xSwitch

Installation & User's Guide

Manual Rev 1.2.2 - June 2014
p/n 1490-00094-001

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 present appareil numerRadiusue n'emet pas de bruits radioelectrique depassant les limites applicables aux appareils numerRadiusues (de les Class A) prescrites dans le Reglement sur le brouillage radioelectrique par le ministere 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 xSwitch 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 xSwitch 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 xSwitch. 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

Complexity, gone.

Just plug it in and go: that's

what we're talkin' 'bout.

Chapter One:

Introducing the xSwitch

The xSwitch is a member of the xNode family, compact half-rack Livewire devices. The xSwitch is intended to be used with Livewire devices and thus has been configured for the customer, with almost no setup required!

The Front Panel

Figure 1-1: xSwitch Front Panel

The xSwitch has an OLED display on the left side providing status and setup information.

Figure 1-2: xSwitch OLED Display

Rear Panel

Figure 1-3: xSwitch Rear Panel

The rear panel of the xSwitch has multiple network ports for connecting Livewire devices:

- Two Gigabit ports which are accessed through either a 1000BASE-T connection or Small-Form-Factor pluggable (SFP) connection.
- Four 100BASE-T + PoE (Power over Ethernet) ports
- Four 100BASE-T ports

There is also a single IEC connector to power the xSwitch.

HTML Interface

Along with the front panel OLED display, the xSwitch has an HTML interface that can be accessed with a PC connected to the same network and within the same subnet. When entering the IP address of the xSwitch in a browser, an authentication window will ask for a username and password. The defaults are:

Username: user
Password: (none)

What's Next

Now that you've got a basic overview, let's start routing some packets with your xSwitch! First, you'll need to assign an IP address; this can be done through the front panel controls, or with Axia iProbe software. The next chapters will show you how and discuss setup and details about your xSwitch.

SFP, so small

Copper, fiber, coexist

Duality rocks.

Chapter Two:

Setup

When the xSwitch boots for first time, it will have no IP address. An IP address can be assigned to the xSwitch in any of three ways:

1. Assign the xSwitch a NODE-ID value, which in turn assigns an IP address.
2. Enter an IP address from the front panel.
3. Use the *bootp* server within iProbe to push an IP address to the xSwitch.

These three methods are given more detail below.

Assigning an ID to the xSwitch

The Axia xNode family uses an ID schema for identifying each device, in which assigning a unique ID number also assigns a unique IP address. The xSwitch supports this schema. To do this, press the top button to the right of the OLED display a few times until the page shown is the Node ID page.

Figure 2-1

No ID value should be shown, as the xSwitch has not been given an ID number yet. Press and hold the lower button (represented by the pencil icon) for 10 seconds to edit the ID value. Note that if the screen has fallen asleep (the OLED display dims), a single button press is required to wake up the front panel before pressing and holding the edit button.

In Edit mode, a cursor appears next to the word "Node". The top button becomes an increment button and increases the numerical value at the cursor position; the bottom button becomes the next key, moving the cursor to the next position. After the last digit is entered, the xSwitch is assigned the ID value and an IP address in the subnet of 10.216.x.y . If, during this process, there is inactivity for 30 seconds, edit mode times out and no ID will be assigned.

MORE ON ID VALUES: Number ranges of 1-99 (nn) supports small-to-medium networks with up to 99 network devices. The ID defines the IP address 10.216.0.1nn . Number ranges of 100-319 (abc) supports large networks with up to 2299 network devices. When the 3 digit ID is being used, a second level identifier becomes available with range of d=<0-9>. The ID defines the IP address 10.216.ab.1cd .

If an IP address has previously been assigned to the xSwitch, assigning an ID number moves the cursor to the IP Address field, allowing the user to toggle with the increment button (top button) between the ID-assigned value and the previous assigned value.

Manual assignment of an IP address

The xSwitch can be given an IP address to fit within a previously established network schema by accessing the IP address page on the front panel and entering into edit mode. Press and hold the lower button (shown with a pencil icon) for 10 seconds.

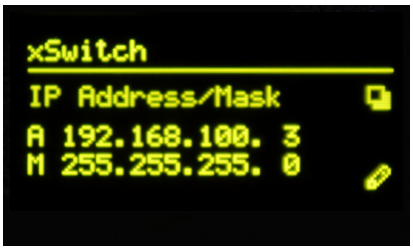


Figure 2-2

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 time out. Once the IP address is edited, pressing the next button (bottom button) will

move the editing to the next line which is the netmask setting. Pressing the next button (bottom button) from the netmask position will save the values.

Using iProbe to push IP address

When an xSwitch boots with no IP address, it will broadcast a bootp request, which continues until an IP address setting is applied. iProbe includes a bootp server, which "hears" this request and can push an IP address to the xSwitch.

A counter at the bootstrap configuration button will

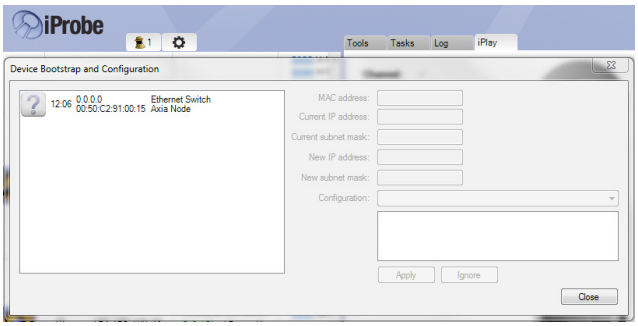


Figure 2-3

appear when requests are received. Clicking on the button will open the Device Bootstrap and Configuration window.

From this window view, select the device from the left side pane and the configuration options will appear on the right side. Enter in an IP address and netmask and press the Apply button.

Web Interface

Once an IP address is assigned to the xSwitch, a PC can access the HTML interface of the device. Make sure that the PC has been given a static IP address within the same subnet as the xSwitch. When accessing the user interface (UI), an authentication window will appear asking for a username and password.

The default values are:

Username: user

Password: (none)

The home page shows device information under the System heading. There is a "Simple Setup" button on the page which will present the Simple Setup page.

The Simple Setup page only shows the Node ID value, allowing the user to assign an ID value from the web UI as opposed to using the front panel. That's all the setup there is — the rest of the switch configuration is pre-programmed for Livewire by the engineers at Axia!

Restoring Defaults

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

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

What's Next

Now that you've had the overview, let's get a closer look. In the next chapter, we'll look at xSwitch in detail, and discuss mounting options as well.

Chapter Three:

The xSwitch in depth

The xSwitch is a 1U half-rack device that can be mounted to a flat surface or in an equipment rack with optional accessories.

Mounting

Optional Surface Mount kit

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

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

Figure 3-1

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

Figure 3-2 Outward configuration

Figure 3-3: Inward configuration

Optional Rack Mount kit

A rack mount kit is provided with each xSwitch, which contains one (1) short rack ear, one (1) long rack ear, one (1) spacer, and associated screws. These parts allow for the mounting of the xSwitch in a standard 19" equipment rack. Thanks to its half-rack design, you can join xSwitch to another member of the xNode family to mount two devices in a single RU space.

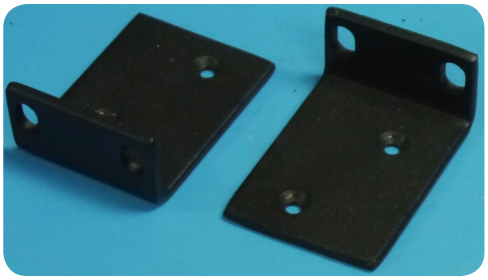


Figure 3-4: Short rack ear

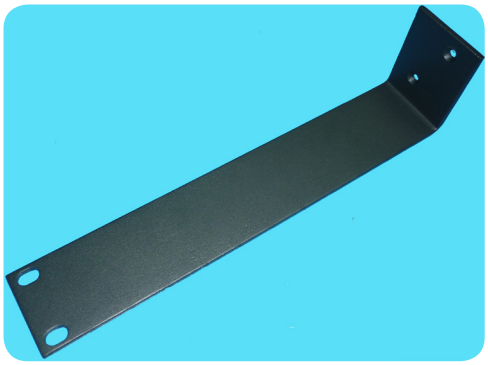


Figure 3-5: Long rack ear

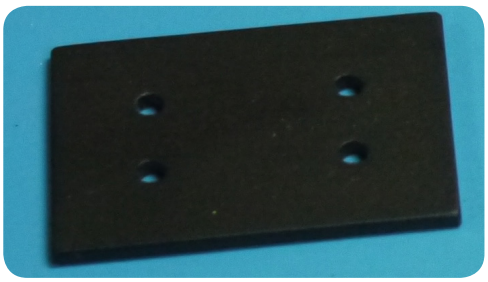


Figure 3-6: Spacer

Single xSwitch

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

Figure 3-8

Double Mount

Remove the top lid from both devices. Place side by side. Place spacer between the two as shown.

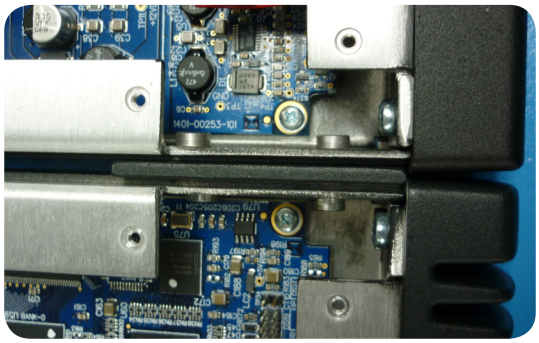


Figure 3-9a

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

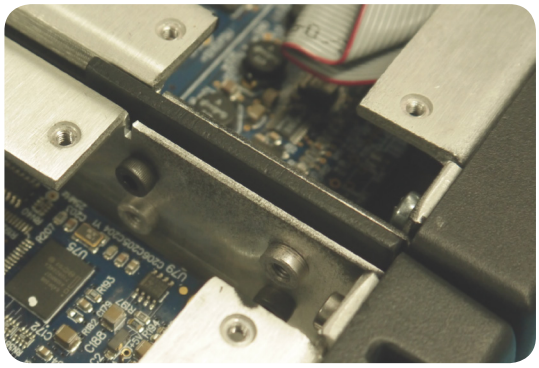


Figure 3-9b

Return the lids and secure. Attach a short rack ear to either side of the devices.

Figure 3-10

Web Interface

The first time an HTML request is issued to a xSwitch, 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 xSwitch.

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

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

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.

Switch Port Status: Each port is identified and information on the link status and PoE usage is reported. At the bottom of the list of ports is a multicast router identifier which reports which ports are connected to devices that manage IGMP reports.

Simple Setup

Simple Setup provides only a Node ID option to the user. All other configuration options have already been done for the customer by the Axia Engineers.

Switch Statistics

The Switch Statistics link provides comprehensive per-port statistics common to Ethernet switchgear. In-

gress statistics refers to packets entering the switch through the port. Egress statistics refer to packets leaving the switch through the port. The page also identifies the different size of packets passing through the switch in the Histogram Statistics Counters.

Other statistic readouts are provided for your information, as follows:

- GoodOctet – represents good data. An octet refers to 8 bits. Generally octet and byte are synonyms, but some platforms in the past may have used byte to refer to a different storage amount. To avoid ambiguity, the term octet is used.
- Bad Octet – counter of bad data. Octet refers to 8 bits.
- Unicast – Transmission of data from one to one. The counter indicates the amount of packets which are unicast transmission messages.
- Broadcast – Transmission of data from one to all. The counter indicates the amount of packets which are broadcast transmission messages.
- Multicast – Transmission of data from one to many — the basis of Livewire audio. The counter indicates the amount of packets which are multicast packets.
- Pause – The counter shows the amount of Pause frames as defined by the IEEE 802.3x standard. This is a form of flow control allowing overwhelmed network ends to halt data transmission.
- Undersize - The number of packets received that were less than 64 octets long but were otherwise well formed.
- Fragments – The number of packets received that were less than 64 octets in length and had either a bad Frame Check Sequence with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error).
- Oversize – The number of packets received that were longer than 1518 octets but were otherwise well formed.
- Jabber – The number of packets received that were longer than 1518 octets, and had either a bad Frame Check Sequence with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error).
- RxErr – Error in received packets.
- FCSErr – Frame Check Sequence errors indicate corrupted data on transmission.
- Deferred – Counter increments when a frame is to be sent but the carrier is found to be busy. Typically an issue only with half-duplex connections.
- Collisions - The result of two or more devices transmitting at the same time on the same segment, producing a garbled transmission. Collisions typically are not an issue with full-duplex switched networks.
- InDiscards – Counter of packets received that are tagged for a VLAN that the port is not associated with, and so are dropped.
- InFiltered – Ingress packets being filtered.
- OutFiltered – Egress packets being filtered.
- <65 - 1024> – counters of different sized packets that travel in and out of the switch.

IGMP Snooping

IGMP Snooping link provides information about the switch's snooping activity. In snooping, the switch is able to determine which ports have requested a multicast group and also determine how many groups have been requested (Multicast Group Count). The page will also identify the source of IGMP query messages and on which port these messages are arriving.

The IGMP Snooping Table identifies the various groups within the switch and which ports have made requests for these groups. In cases where the group is one that is used by Livewire, it will be identified by its simpler Livewire Channel number or administrative function. In some cases you may see groups that are listed which have no Livewire Channel. Some devices on the network may request other multicast streams which are used by other standards. Some examples:

224.0.0.107 - PTP
224.0.0.251 - mDNS
224.0.0.252 - LLMNR

...and a large list of others which can be found by doing an Internet search on multicast addresses.

The IGMP snooping table will display all of the multicast request that have been made by devices connected to the xSwitch.

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 xSwitch providing a unique name. You may customize this field if you desire.

Network address: The IP address of the device as it was configured either by an automated process or by a manual process. 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.

Netmask: 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.

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 be entering in the password twice in the two fields.

Firmware version: The xSwitch uses two storage banks to store software for the xSwitch. 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 xSwitch. Rebooting will cause any audio streams to be interrupted until the reboot completes.

If Bank 1 is empty, you will you 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 xSwitch. Once complete, the System page will return and the two banks will show versions of software.

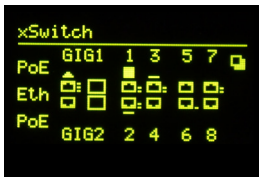
If operating with Bank 1, and you wish to upload a different version, you will select the “commit this version to Bank 0” and press Apply button. This will move the code to Bank 0 and empty Bank 1.

Front panel pages

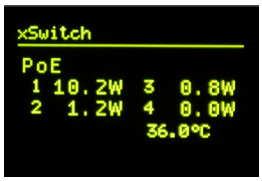
The xSwitch front-panel OLED display presents useful data to the user. Each screen is called a page and the pages can be toggled by pressing the top button — you’ll see the Page icon change as you do so.

- Device Page – shows the type of device, the version of software running, and the current operating temperature. The bottom button has a function defined by the icon near the button. The icon states “ID”. Pressing the bottom button when ID icon is displayed cause the device to send out a bootp request. Axia iProbe software is able to recognize these broadcast messages and provides an interface to push information to the device.

- Port status page – shows status of the two 1000bt ports (copper and SFP), the four PoE ports, and the four 100bt ports. From this page, the user can identify which ports are active, the link speed, PoE active, and which port is an uplink port.
  - » Ports blinking indicate an active port.
  - » 1 dot next to a port indicates 10bt, 2 dots next to port indicate 100bt, and 3 dots next to port indicate 1000bt.
  - » A bar above or below a port indicates active PoE on that port. The amount of power through the port is represented by the size of the bar.
  - » An arrow pointing away from port indicates an uplink port.



- PoE status page – shows the wattage applied to each of the four (4) PoE ports. The xSwitch's operating temperature is also displayed.



- Node-ID page – shows the ID of the device and permits the editing of this value with a 10 second press of the 'pencil' (bottom) button. The IP address is also shown.
- IP address page – shows the IP address of the device and the netmask. Pressing the pencil (bottom) button for 10 seconds allows manual editing of the IP address from the front panel.

Switch details

The xSwitch supports 4 QoS queues. Highest priority given to CoS 6 and 7. DCSP priority also recognized.

IGMP version 2 supported. IGMP snooping query function is enabled with 10 second response time for general queries. The xSwitch will relingish the query function if a multicast router or another querier at a lower IP address is detected. The xSwitch has a 200 second time out for router presence. If another querier is not detected within the time out period, the xSwitch delegates itself as a querier.

The xSwitch has two 1-gigabit ports. A port is either the 1000BT copper interface or the SFP interface. If both interfaces of the port are connected, the first detected will be the active interface. The active interface is used until the link goes down. In such a case, the second interface becomes active for the port.

The SFP interface accepts fiber or copper modules. In case of the copper SFP module, only 1GBit/s speed is supported.

The xSwitch supports a single VLAN.

The xSwitch has a hardware filter capacity of 8k. This is a single capacity for both MAC addresses and multicast groups. The amount of either can vary between network, but in any case, the xSwitch can manage any amount of multicast groups connected to its 10 ports.

Appendix A: xSwitch Specifications

Power Supply AC Input

- Auto-ranging supply, 95VAC to 240VAC, 1.0 A, 50 Hz to 60 Hz
- IEC receptacle, internal fuse
- Power consumption: 75 Watts (all PoE ports under load)

Environmental Ranges

- Operating temperature: 32° F to 104° F (0°C to 40°C),
- Relative humidity: <90% (noncondensing)

Physical Dimensions

- 8.5" (22 cm) wide; two may be mounted side-by-side in a standard 1RU rack space (with included 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

Power over Ethernet

- 15.4 W-per-port maximum, 61.6-W switch maximum

Connector Specifications

10/100/1000 Ports

The 10/100/1000 Ethernet ports use standard RJ-45 connectors.

Connecting to 100BASE-T-Compatible Devices

When connecting the ports to 100BASE-TX-compatible devices, you can use a two or four twisted-pair, Category 5e, straight-through cable.

Connecting to 1000BASE-T Devices

When connecting the ports to 1000BASE-T devices, you must use a four twisted-pair, Category 6, straight-through cable.

SFP Module Ports

The SFP module slot on a dual-purpose port uses SFP modules for fiber-optic and copper uplink ports. xSwitch works with the following supported SFP modules:

- Cisco Copper SFP Model:GLC-T=
- Cisco Copper SFP Model: SFP-GE-T=
- Cisco Multimode fiber model: GLC-SX-MMD=
- Cisco Multimode fiber model: GLC-SX-MM-RGD

Five Guys — In 'N Out

Anyway you slice it, it's

a darn fine burger.

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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