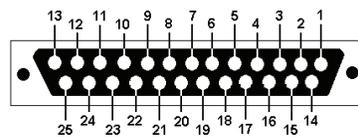


Figure 6-1: Microphone xNode Rear Panel

The top 4 RJ-45 style ports are analog, mono inputs. The bottom 4 RJ-45 style ports are line level analog outputs.

(Microphone Inputs 1-4)

PIN	FUNCTION
1	Not Used
2	Not Used
3	MIC Ch4 -
4	Not Used
5	Not Used
6	MIC Ch3 -
7	Not Used
8	Not Used
9	MIC Ch2 -
10	Not Used

PIN	FUNCTION
11	Not Used
12	MIC Ch1 -
13	Not Used
14	Not Used
15	MIC Ch4 +
16	MIC Ch4 Gnd
17	Not Used
18	MIC Ch3 +
19	MIC Ch3 Gnd
20	Not Used
21	MIC Ch2 +
22	MIC Ch2 Gnd
23	Not Used
24	MIC Ch1 +
25	MIC Ch1 Gnd

(Analog Line Outputs 1-4)

PIN	FUNCTION
1	Channel 4b/8 +
2	Channel 4b/8 Gnd
3	Channel 4a/7 -
4	Channel 3b/6 +
5	Channel 3b/6 Gnd
6	Channel 3a/5 -
7	Channel 2b/4 +
8	Channel 2b/4 Gnd
9	Channel 2a/3 -
10	Channel 1b/2 +
11	Channel 1b/2 Gnd
12	Channel 1a/1 -
13	Not Used
14	Channel 4b/8 -
15	Channel 4a/7 +
16	Channel 4a/7 Gnd
17	Channel 3b/6 -
18	Channel 3a/5 +
19	Channel 3a/5 Gnd
20	Channel 2b/4 -
21	Channel 2a/3 +
22	Channel 2a/3 Gnd
23	Channel 1b/2 -
24	Channel 1a/1 +
25	Channel 1a/1 Gnd

Simple Setup

The Simple Setup page will provide an option to edit the Node ID and allow the setup of the Source channels based on the node ID given. Auto channel numbering follows the following rules:

- **Node ID in range nn=<1-99>** - Channel numbers: nn01-nn08.
- **Node ID in range abc=<100-319>**, with second level identifier d=<0-9> - Channel numbers: abcd1-abcd8

The Simple Setup page provides fields to give each active source a name. The name is useful in documenting what is wired to the input, but is also used in the source advertisement through the network.

The Simple Setup page provides fields to give a name to each Destination. This is used to document what is wired to the xNode. The channel field is used to specify the network audio source that is to be routed to the output. Use the browse button to open a popup which will have a list of sources in the network. Picking a source from the popup window will immediately route that source to the destination.

Any manual entries made into fields will require you to save the work by pressing the APPLY button.

Advanced Web Interface

Sources

The Sources page is dedicated to the audio inputs of the xNode. A single input to the xNode is given a name, a unique channel number, and a mode. These values define how the source audio is sent into the Livewire network. Default values are provided and an auto numbering process is achieved through the xNode ID process. The Sources page provides the ability to customize each value of an input.

The *Name* column is used to identify the device that is connected to the xNode input and is also used in source advertisement through the network.

Channel column is the unique number for each source. This is likely already numbered based on the auto-number rules. It is critical that each source in the network has a unique number, not shared with any other device.

Input gain column provides adjustment of +21dB to +77dB for audio inputs.

Destinations

The Destinations page defines the audio outputs of the xNode. The microphone xNode defaults to 4 stereo audio outs. The xNode provides the option to split the 2 channel into two mono outs.

The *name* field is used for documenting the output. This is helpful to recall what should be wired to the xNode or what source should be routed to the output.

The *Channel* column is used to define the network source which is routed to the destination. You may type in the channel number or use the browse button to search the network for the desired source. When using the browse function, a popup will appear displaying all the sources in the network. Selecting a source will populate the channel information in the text field but the change will not take place until the Apply button is pressed. Selecting a “To:*” source from the network will automatically change the type field for you.

Type column defines if the output should behave as stereo or mono and if the output is the audio *from the source* defined in the channel field or a special dynamic return audio known as a backfeed (*To Source*).

Backfeeds exist in the network because of an Axia control surface that may have generated the source due to configuration. If you are comfortable with the concept of backfeeds, you can manually change the option. If not familiar, simply picking the desired source from the browse function should be all you need to do.

If the desire is to convert the default stereo output to two single channel outputs, the Type option allows you to select the LEFT, RIGHT, or SUM of Left and Right, of the channel defined in the Channel field. After

applying this change, a new Destination will appear under the default 4 Destinations allowing you to configure the other channel (right side) of the same output.

Gain column provides adjustment for the outputs from the range of -72dB to +24dB.

The cup steams, sweet scent

wafting lightly in the air.

Mmmmm... it is Earl Grey.

Chapter Seven:

GPIO xNode

The GPIO xNode provides 6 DA-15 ports. Each port provides 5 GPI (opto isolated inputs) and 5 GPO (solid state relays). Each port is capable of driving a combined current of 100mA. Each GPI pin should be limited to 20mA of current.

The web interface provides configuration control as well as a real time view on each of the GPI and GPO pins through a Java script in the web interface.

Rear Panel



Figure 7-1: GPIO xNode Rear Panel

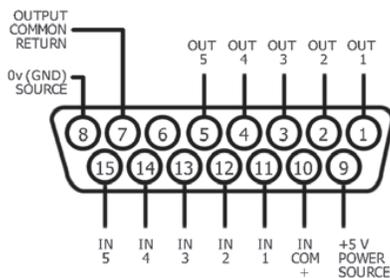


Figure 7-2

The illustration shows the connector pinouts; 5 inputs and associated common return, 5 output relays and associated common, a +5 volt power source, and power source ground.

The maximum allowed external power supply for logic control 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 @ 1/4 watt
24	1.8k @ 1/2 watt
48	3.9k @ 1 watt

Using external power supplies is the recommended method in order to avoid possible ground loops between equipment.

Take note to use current limiting resistors per Figure: 7-3 if the voltage supplied is above 6vdc. The intention is to limit the current to 20mA for each GPI pin. If the equipment being controlled is electrically isolated, than the use of the GPIO port's power supply is acceptable.

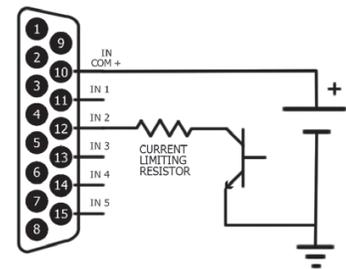


Figure 7-3

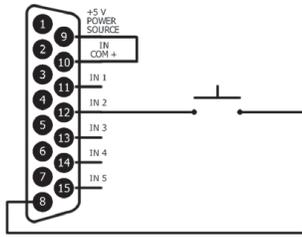


Figure 7-4

Axia GPIO accessory modules are designed to interface directly to the GPIO port. The DA-15 connector on the back of an accessory module is a direct pin-to-pin match to the GPIO port of the xNode. Premade cables of this configuration are commonly available through companies that specialize in interconnect cable assembly products.

The GPO portion of the GPIO ports are solid state relays. Current should be limited to a combined 100 mA through all the pins of a port. Maximum allowed voltage is 24 volts. The following diagram shows the recommended connections for outputs with the use of an external power supply.

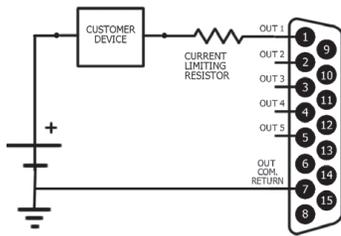


Figure 7-5

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

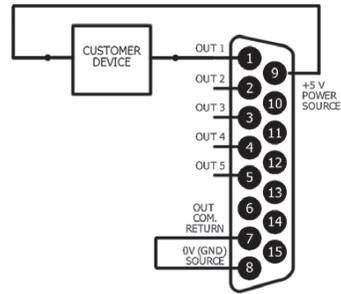


Figure 7-6

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.

Note that all of 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 remotely-controlled device is to be connected to a single 15-pin I/O port, you must make sure that the two units in question have the same ground potential or ground loops will occur. Therefore, it is recommended that only one remote device be connected to each I/O port connector to assure complete electrical isolation.

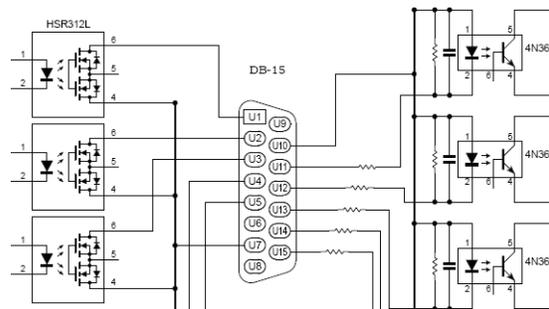


Figure 7-7

Tid bit of worthless knowledge: The D-sub series of connectors was invented by ITT Corporation, in 1952. Cannon’s part-numbering system uses D as the prefix for the whole series, followed by one of A, B, C, D, or E denoting the shell size, followed by the number of pins. Each shell size usually corresponds to a certain number of pins: A with 15, B with 25, C with 37, D

with 50, and E with 9. For example, DB25 denotes a D-sub with a 25position shell size and a 25-position contact configuration which was common in the onset of personal computers. When the PC serial port transitioned to the use of a 9-pin connector, they were often labeled as DB9 instead of DE9 connectors, due to an ignorance of the fact that B represented a shell size. It is now common to see DE9 connectors sold as DB9 connectors.

Simple Setup

The GPIO xNode has a simple setup page which provides access to the node ID (a node ID was likely already assigned from the front panel at install) and configuration of the 6 GPIO ports. Included also in the page is a Java script which provides status on each of the inputs and outputs.

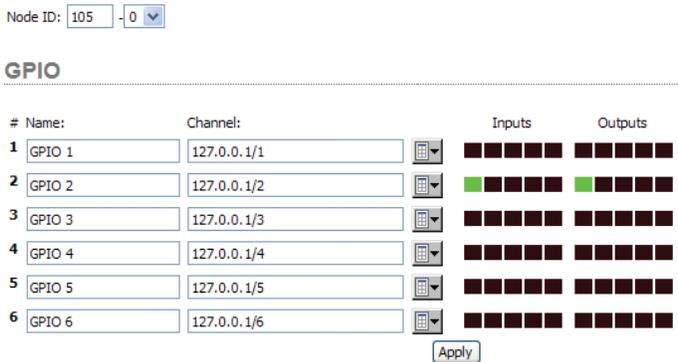


Figure 7-8

Each port is represent by a row. The name column is used to assist with documenting the function of the port (or the device which is connected to the port). The Channel column is used to configured the port. The input and output columns show a grouping of boxes that represent each of the 5 GPIs and 5 GPOs. A high state (not active) is represented by a black box. A low state (active) is represented by a green state.

Configuration of a port can be accomplished in three different ways.

1. **Port routing** – The GPI activity on a port will trigger the GPO of the port you are configuring. (you are routing the GPIs of a port to another port’s GPOs). This is done by entering in the IP address

of the device with a GPIO port followed by a forward slash and the port number. 10.216.0.121/5 – equates to port 5 at address 10.216.0.121 new line 127.0.0.1/1 assigned to port 1 would be a loopback; GPI activity on the port would trigger the GPO of the same port (used for testing)

2. **Channel assignment** – The GPIO port will follow the logic as defined by a control surface. Axia control surfaces have predefined logic for a source loaded to a fader. The logic is shared on the network through the use of the unique channel number for a source. Refer to appendix A for common predefined functions. To assign a port to a channel, either manually type in the channel number in the field OR use the browse button to search the network for advertised sources.

3. **Pathfinder control** – The Pathfinder series of products has the ability to observe GPIO activity as well as trigger GPO activity. Nothing is required to configure in the GPIO xNode, all the configuration is done in Pathfinder. Please refer to Pathfinder documentation for detailed information.

Other Web Interfaces

The GPIO xNode does not have any complexity to it, so there are no advance web pages to worry about.

Home

The Home page is the default page and provides information on the device ID, software version, system temp, network interface status, power supply status, and uptime. There is no sync information as in other xNodes because the GPIO xNode is not an audio device and therefore does not require audio synchronization.

System

The system page provides access to IP settings, logging options, password change, and software control. The system page is covered in more detail in chapter 3, section Web Interface.

*Dark, dark as coal tar
it pours out, bitter and strong.
That's Starbucks for you.*

Chapter Eight:

Mixed Signal xNode

The Mixed Signal xNode has one switched analog input (either microphone or analog stereo), two analog stereo inputs, one AES/EBU input, three analog stereo outputs, one AES/EBU output, and 2 GPIO ports (5GPI/5GPO per port).

Rear Panel

The Mixed Signal xNode uses RJ45 connectors for analog and AES audio, and an XLR connector for the selectable Mic input.



Figure 8-1: GPIO xNode Rear Panel

The top 4 RJ-45 style ports are inputs; three analog inputs followed by one AES/EBU input. The bottom 4 RJ-45 style ports are outputs; three analog outputs followed by one AES/EBU output.

The XLR-F connector is used as an analog input with the intention of it being a microphone input.

PIN	FUNCTION
1	Shield
2	Positive
3	Negative

The pinout of an RJ-45 port

PIN	FUNCTION
1	Left Channel /AES Input/Output +
2	Left Channel /AES Input/Output -
3	Right Channel Input/Output +
4	Ground
5	Not Used
6	Right Channel Input/Output -
7	Not Used
8	Not Used

The illustration shows the connector pinouts; 5 inputs and associated common return, 5 output relays and associated common, a +5 volt power source, and power source ground.

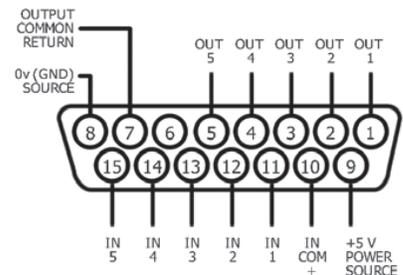


Figure 8-2

The maximum allowed external power supply for logic control 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 @ 1/4 watt
24	1.8k @ 1/2 watt
48	3.9k @ 1 watt

Using external power supplies is the recommended method to avoid possible ground loops between equipment.

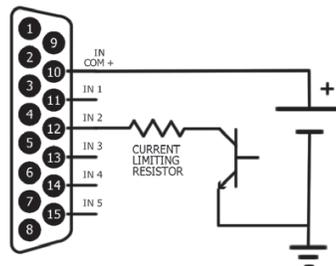


Figure 8-3

Take note to use current limiting resistors per the above 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 controlled is electrically isolated, than the use of the GPIO port’s power supply is acceptable.

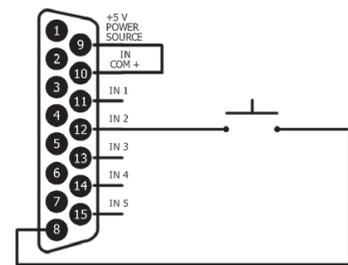


Figure 8-4

Axia GPIO accessory modules are designed to interface directly to the GPIO port. The DA-15 connector on the back of an accessory module is a direct pin-to-pin match to the GPIO port of the xNode. Premade cables of this configuration are commonly available through companies that specialize in interconnect cable assembly products.

The GPO portion of the GPIO ports are solid state relays. Current should be limited to a combined 100 mA through all the pins of a port. The following diagram shows the recommended connections for outputs with the use of an external power supply.

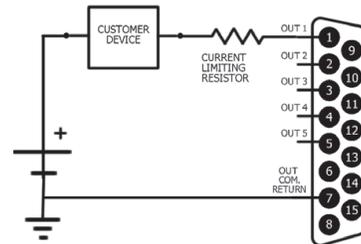


Figure 8-5

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

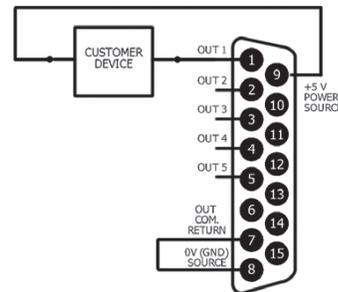


Figure 8-6

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.

Note, all of 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 remotely-controlled device is to be connected to a single 15-pin I/O port, you must make sure that the two units in question have the same ground potential or ground loops will occur. Therefore, it is recommended that only one remote device be connected

to each I/O port connector to assure complete electrical isolation.

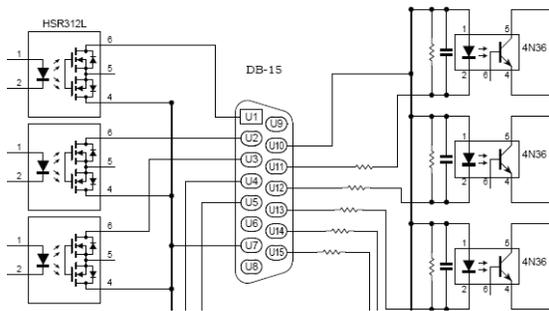


Figure 8-7

Simple Setup

The Simple Setup page will provide an option to edit the Node ID and allow the setup of the Source channels based on the node ID given. Auto channel numbering follows the following rules:

- **Node ID in range nn=<1-99>** - Channel numbers: nn01-nn08.
- **Node ID in range abc=<100-319>**, with second level identifier d=<0-9> - Channel numbers: abcd1-abcd8

The Simple Setup page provides fields to give each active source a name. The name is useful in documenting what is wired to the input, but is also used in the source advertisement through the network. Source #1 has an option to select if the audio source will be the XLR “Mic(1)” input or the RJ45 “Line 1” input. Only one of the switched inputs may be used. By default, 4 channels are enabled in stereo mode. If you desire to set some sources as mono, refer to the Advanced Web Interface Source section.

The Simple Setup page provides fields to give a name to each Destination. This is used to document what is wired to the xNode. The channel field is used to specify the network audio source that is to be routed to the output. If you are not familiar with the desired channel, use the browse button to open a popup which will have a list of sources in the network. Picking a source from the popup window will immediately route that source to the destination.

Simple Setup page provides the only configuration access to the two GPIO ports. Each port is represented by a row. The name column is used to assist with documenting the function of the port (or the device which is connected to the port). The Channel column is used to configure the port. The input and output columns show a grouping of boxes that represent each of the 5 GPIs and 5 GPOs. A high state (not active) is represented by a black box. A low state (active) is represented by a green state.

Configuration of a port can be accomplished in three different ways.

1. **Port routing** – The GPI activity on a port will trigger the GPO of the port you are configuring. (you are routing the GPIs of a port to another port’s GPOs). This is done by entering in the IP address of the device with a GPIO port followed by a forward slash and the port number. 10.216.0.121/5 – equates to port 5 at address 10.216.0.121 127.0.0.1/1 assigned to port 1 would be a loopback; GPI activity on the port would trigger the GPO of the same port (used for testing)
2. **Channel assignment** – The GPIO port will follow the logic as defined by a control surface. Axia control surfaces have predefined logic for a source loaded to a fader. The logic is shared on the network through the use of the unique channel number for a source. Refer to Appendix A for common predefined functions. Refer to the control surface manual for updated information on these functions. To assign a port to a channel, either manually type in the channel number in the field OR use the browse button to search the network for advertised sources.
3. **Pathfinder control** – The Pathfinder series of products has the ability to observe GPIO activity as well as trigger GPO activity. Nothing is required to configure in the GPIO xNode, all the configuration is done in Pathfinder. Please refer to Pathfinder documentation for detailed information.

Any manual entries made into fields will require you to save the work by pressing the APPLY button.

Advanced Web Interface

Sources

Sources page defines the audio inputs of the xNode. An input of the xNode is given a name and a unique channel number that is used to distribute through the network. The xNode provides an auto numbering process when you ID the xNode.

Source Name column is used to identify the device that is connected to the xNode input and is also used in source advertisement through the network.

Channel column is the unique number for each source. This is likely already numbered based on the auto-number rules. It is critical that each source in the network has a unique number, not shared with any other devices.

Along with stream type, the mode option defines whether the input should be treated as a stereo input or a mono input. Setting a channel as mono will define which portion of the input should be used. For example (in 1-L) defines Input 1 – Left as the source for the channel. Once you Apply the new selection, a new channel will appear below the first four channels, allowing you to define another Livewire channel for the right side of the same input.

Input gain column provides adjustment of -72dB to +24dB for line level audio and +21dB to +77dB for the microphone audio input.

Destinations

Destinations page defines the audio outputs of the xNode. The xNode defaults to 4 stereo audio outs. The xNode provides the option to split the 2 channel, stereo outs into two mono outs.

The first column is the name field which is used for documenting the output. This is helpful to recall what should be wired to the xNode or what source should be routed to the output.

Channel column is used to define the network source which is routed to the destination. You may type in the channel number or use the browse button to search the

network for the desired source. When using the browse function, a popup will appear displaying all the sources in the network. Selecting a source will populate the channel information in the text field but the change will not take place until the Apply button is pressed. Selecting some “To:*” source from the network will automatically change the type field for you.

Type column defines if the output should behave as stereo or mono and if the output is the audio *from the source* defined in the channel field or a special dynamic return audio known as a backfeed (*To Source*). Backfeeds exist in the network because of an Axia control surface that may have generated the source due to configuration. If you are comfortable with the concept of backfeeds, you can manually change the option. If not familiar, simply picking the desired source from the browse function should be all you need to do.

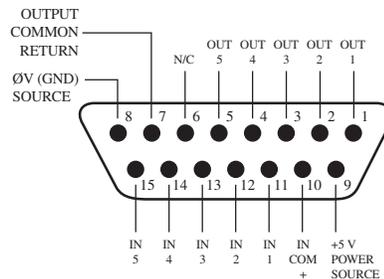
If the desire is to convert the default stereo output to two single channel outputs, the Type option allows you to select the LEFT, RIGHT, or SUM of Left and Right, of the channel defined in the Channel field. After applying this change, a new Destination will appear under the default 4 Destinations allowing you to configure the other channel (right side) of the same output.

Gain column provides adjustment for the outputs from the range of -72dB to +24dB.

Appendix A: GPIO Logic Table Samples

GPIO Operator's Microphone Logic

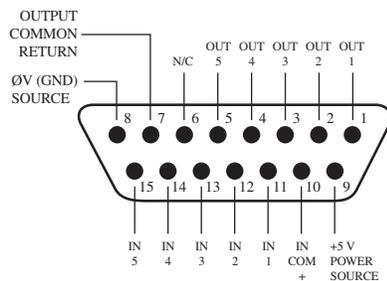
Name	Pin	Type	Notes
INPUTS			
ON Command	11	Active Low Input	Turns channel ON
OFF Command	12	Active Low Input	Turn channel OFF
TALK (to Monitor 2) Command	13	Active Low Input	Activates the TALK TO MON2 function and routes mic audio to the Talkback bus.
MUTE Command	14	Active Low Input	Mutes channel outputs
TALK (to PREVIEWED SOURCE) Command	15	Active Low Input	Activates the TALK button on every source currently in preview and routes mic audio to the Talkback bus.
OUTPUTS			
ON Lamp	1	Open Collector to Logic Common Return	Illuminates when channel is ON unless TALK or MUTE is active
OFF Lamp	2	Open Collector to Logic Common Return	Illuminates when channel is OFF
TALK (to Monitor 2) Lamp	3	Open Collector to Logic Common Return	Illuminates when TALK TO MON2 is active
MUTE Lamp	4	Open Collector to Logic Common Return	Illuminates when MUTE is active
TALK (to PREVIEWED SOURCE) Lamp	5	Open Collector to Logic Common Return	Illuminates when TALK to PREVIEWED SOURCE is active.
POWER & COMMON			
Source Common	7	Logic Common	Connect to ground of source device or to Pin 8
Logic Common	8	Internal 5 Volt return	Can be connected to Pin 7 if source is not providing common
Logic +5 Volt Supply	9	Logic Supply, Individually Fused	Can be connected to Pin 10 if source is not providing voltage; active only when source has been assigned to channel.
Input Common	10	Common for all 5 inputs	Connect to power supply of source device or to Pin 9
NOT CONNECTED	6		



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GPIO Control Room Guest Microphone Logic

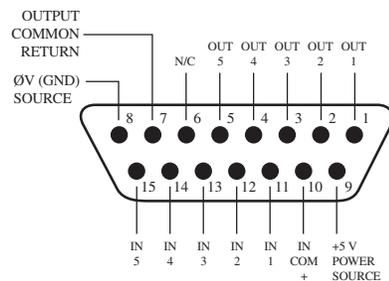
Name	Pin	Type	Notes
INPUTS			
ON Command	11	Active Low Input	Turns channel ON
OFF Command	12	Active Low Input	Turn channel OFF
TALK (to CR) Command	13	Active Low Input	Mutes channel outputs and routes source audio to PVW speakers
MUTE Command	14	Active Low Input	Mutes channel outputs
NOT CONNECTED	15		
OUTPUTS			
ON Lamp	1	Open Collector to Logic Common Return	Illuminates when channel is ON unless TALK or MUTE is active
OFF Lamp	2	Open Collector to Logic Common Return	Illuminates when channel is OFF
TALK (to CR) Lamp	3	Open Collector to Logic Common Return	Illuminates when TALK is active
MUTE Lamp	4	Open Collector to Logic Common Return	Illuminates when MUTE is active
NOT CONNECTED	5		
POWER & COMMON			
Source Common	7	Logic Common	Connect to ground of source device or to Pin 8
Logic Common	8	Internal 5 Volt return	Can be connected to Pin 7 if source is not providing common
Logic + 5 Volt supply	9	Logic Supply, Individually Fused	Can be connected to Pin 10 if source is not providing voltage; active only when source has been assigned to channel.
Source Supply	10	Common for all 5 inputs	Connect to power supply of source device or to Pin 9
NOT CONNECTED	6		



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GPIO Producer's Microphone Logic

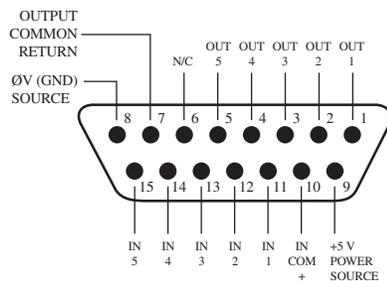
Name	Pin	Type	Notes
INPUTS			
ON Command	11	Active Low Input	Turns channel ON
OFF Command	12	Active Low Input	Turn channel OFF
TALK (to MONITOR 2) Command	13	Active Low Input	Activates the TALK to MON2 function and routes mic audio to the Talkback bus.
MUTE Command	14	Active Low Input	Mutes channel outputs
TALK (to PREVIEWED SOURCE) Command	15	Active Low Input	Activates the TALK button on every source currently in Preview and routes mic audio to the Talkback bus.
OUTPUTS			
ON Lamp	1	Open Collector to Logic Common Return	Illuminates when channel is ON unless TALK or MUTE is active
OFF Lamp	2	Open Collector to Logic Common Return	Illuminates when channel is OFF
TALK (to MONITOR 2) Lamp	3	Open Collector to Logic Common Return	Illuminates when TALK to MON2 is active.
MUTE Lamp	4	Open Collector to Logic Common Return	Illuminates when MUTE is active
TALK (to PREVIEWED SOURCE) Lamp	5	Open Collector to Logic Common Return	Illuminates when TALK to PREVIEWED SOURCE is active.
POWER & COMMON			
Source Common	7	Logic Common	Connect to ground of source device or to Pin 8
Logic Common	8	Internal 5 Volt return	Can be connected to Pin 7 if source is not providing common
Logic + 5 Volt supply	9	Logic Supply, Individually Fused	Can be connected to Pin 10 if source is not providing voltage; active only when source has been assigned to channel.
Source Supply	10	Common for all 5 inputs	Connect to power supply of source device or to Pin 9
NOT CONNECTED	6		



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GPIO Line Input Logic

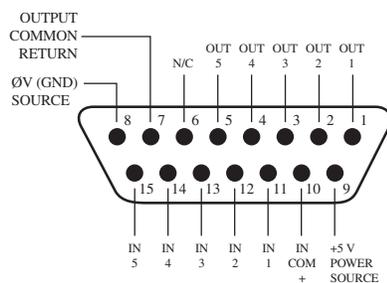
Name	Pin	Type	Notes
INPUTS			
ON Command	11	Active Low Input	Turns channel ON
OFF Command	12	Active Low Input	Turns channel OFF & sends 100 msec STOP pulse
PREVIEW Command	13	Active Low Input	Turns preview ON
RESET Command	14	Active Low Input	Turns channel OFF, while not sending a STOP pulse
READY Command	15	Active Low Input	Illuminates OFF lamp to indicate source's readiness
OUTPUTS			
ON Lamp	1	Open Collector to Logic Common Return	Illuminates when channel is ON
OFF Lamp	2	Open Collector to Logic Common Return	Illuminates when channel is OFF and READY is active
PREVIEW Lamp	3	Open Collector to Logic Common Return	Illuminates when PREVIEW is ON
START Pulse	4	Open Collector to Logic Common Return	A 100 msec pulse when the channel status changes from OFF to ON
STOP Pulse	5	Open Collector to Logic Common Return	A 100 msec pulse when the channel status changes from ON to OFF
POWER & COMMON			
Source Common	7	Logic Common	Connect to ground of source device or to Pin 8
Logic Common	8	Internal 5 Volt return	Can be connected to Pin 7 if source is not providing common
Logic + 5 Volt supply	9	Logic Supply, Individually Fused	Can be connected to Pin 10 if source is not providing voltage; active only when source has been assigned to channel.
Source Supply	10	Common for all 5 inputs	Connect to power supply of source device or to Pin 9
NOT CONNECTED	6		



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GPIO Codec Logic

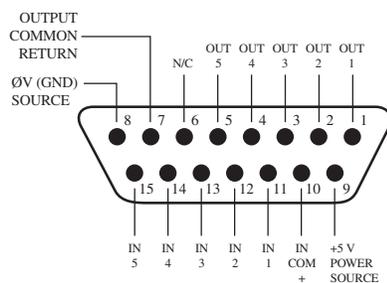
Name	Pin	Type	Notes
INPUTS			
ON Command	11	Active Low Input	Turns channel ON
OFF Command	12	Active Low Input	Turns channel OFF
TALK (to CR) Command	13	Active Low Input	Mutes channel outputs and routes source audio to PVW speakers
MUTE Command	14	Active Low Input	Mutes channel outputs
TALK (to SOURCE) Command	15	Active Low Input	Allows an external button to activate channel TALK TO SOURCE function.
OUTPUTS			
ON Lamp	1	Open Collector to Logic Common Return	Illuminates when channel is ON unless TALK or MUTE are active
OFF Lamp	2	Open Collector to Logic Common Return	Illuminates when channel is OFF.
TALK (to CR) Lamp	3	Open Collector to Logic Common Return	Illuminates when TALK is active
MUTE Lamp	4	Open Collector to Logic Common Return	Illuminates when MUTE is active
TALK (to SOURCE) Lamp	5	Open Collector to Logic Common Return	Illuminates when the channel TALK TO SOURCE function is active.
POWER & COMMON			
Source Common	7	Logic Common	Connect to ground of source device or to Pin 8
Logic Common	8	Internal 5 Volt return	Can be connected to Pin 7 if source is not providing common
Logic + 5 Volt supply	9	Logic Supply, Individually Fused	Can be connected to Pin 10 if source is not providing voltage; active only when source has been assigned to channel.
Source Supply	10	Common for all 5 inputs	Connect to power supply of source device or to Pin 9
NOT CONNECTED	6		



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GPIO Telephone Hybrid Logic

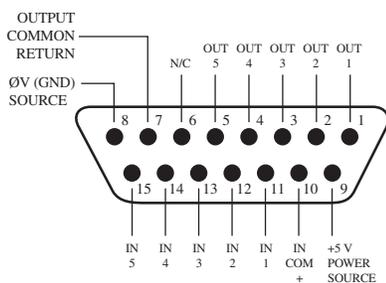
Name	Pin	Type	Notes
INPUTS			
ON Command	11	Active Low Input	Turns channel ON
OFF Command	12	Active Low Input	Turns channel OFF
PREVIEW Command	13	Active Low Input	Turns preview ON
RESET Command	14	Active Low Input	Turns channel off while not sending a STOP pulse
READY Command	15	Active Low Input	Illuminates OFF lamp to indicate source's readiness
OUTPUTS			
ON Lamp	1	Open Collector to Logic Common Return	Illuminates when channel is ON
OFF Lamp	2	Open Collector to Logic Common Return	Illuminates when channel is OFF
PREVIEW Lamp	3	Open Collector to Logic Common Return	Illuminates when PREVIEW is ON
START Pulse	4	Open Collector to Logic Common Return	A 100 ms PULSE is sent when channel is first turned ON or when PVW is first selected
STOP Pulse	5	Open Collector to Logic Common Return	A 100 ms PULSE sent when channel is turned OFF.
POWER & COMMAND			
Source Common	7	Logic Common	Connect to ground of source device or to Pin 8
Logic Common	8	Internal 5 Volt return	Can be connected to Pin 7 if source is not providing common
Logic + 5 Volt supply	9	Logic Supply, Individually Fused	Can be connected to Pin 10 if source is not providing voltage; active only when source has been assigned to channel.
Source Supply	10	Common for all 5 inputs	Connect to power supply of source device or to Pin 9
NOT CONNECTED	6		



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GPIO Control Room Monitor Logic

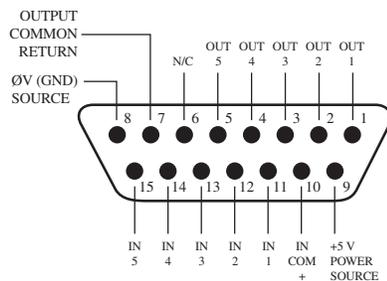
Name	Pin	Type	Notes
INPUTS			
MUTE CR Command	11	Active Low Input	Mutes CR monitors and Pre-view speakers
DIM CR Command	12	Active Low Input	Allows external dimming of CR monitor speakers.
Enable EXT PREVIEW Com-mand	13	Active Low Input	Feeds External Audio Input to PREVIEW
TALK TO EXT Command	14	Active Low Input	Turns on Talk to External Audio.
Not used.	15	Active Low Input	
OUTPUTS			
CR ON AIR Lamp	1	Open Collector to Logic Com-mon Return	Illuminates whenever CR monitors are muted
DIM CR Lamp	2	Open Collector to Logic Com-mon Return	Illuminates whenever control room monitors are DIMMED
PREVIEW Lamp	3	Open Collector to Logic Com-mon Return	Illuminates when PREVIEW is active.
TALK TO EXT Lamp	4	Open Collector to Logic Com-mon Return	Illuminates when Talk to External is active.
TALK (to CR) Active Lamp	5	Open Collector to Logic Com-mon Return	Active whenever a source has activated its TALK (to CR) function
POWER & COMMON			
Source Common	7	Logic Common	Connect to ground of source device or to Pin 8
Logic Common	8	Internal 5 Volt return	Can be connected to Pin 7 if source is not providing com-mon
Logic + 5 Volt supply	9	Logic Supply, Individually Fused	Can be connected to Pin 10 if source is not providing voltage; active only when source has been assigned to channel.
Source Supply	10	Common for all 5 inputs	Connect to power supply of source device or to Pin 9
NOT CONNECTED	6		



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GPIO Computer Playback Device Logic

Name	Pin	Type	Notes
INPUTS			
ON Command	11	Active Low Input	Turns channel ON
OFF Command	12	Active Low Input	Turns channel OFF & sends 100 msec STOP pulse
PREVIEW Command	13	Active Low Input	Turns preview ON
Not Used	14	Active Low Input	
READY Command	15	Active Low Input	Illuminates OFF lamp to indicate source's readiness
OUTPUTS			
NEXT Pulse	1	Open Collector to Logic Common Return	A 100 mS PULSE sent when ON button is depressed, except when initially turned ON.
OFF Lamp	2	Open Collector to Logic Common Return	Illuminates when channel is OFF and READY is active
PREVIEW Lamp	3	Open Collector to Logic Common Return	Illuminates when PREVIEW is ON
START Pulse	4	Open Collector to Logic Common Return	A 100 ms PULSE sent when channel is first turned ON.
STOP Pulse	5	Open Collector to Logic Common Return	A 100 ms PULSE sent when channel is turned OFF.
POWER & COMMON			
Source Common	7	Logic Common	Connect to ground of source device or to Pin 8
Logic Common	8	Internal 5 Volt return	Can be connected to Pin 7 if source is not providing common
Logic + 5 Volt supply	9	Logic Supply, Individually Fused	Can be connected to Pin 10 if source is not providing voltage; active only when source has been assigned to channel.
Source Supply	10	Common for all 5 inputs	Connect to power supply of source device or to Pin 9
NOT CONNECTED	6		



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Appendix B: xNode Specifications

Microphone Preamplifiers

- Source Impedance: 150 ohms
- Input Impedance: 4 k ohms minimum, balanced
- Nominal Level Range: Adjustable, -75 dBu to -20 dBu
- Input Headroom: >20 dB above nominal input
- Phantom power: +48VDC, switchable

Analog Line Inputs

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

Analog Line Outputs

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

Digital Audio Inputs and Outputs

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

Frequency Response

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

Latency

- Analog Input to Analog Output, 2.75ms including network, converters, and mixing process
- Digital Input to Digital Output, 1.75ms including network mixing engine (ASRC off)

Dynamic Range

- Analog Inputs to Analog Outputs 108dB referenced to 0dBFs, 111dB A-weighted
- Analog Inputs to Digital Outputs 110dB referenced to 0dBFs, 113dB A-weighted
- Digital Inputs to Analog Outputs 112dB referenced to 0dBFs, 115dB A-weighted
- Digital Inputs to Digital Outputs 126dB

Equivalent Input Noise

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

Total Harmonic Distortion + Noise

- Mic Pre Input to Analog Output: < 0.005%, 1 kHz, -36dBu input, +18dBu output
- Analog Input to Analog Output: < 0.005%, 1 kHz, +18dBu input, +18dBu output
- Analog Input to Digital Output: < 0.004%, 1 kHz, +18dBu input, -6dBFs output
- Digital Input to Analog Output: < 0.004%, 1 kHz, -6dBFs input, +18dBu output
- Digital Input to Digital Output: < 0.0003%, 1 kHz, -20dBFs

Crosstalk Isolation, Stereo Separation and CMRR

- Analog Line channel to channel isolation: 90dB minimum, 20Hz to 20kHz
- Analog Line stereo separation: 85dB minimum, 20Hz to 20kHz

- Analog Line Input CMRR: 80dB minimum, 20Hz to 20kHz
- Microphone Input CMRR: >60 dB, 20 Hz to 20 kHz

Power Supply AC Input

- Auto-ranging supply, 95VAC to 240VAC, 50 Hz to 60 Hz,
- IEC receptacle, internal fuse
- Power consumption: 14 Watts

Operating Temperatures

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

Dimensions and Weight

- 8.5" (22 cm) wide; two may be mounted side-by-side in a standard 1RU rack space (with accessory mounting kit)
- 1.72" (4.4 cm) height, 11.75" (30 cm) depth
- Shipping Weight: 7 lbs. (3.2 kg.)
- Shipping Dimensions: 17" (43.2 cm) length, 13" (33 cm) width, 7" (17.8 cm) height

Warranty

Telos Alliance Limited Warranty

This Warranty covers “the Products,” which are defined as the various audio equipment, parts, software and accessories manufactured, sold and/or distributed by or on behalf of TLS Corp. and its affiliated companies, collectively doing business as The Telos Alliance (hereinafter “Telos”).

With the exception of software-only items, the Products are warranted to be free from defects in material and workmanship for a period of five (5) years from the date of receipt of such Product by the end-user (such date of receipt the “Receipt Date”). Software-only items are warranted to be free from defects in material and workmanship for a period of 90 days from the Receipt Date. Telos will repair or replace (in its discretion) defective Products returned to Telos within the warranty period, subject to the provisions and limitations set forth herein.

This warranty will be void if the Product: (i) has been subjected, directly or indirectly, to Acts of God, including (without limitation) lightning strikes or resultant power surges; (ii) has been improperly installed or misused, including (without limitation) the failure to use telephone and power line surge protection devices; (iii) has been damaged by accident or neglect. As with all sensitive electronic equipment, to help prevent damage and or loss of data, we strongly recommend the use of an uninterruptible power supply (UPS) with all of our Products. Telos products are to be used with registered protective interface devices which satisfy regulatory requirements in their country of use.

This Warranty is void if the associated equipment was purchased or otherwise obtained through sales channels not authorized by Telos.

EXCEPT FOR THE ABOVE-STATED EXPRESS WARRANTY, TELOS MAKES NO WARRANTIES, EXPRESS OR IMPLIED (INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE).

In no event will Telos, its directors, officers, employees, agents, owners, consultants or advisors (its “Affiliates”), or authorized dealers or their respective Affiliates, be liable for incidental or consequential damages, or for loss, damage, or expense directly or indirectly arising from the use of any Product or the inability to use any Product either separately or in combination with other equipment or materials, or from any other cause.

In order to invoke this Warranty, the Product must be registered via Telos’ website (found at: <http://telosalliance.com/legal/warranty>) at time of receipt by end-user and notice of a warranty claim must be received by Telos within the above stated warranty period and warranty coverage must be authorized by Telos. Contact may be made via email: support@telosalliance.com or via telephone: (+1) 216-241-7225. If Telos authorizes the performance of warranty service, the defective Product must be delivered to: Telos, 1241 Superior Avenue, Cleveland, Ohio 44114 or other company repair center as may be specified by Telos at the time of claim.

Shipping Costs and Warranty Service:

If the date the customer's notice of warranty claim is received by Telos (such date the "Warranty Claim Notice Date") is within the first 90 days following the Receipt Date, Telos will pay the costs of shipping such warranted Product to and from the end user's location, and the cost of repair or replacement of such warranted Product.

If the Warranty Claim Notice Date occurs after the first 90 days following the Receipt Date and before the end of the second (2nd) year, the customer will pay the freight to return the warranted Product to Telos. Telos will then, at its sole discretion, repair or replace the warranted Product and return it to the end user at Telos' expense.

If the Warranty Claim Notice Date occurs between the end of the second (2nd) year following the Receipt Date and the completion of the fifth (5th) year, the customer will pay the costs of shipping such warranted Product to and from the end user's location. Telos will then, in its sole discretion, repair or replace the warranted Product at Telos' expense. Telos also reserves the right, if it is not economically justifiable to repair the warranted Product, to offer a replacement product of comparable performance and condition direct to the customer at a discounted price, accepting the failed warranted Product as a trade-in.

The end user will in all cases be responsible for all duties and taxes associated with the shipment, return and servicing of the warranted Product.

No distributor, dealer, or reseller of Telos products is authorized under any circumstances to extend, expand or otherwise modify in any way the warranty provided by Telos, and any attempt to do so is null and void and shall not be effective as against Telos or its Affiliates.

Out of warranty units returned to the factory for repair may be subject to a \$500 evaluation fee, which fee must be prepaid prior to shipping the unit to Telos. If no repairs are required, the \$500 fee will be retained by Telos as an evaluation charge. If repairs are required, the \$500 fee will be applied to the total cost of the repair.



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