

Telos Alliance SDI AoIP Node

Telos Alliance SDI AoIP Node



As the successor to the SDI xNode, the Telos Alliance SDI AoIP Node continues our commitment to bring the power and flexibility of Audio over IP to broadcast television by de-embedding and converting up to eight pairs of audio from two SDI inputs to AES67. Audio can then be shared on the network, processed for loudness compliance, and ultimately re-embedded into two SDI output streams.

I/O includes 3Gb/s HD/SD-SDI plus AES67 for integration into SMPTE ST 2110-30 workflows. Compensating video delay maintains proper A/V sync, and SRCs are provided for all SDI output channels.

Quick Start Guide

Hardware Overview

SDI AoIP Node Front Panel

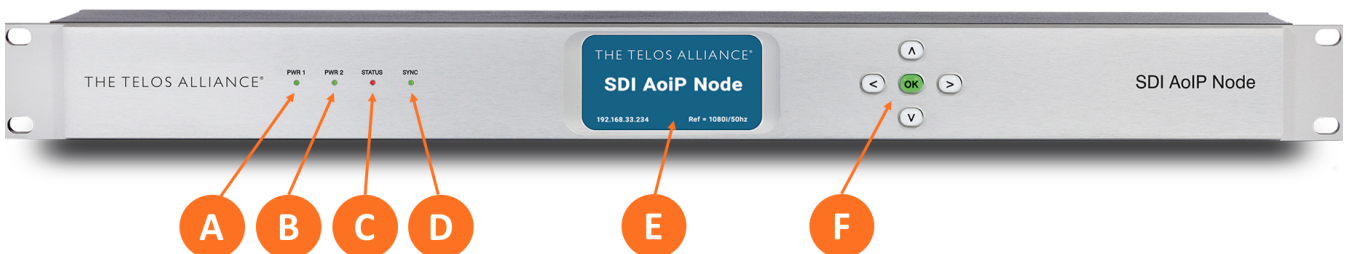


Figure 1 - Front panel

SDI AoIP Node front panel features include:

- **Four status LEDs** indicating the status of each power supply (1A, 1B), the **overall status** of the unit (1C), and **sync** for the reference clock (1D)

-

- A **color LCD display** to show status and basic configuration parameters (1E)
- A **five-button navigation cluster** with Left, Right, Up, and Down arrows plus a green “OK” button (1F)

The front panel is used for the initial setup and configuration including setting the IP address of the Ethernet ports. Additional configuration is accomplished via the remote user interface.

SDI AoIP Node Rear Panel

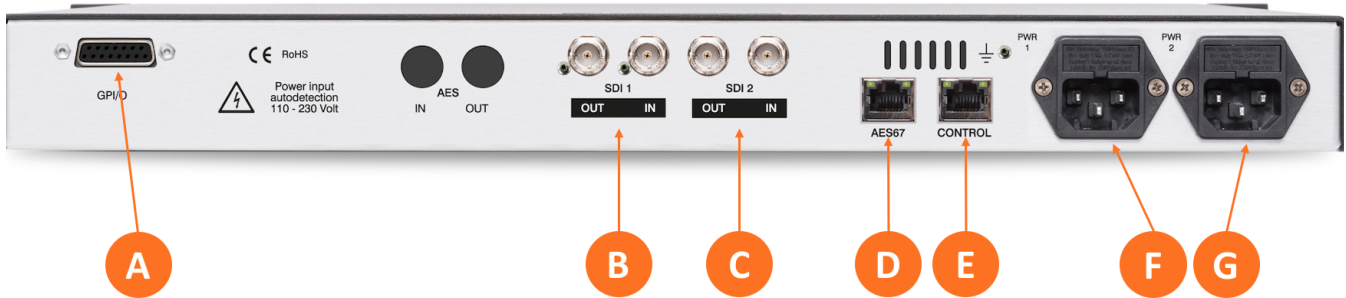


Figure 2 - Rear panel

The rear panel of the SDI AoIP Node contains the following connections:

- One parallel **GPI/O control port** (female DB-15) for five inputs and five outputs (2A)
- **SDI 3Gb/s HD/SD-SDI Input and Output 1** (2B) and **3Gb/s HD/SD-SDI Input and Output 2** (2C) on female BNC connectors
- Two RJ-45 **Gigabit Ethernet connections**, one for AES67 I/O (2D) and one for network remote control (2E)
- Two **IEC power inlets** for the internal redundant universal auto-ranging power supplies (2F, 2G)

Installation and Initial Setup

Installation

SDI AoIP Node is a 1RU product intended to be permanently installed in a standard 19½” equipment rack and secured with four standard rack screws. It is fan cooled with air intakes and exhausts located on the side of the unit just behind the front panel, but whenever possible, it is recommended to leave 1RU of empty space above and below the unit.

Power

Plug the supplied IEC power cords into the unit and connect each to different mains power sources. Remember that while redundant supplies do protect against the unit losing power in the event of a PSU failure, the loss of mains supply voltage is a bigger concern. Accordingly, each supply should be fed from a different circuit equipped with adequate surge protection and fitted with an uninterruptible power supply (UPS).



Important - [Please click here](#) for important information on proper grounding and other items pertaining to electrical safety.

Boot Up and Home Screen

SDI AoIP Node will begin to boot upon applying power; there is no power switch. When the unit finishes booting, it displays the Home Screen which includes the Telos Alliance and SDI AoIP Node logos, the unit's Control IP address, and its reference source and status.

Setting IP Addresses

SDI AoIP Node ships with DHCP enabled and will automatically retrieve an IP address when connected to a network with a DHCP server.



Important! Both the Control and AES67 connections **must** be connected to 1000BASE-T (Gigabit) switch ports. If a port will not be used, **it should not** be connected to a switch but **does** require a specific configuration described below. If both the Control and AES67 ports are used, **each must be on a different subnet.**

Setting a Fixed IP Address for the Control Port

- Press the **Right button** until the IP Configuration (Control) screen is displayed
- Press the **OK button** to highlight "Edit"
- Press **OK** again to highlight "Use DHCP"
- Press the **Right button** to highlight "Yes"
- Press the **Up/Down button** to change the selection to "No"
- Press the **Left button** to highlight the "Use DHCP" field
- Press the **Down button** to highlight "Address"
- Press the **Right button** to move to the first digit of the IP address
- Use the **Up/Down buttons** to change the selection
- Press the **Right/Left buttons** to select another digit to edit
- When finished editing the address field, press the **Right or Left button** to return to "Address"
- Press the **Down button** to navigate to the Netmask and Gateway fields
- Repeat the above steps to edit the Netmask and Gateway fields; note that the gateway may be set to 000.000.000.000 if no gateway is required
- After the Gateway is set, press the **Left button** to highlight "Gateway"
- Press the **Down button** to highlight "Update"
- Press **OK** to save the new IP information

- If you suddenly notice you've entered some incorrect information and need to start over, use the **Right/Left** buttons to highlight "Cancel" followed by "OK"

Pressing the **Right/Left** buttons will eventually return you to the Home Screen.

Configuring the AES67 Port

If you are using AES67 I/O, use the **Left/Right** buttons to navigate to the IP Configuration (AES67) screen. The steps for configuring this port are identical to those above for the Control port. **Please remember that when both the Control and AES67 ports are used, each must be on a different subnet.**

Configuring an Unused Port

If either of the two Ethernet ports will not be used, the unused port must be configured as follows:

- **Do not connect the unused port to a network switch**
- Using the steps above for Control port setup, navigate to the IP Configuration screen of the unused port
- Set "Use DHCP" to "Yes"
- Highlight and select "Update"

Connecting Inputs and Outputs

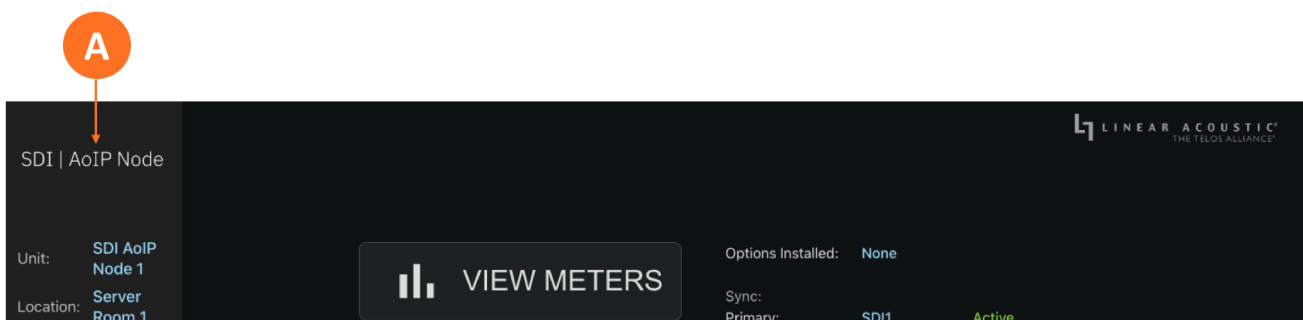
Connect inputs and outputs as required for your particular installation. SDI AoIP Node can access any of the eight audio pairs carried on each of the two available incoming HD- or SD-SDI streams, pair shuffle to the two HD- or SD-SDI outputs, or route audio to an AoIP stream.

Incoming AES67 audio sources can be embedded to an SDI output, and embedded SDI outputs can be sent out as AES67 streams.

Connecting to the Web-Based User Interface

No special client software is required to remotely connect to the SDI AoIP Node. The HTML5-based GUI works on any web browser; we recommend Google Chrome or Apple Safari. The computer or tablet should be connected to the same network and subnet as the SDI AoIP Node.

Enter the IP address of the SDI AoIP Node in the URL field of your browser. Once connected, the Home Screen will appear.



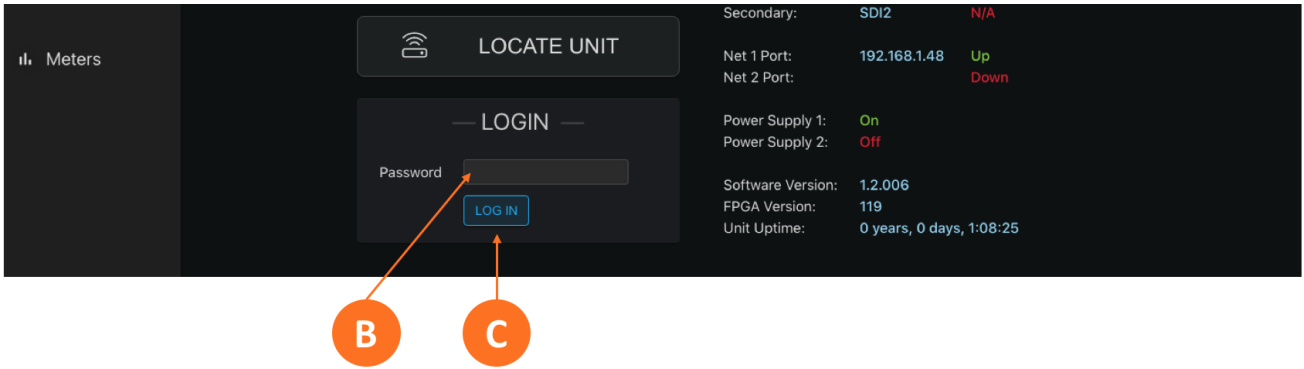


Figure 3 - Home screen

Clicking on the **SDI AoIP Node logo** (3A) in the top left corner will always return you to this screen.

Making modifications to SDI AoIP Node's configuration or signal routing parameters requires logging into the unit. While multiple users can connect simultaneously, only one user account with one password is currently supported.

Type the default password ("1234" minus the quotes) into the **Password field** (3B), then click the **Log In button** (3C).

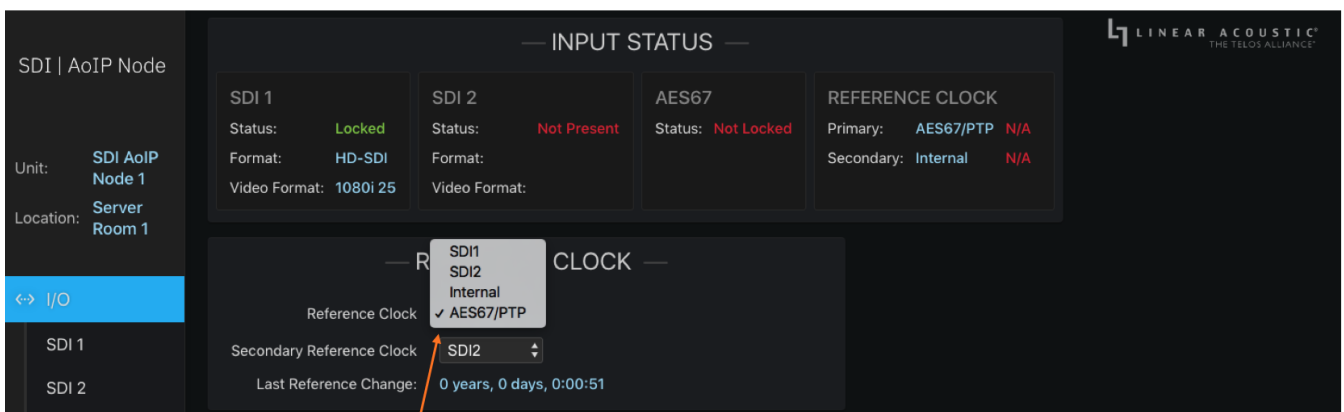
Note - At this time, the password cannot be changed from its factory default. This ability will be incorporated into a future software version.

Basic Reference, I/O Configuration, and A/V Sync

Reference Clock

If you will be using the SDI AoIP Node simply to de-embed, pair shuffle, route, and re-embed only SDI signals and will not be connecting it to an AoIP network, navigate to the **I/O Menu** and choose "SDI1" or "SDI2" as your reference in the **Reference clock dropdown** (4A). If desired, you may choose a secondary reference clock as a backup should the unit lose its reference from the primary clock source.

If you are connecting to an AoIP network with a Master PTP Clock, you must choose "AES67/PTP" as your clock reference.



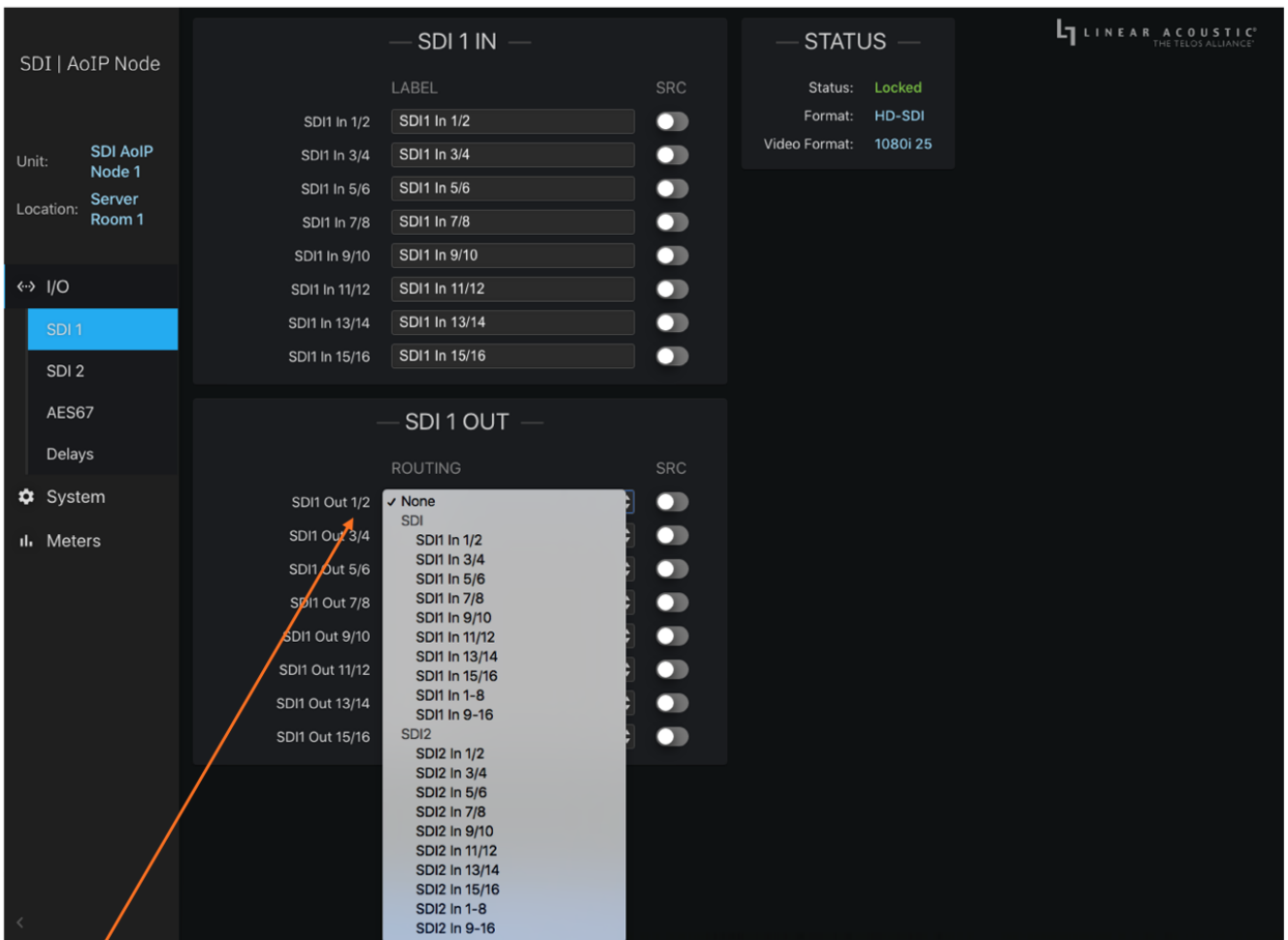


A

Figure 4 - Reference clock

SDI I/O

Each rear-panel SDI I/O has its own routing menu. Outputs for each are set using the **SDI Out dropdown** (5A) for each pair on each physical output within the **I/O Menu**. Pair shuffling within or between inputs is supported.



A

Figure 5 - SDI I/O

AES67 I/O

Navigate to the **AES67** portion of the **I/O menu**.

To set an AES67 input, enter the Livewire channel number or multicast address of the AoIP source directly in the **Address field** (6A) or use the **channel picker** (6B) to see a list of available sources. Livewire channels will automatically resolve to their corresponding multicast addresses.

Use the **AES67 Output dropdown** (6C) to route output audio. You may select any audio pair on either SDI output from the list, or route the audio as an AES67 stream by choosing one of the AES67 pairs and assigning it a Livewire channel number or multicast address in the **Address field** (6D). As with the input, Livewire channel numbers will automatically resolve to their corresponding multicast addresses.

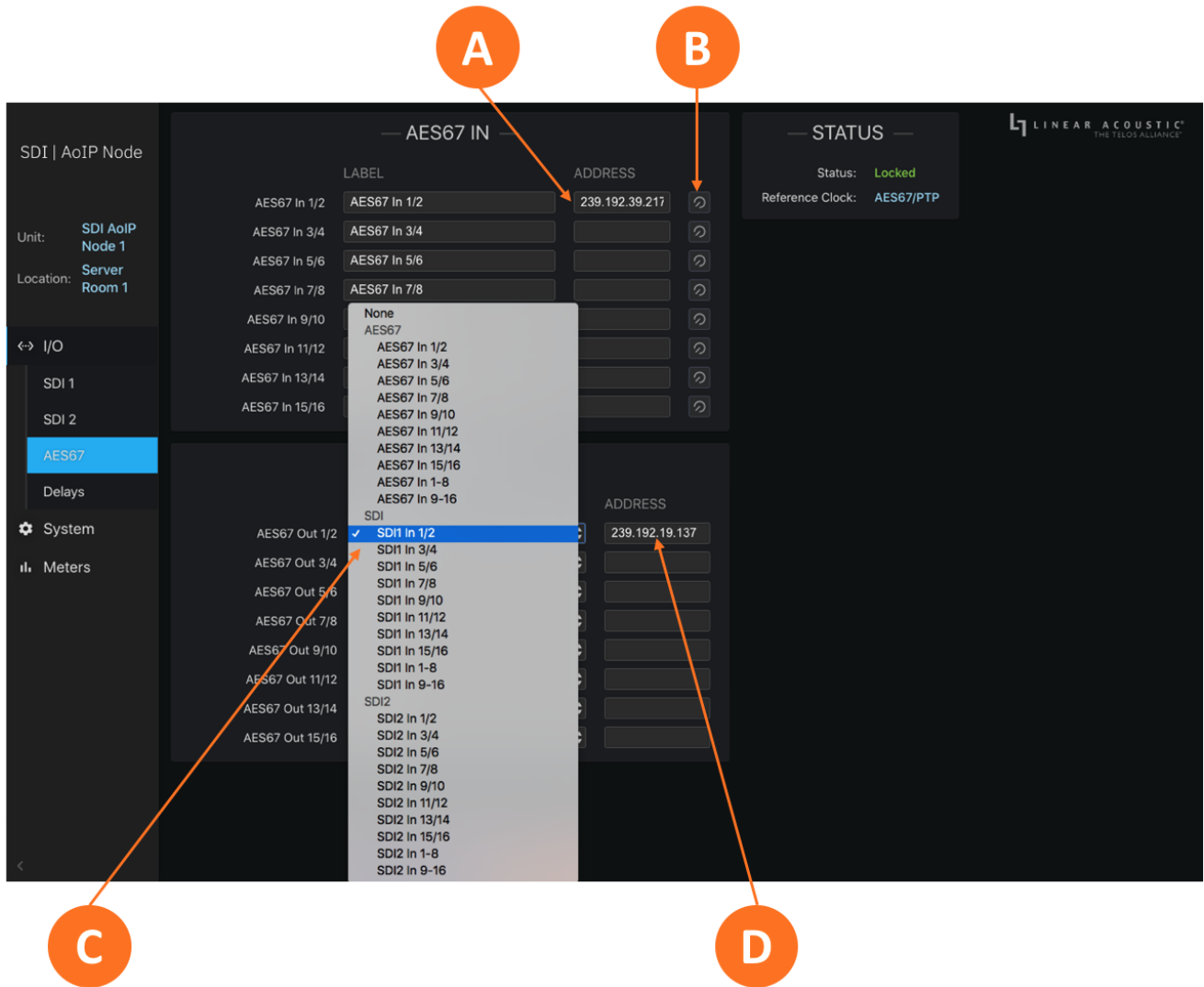


Figure 6 - AES67 I/O

A/V Sync

An adjustable video delay is provided in the **Delays** section of the **I/O menu** to compensate for the audio latencies in the broadcast system and to ensure correct A/V sync at the output. Latency figures for various I/O configurations are provided in the [User Manual](#).

Each SDI path has its own video delay, adjustable in milliseconds (ms) and microseconds (us).

In instances where the SDI output needs to be delayed by an even frame, it may be necessary to compensate for the difference between that time value and the latency of the unit by adding audio delay.

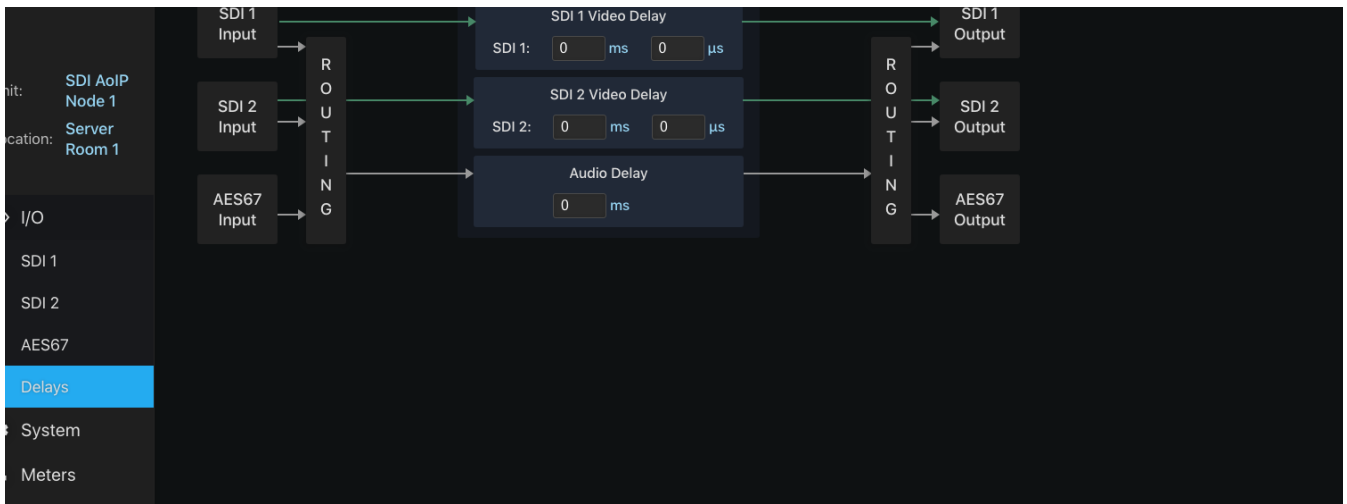
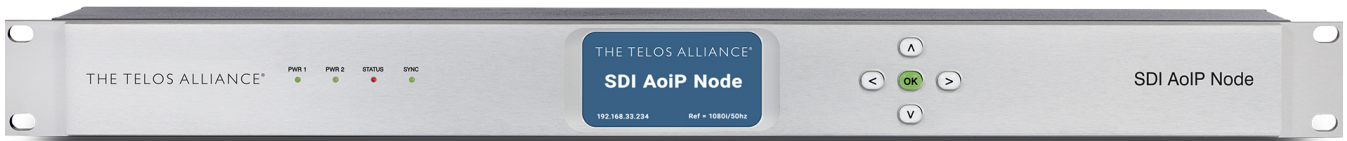


Figure 7 - Delays

User Manual

For additional information and detailed operating instructions, please refer to the SDI AoIP Node [User Manual](#).

User Manual V1.2.006



Front and Rear Panel Overview

SDI AoIP Node Front Panel



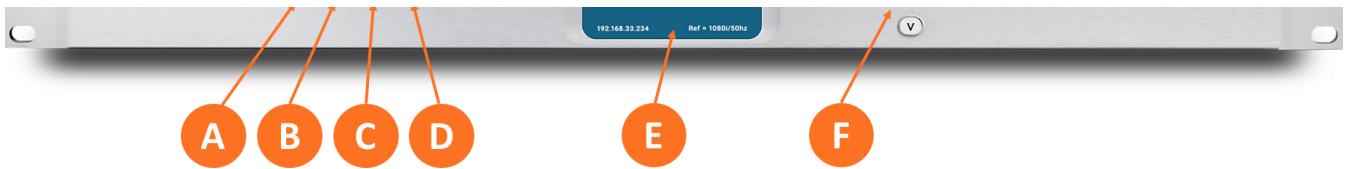


Figure 1 - Front panel

SDI AoIP Node front panel features include:

- **Four status LEDs** indicating the status of each power supply (1A, 1B), the **overall status** of the unit (1C), and **sync** for the reference clock (1D)
- A **color LCD display** to show status and basic configuration parameters (1E)
- A **five-button navigation cluster** with Left, Right, Up, and Down arrows plus a green “OK” button (1F)

The front panel is used for the initial setup and configuration including setting the IP address of the Ethernet ports. Additional configuration is accomplished via the remote user interface.

SDI AoIP Node Rear Panel

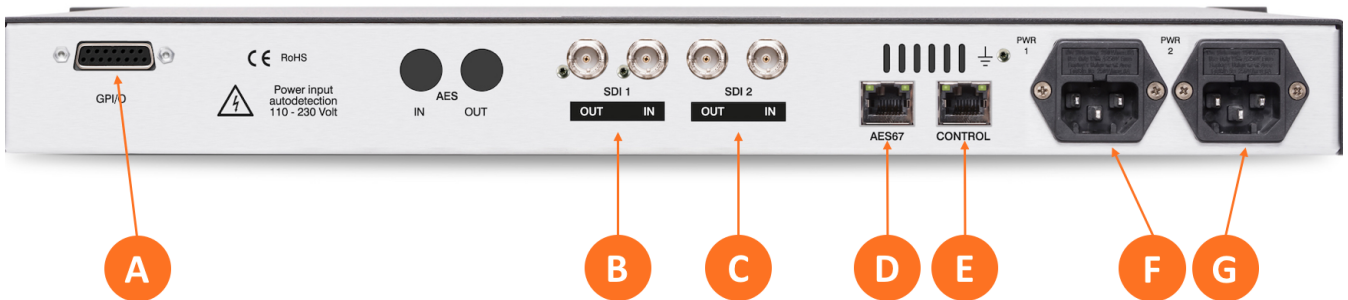


Figure 2 - Rear panel

The rear panel of the SDI AoIP Node contains the following connections:

- One parallel **GPI/O control port** (female DB-15) for five inputs and five outputs (2A)
- **SDI 3Gb/s HD/SD-SDI Input and Output 1** (2B) and **3Gb/s HD/SD-SDI Input and Output 2** (2C) on female BNC connectors
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- Two **IEC power inlets** for the internal redundant universal auto-ranging power supplies (2F, 2G)

Signal Routing and Reference Clock Basics

Inputs and Outputs

SDI I/O

SDI AoIP Node can access any of the eight audio pairs carried on each of the two available incoming HD- or SD-SDI streams, pair shuffle to the two HD- or SD-SDI outputs, or route audio to an AoIP stream.

AES67 I/O

Incoming AES67 audio sources can be embedded to an SDI output, and embedded SDI outputs can in turn be sent out as AES67 streams.

Reference Clocking and Sample Rate Converters

Having a firm grasp of clock sync (reference) requirements is critical to the successful operation of the SDI AoIP Node.

Sample Rate Converters (SRCs) are provided on each of the two SDI input and output paths. **There are no SRCs in the AES67 path.**

Reference clock source options include:

- Internal 48kHz
- SDI Input 1
- SDI Input 2
- PTP v2 per AES67-2015

If the SDI AoIP Node is used strictly for the purpose of pair shuffling between SDI inputs and outputs, it can be clocked to the reference present on either SDI input signal.

When AES67 is used either on the input, the output, or both, it **must** slave to an externally-generated PTP clock as it cannot generate its own; details on PTP settings are provided in the [Network Configuration](#) section.

i Important - All SDI audio pairs are de-embedded at the input and then re-embedded at the output when using SDI I/O. If there is any coded audio present on **any** of the SDI audio pairs, the SDI SRCs **must** be turned off as the coded audio bitstream will become corrupted if passed through an SRC.

Installation and Initial Setup

Please refer to the [SDI AoIP Node Quick Start Guide](#) for installation and setup instructions.

Remote User Interface

Connecting to the SDI AoIP Node

As previously mentioned, certain settings and configurations can be accessed and performed using the front panel buttons and screen, but the SDI AoIP Node is designed to be connected to a network and operated through its HTML-5 web-based interface.

i Important: Please refer to the [Quick Start Guide](#) or the [Network Configuration page](#) for important information on proper network configuration.

No special client software is required, and the HTML-5-based GUI is device-, operating system-, and browser agnostic. We recommend using Google Chrome or Apple Safari. The computer or tablet should be on the same network and subnet as the SDI AoIP Node.

Once the SDI AoIP Node and your computer are connected to your network, enter the IP address of the node to which you want to connect in the URL field of your browser. Once connected, the Home Screen will appear.

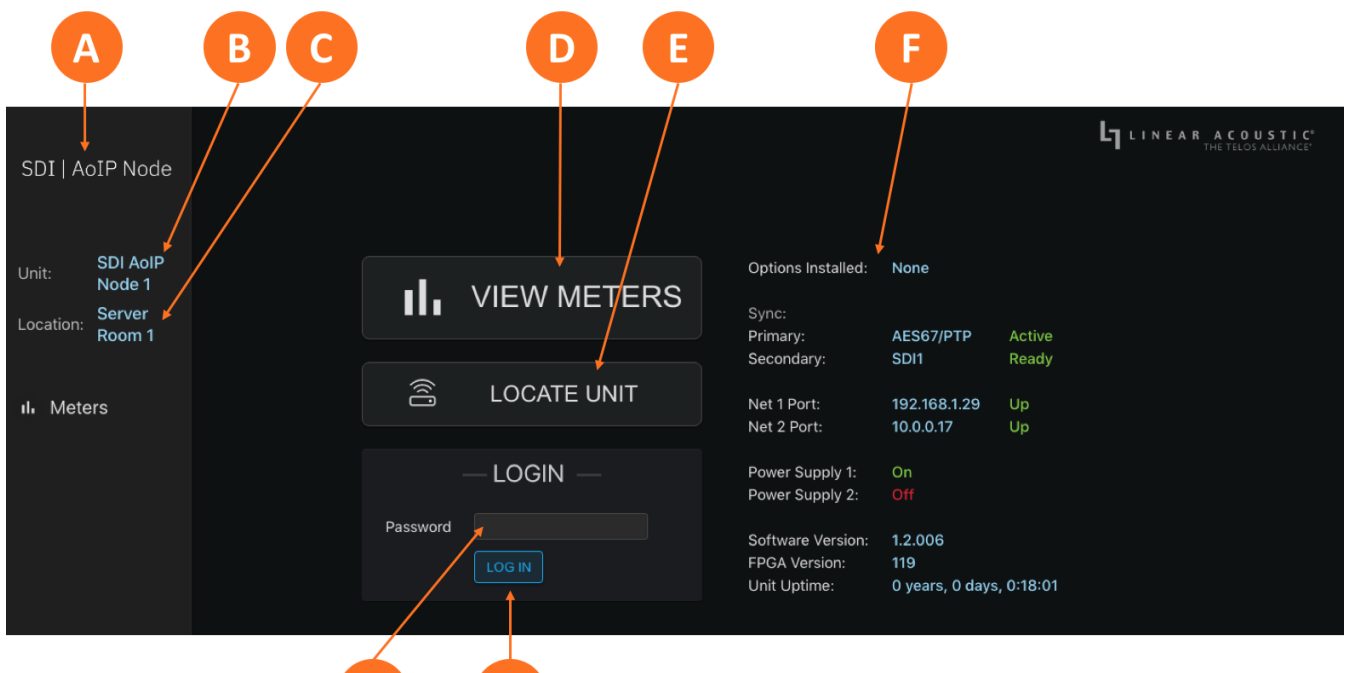




Figure 1 - Home screen when not logged in

As you navigate through the user interface, clicking on the **SDI AoIP Node logo** (A) in the top left corner will always return you to this screen.

Multiple users can connect to the same ARC hardware simultaneously. Anyone connected to the unit will be able to see the information on this screen including the **unit's name** (B) and **physical location** (C).

Additionally, all users can access the **Meters screen** (D) which shows loudness measurements and input/output levels for both programs. See the section "Home Screen When Logged In" below for detailed information.

The **Locate Unit** feature (E), which causes the front panel display of the unit to flash for easy identification in a crowded rack, can also be activated without logging in.

Additional information about installed options, clock sync, network status and IP address, power supply status, software and FPGA versions, and unit uptime **are displayed to the right of the screen** (F).

User Accounts and Logging In

Making modifications to the SDI AoIP Node's configuration and signal routing via the remote user interface requires logging into the unit. At this time, only one user account with one password and one level of access is supported.

Enter the default password of **1234** into the **Password field** (G) then click on the **Log In button** (H). The ability to change the password will be included in a future software update.

Home Screen When Logged In

Additional menus become visible once you are logged in. These include **I/O menus** (A) for the SDI and AES67 inputs and outputs, **detailed system-wide information and configuration settings** (B) including IP, sync, and QoS, and **detailed I/O metering** (C).

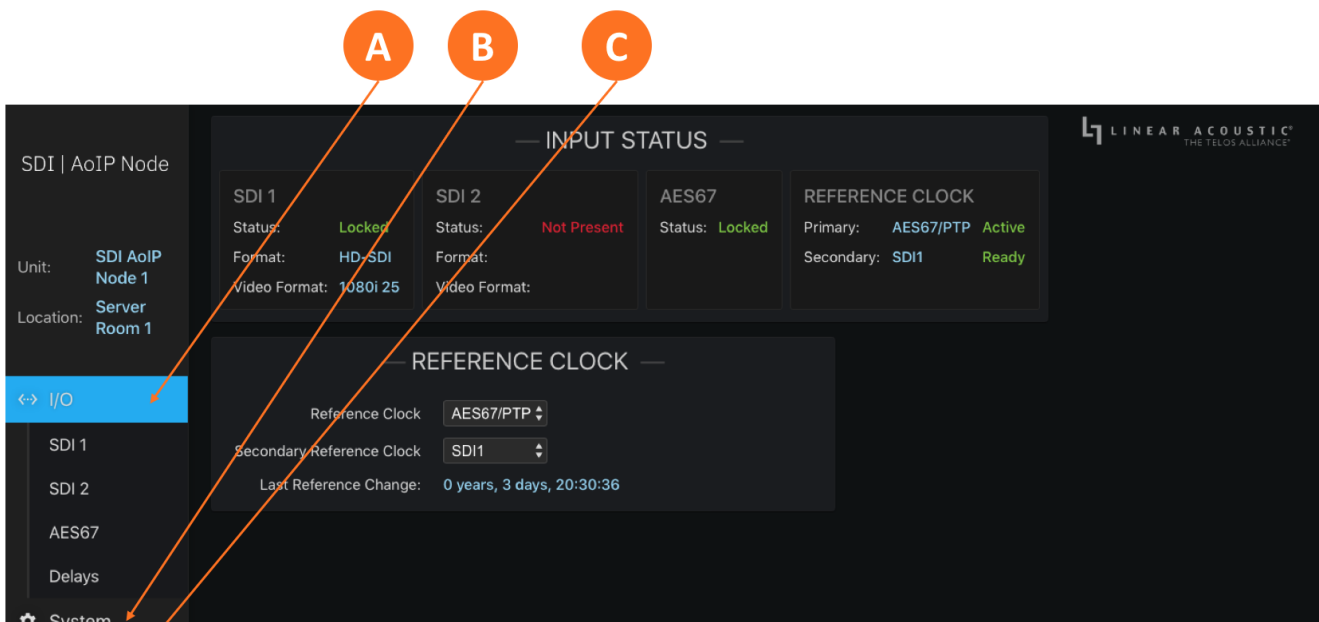


Figure 2- Home screen when logged in

I/O Menu

The process for configuring inputs and outputs is covered in detail in the section on [I/O Configuration](#) and will not be duplicated here, however, an explanation of the information on the main I/O page is provided below.

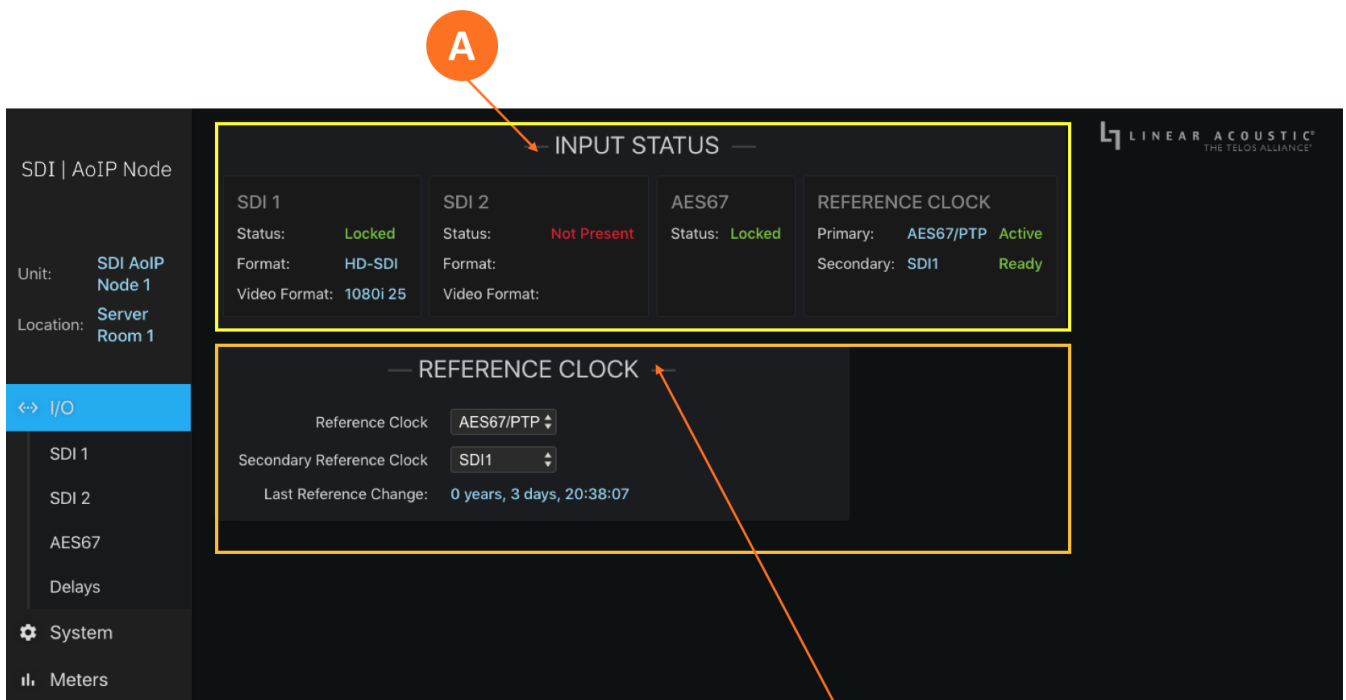
Input Status and Reference Clock

The **Input Status section (A)** shows the sync status, signal format, and video format for both SDI inputs as well as the AES67 input. It also displays the primary and secondary reference clocks along with their status.

The **Reference Clock section (B)** includes the dropdown menus for selecting the primary and secondary reference clocks and an indication of the last time the reference changed.

i Important: At the risk of stating the obvious, proper reference is critical for trouble-free operation. This is true for the SDI AoIP Node and every other digital audio device in your plant. **Improper clocking is one of the most common causes of clicks, pops, audio dropouts, and other anomalies**, and is at the root of a high percentage of support inquiries.

Details about clocking and reference are outlined in the [I/O Clocking and Reference](#) section. A moment spent reading and understanding this information now will save you time and grief down the road.



System Menu

The **System Menu** is home to the System status screen. It also contains the menus and controls for configuring the Control and AES67 Ethernet ports.

The main system screen contains a wealth of technical status information about the device hardware and software (A). Some of it relates to the overall health of the unit (such as Power Supply status and unit uptime) but most will only be required during the course of troubleshooting an issue with our support team or performing software updates.

The **Unit Name and Location** (B) are entered on this screen. These are “friendly” fields to be used in any way that makes sense for your particular operation. Click inside the field, type the desired information, then click on the green checkmark to save.

Clicking on the **Master Unit Bypass button** (C) engages a hard relay bypass that removes all internal circuits and processes from the signal path and connects each input directly to its corresponding output. This button will turn red when the SDI AoIP Node is in bypass mode. Note that this same hard relay bypass automatically engages when the unit is powered down.

Clicking on the **Locate Unit button** (D) will cause the front panel of this particular SDI AoIP Node to change color, making it easy to identify it amongst the dozens of them we hope will populate your racks. A second click will stop the light show. Note that enabling Locate Mode will not affect the audio.

It should come as no surprise that clicking on the **Reboot Unit button** (E) – wait for it – reboots the SDI AoIP Node and engages the hard relay bypass for the duration of the reboot process.

Clicking on the **Reset Unit to Factory Defaults** button (G) resets all parameters to the factory default state with the exception of IP settings which will be retained so that you can remotely connect to the SDI AoIP Node even after performing a reset.

If you wish to reset IP settings as well, enable the **Include IP Settings in Reset** button (F) prior to the reset.

Important: Performing a factory reset will erase all user settings. This information cannot be reclaimed once you reset the SDI AoIP Node; not by you, not by customer support, not by being genuinely remorseful, and not by conjuring help through supernatural ceremonies involving bones and an Ouija board.

Software Updates

The SDI AoIP Node has two software banks. Both can be populated with different software versions, but only one version can be active at any given time. The **Active bank** (H) is indicated in red. Instructions for

uploading and selecting different software versions are provided along with the software when you either

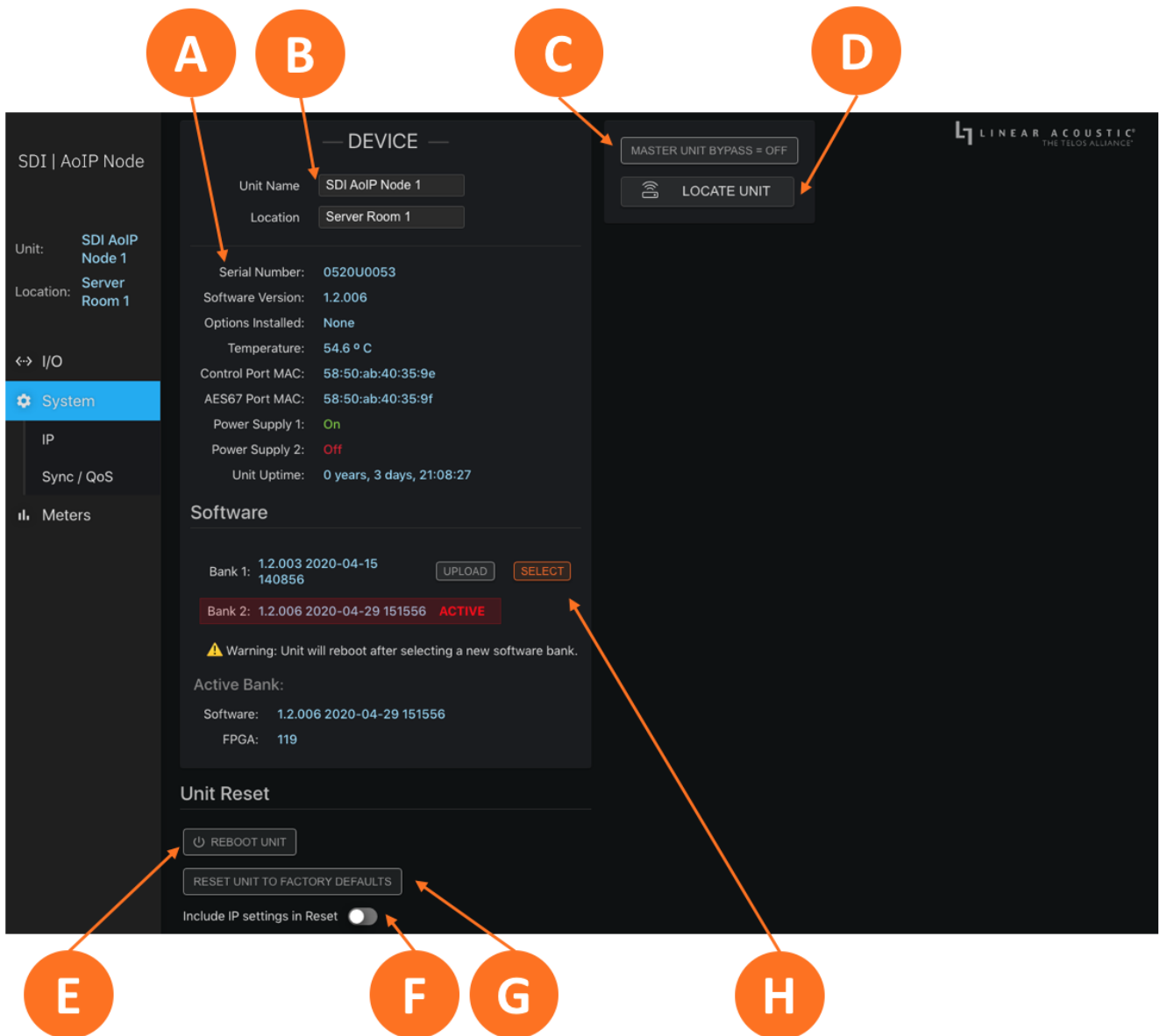
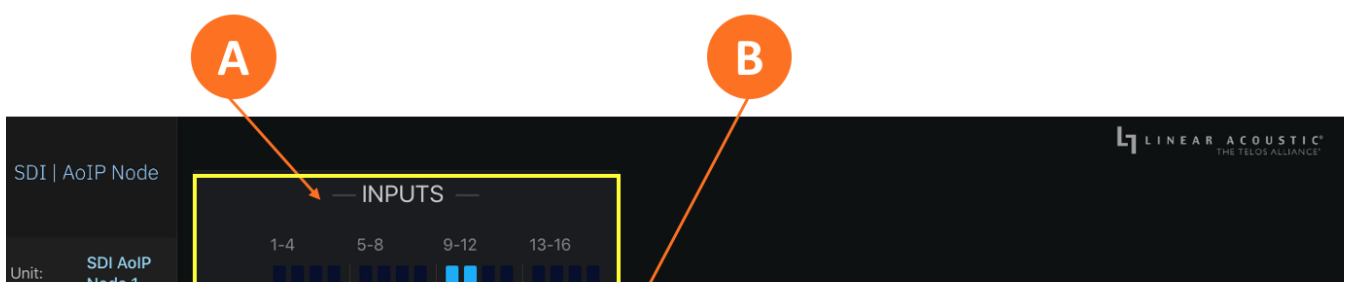


Figure 4 - System menu

Meters

Input meters (A) are provided for the SDI1, SDI2, and AES67 inputs. Individual bar graphs show the levels of each channel (1-16).

Likewise, **Output meters** (B) show the levels of each channel from the SDI1, SDI2, and AES67 outputs.



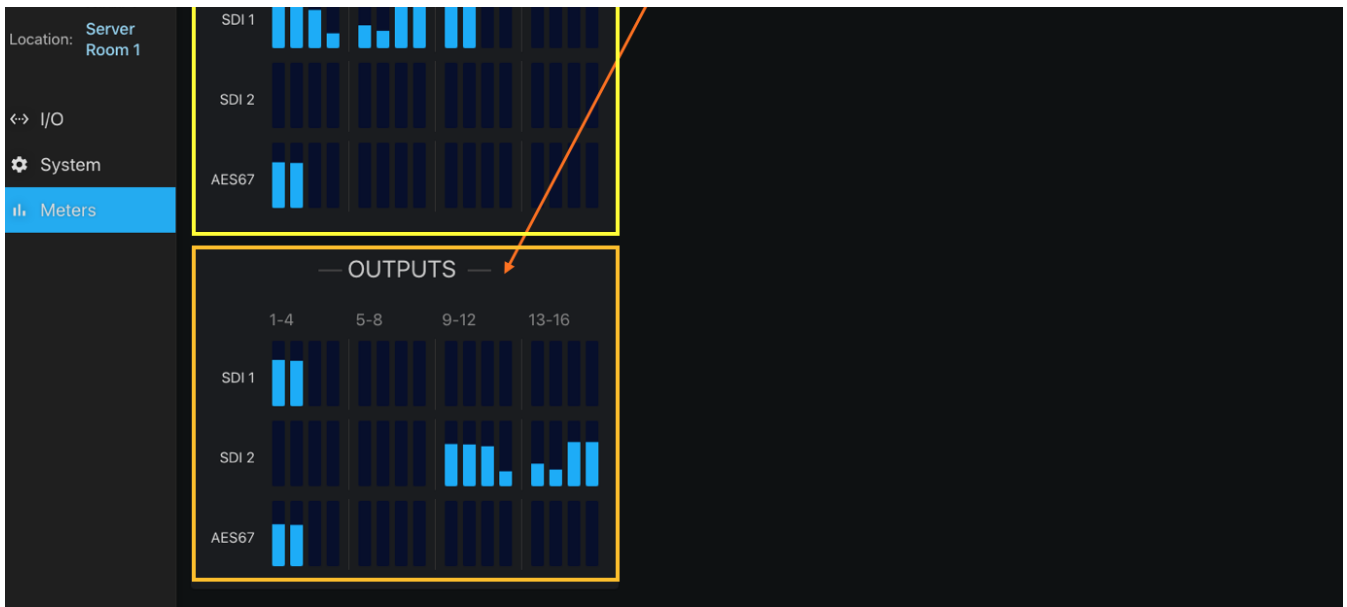


Figure 5 - Meters menu

Reference Clock and I/O Configuration

Reference Clock

If you will be using the SDI AoIP Node simply to de-embed, pair shuffle, route, and re-embed only SDI signals and will not be connecting it to an AoIP network, navigate to the **I/O Menu** and choose "SDI1" or "SDI2" as your reference in the **Reference clock dropdown** (1A). If desired, you may choose a secondary reference clock as a backup should the unit lose its reference from the primary clock source.

If you are connecting to an AoIP network with a Master PTP Clock, you must choose "AES67/PTP" as your clock reference.

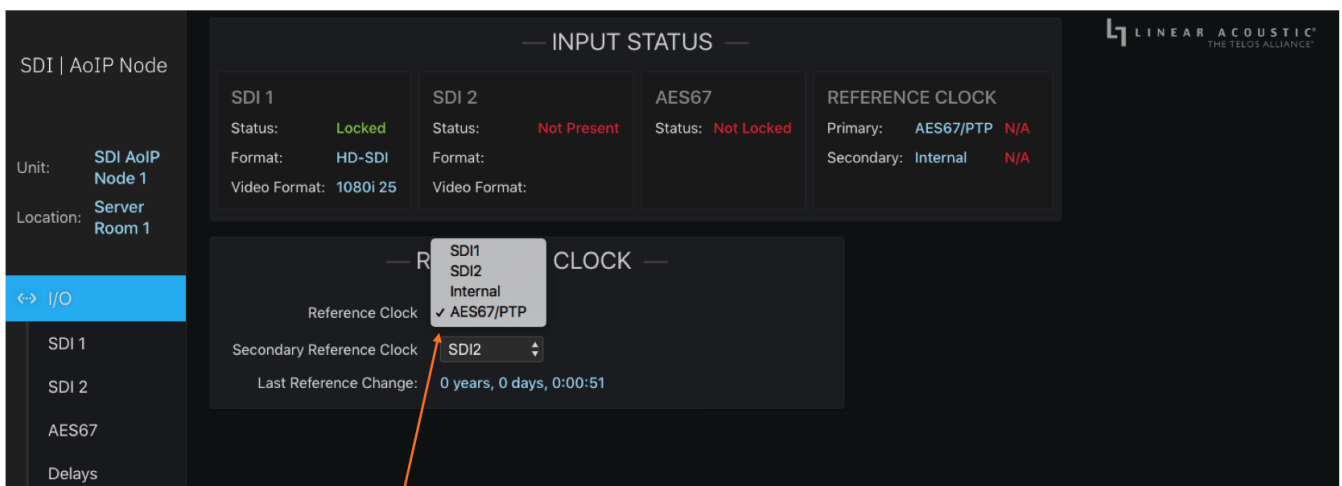




Figure 1- Reference clock

Inputs and Outputs

SDI AoIP Node can access any of the eight audio pairs carried on each of the two available incoming HD- or SD-SDI streams, pair shuffle to the two HD- or SD-SDI outputs, or route audio to an AoIP stream.

Incoming AES67 audio sources can be embedded to an SDI output, and embedded SDI outputs can in turn be sent out as AES67 streams.

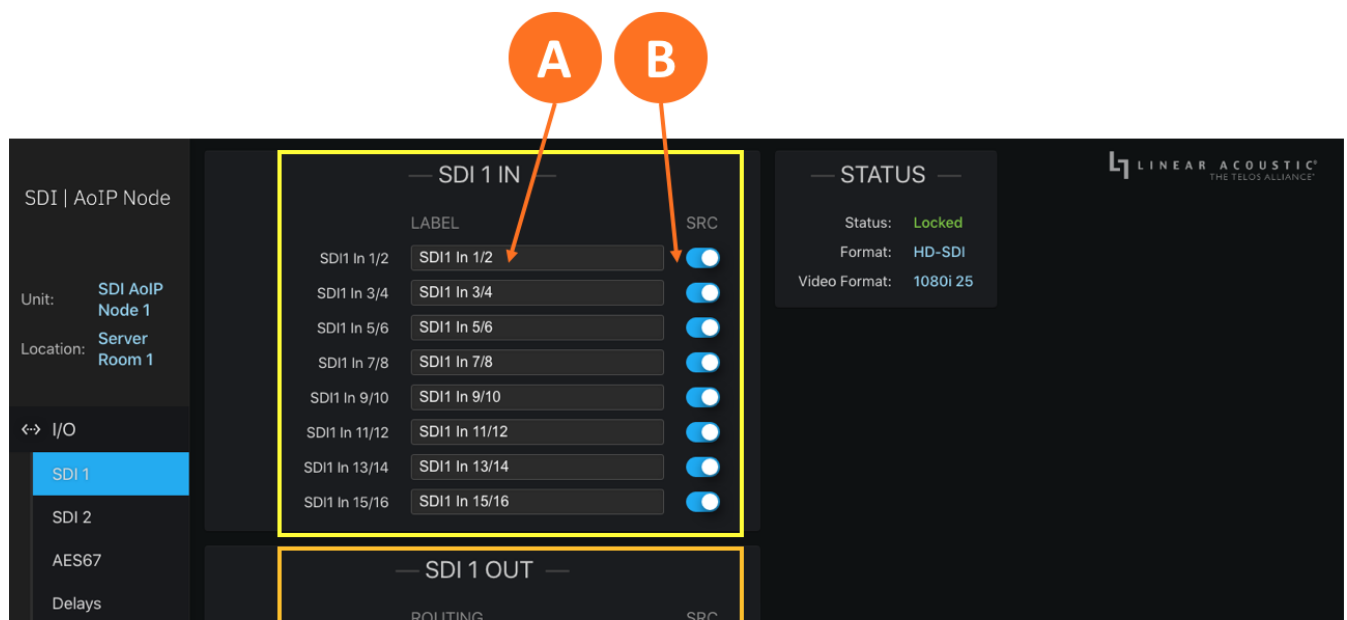
SDI I/O

The SDI 1 and SDI 2 connections each have their own routing controls under the **I/O Menu**. The controls for each are identical.

Each of the SDI input pairs is simply labeled according to its pair number ("SDI In 1/2") but can be renamed by clicking on the **Label field** (2A), typing in the desired name, then clicking on the green checkmark to save.

SDI output routing is set by the **SDI Out dropdown** (2C) for each pair. Pair shuffling within or between SDI inputs is supported, or any available AES67 source may be selected.

All Sample Rate Converters (SRCs) on both the SDI Inputs and Outputs are enabled by default but can be disabled on a per-pair basis using the **Input SRC** (2B) and **Output SRC** (2D) switches. Doing so does lower throughput latency slightly, but there is no disadvantage to leaving them enabled. In fact, if there are any anticipated reference clock changes (either intentional or unplanned) it is safer to leave them enabled.



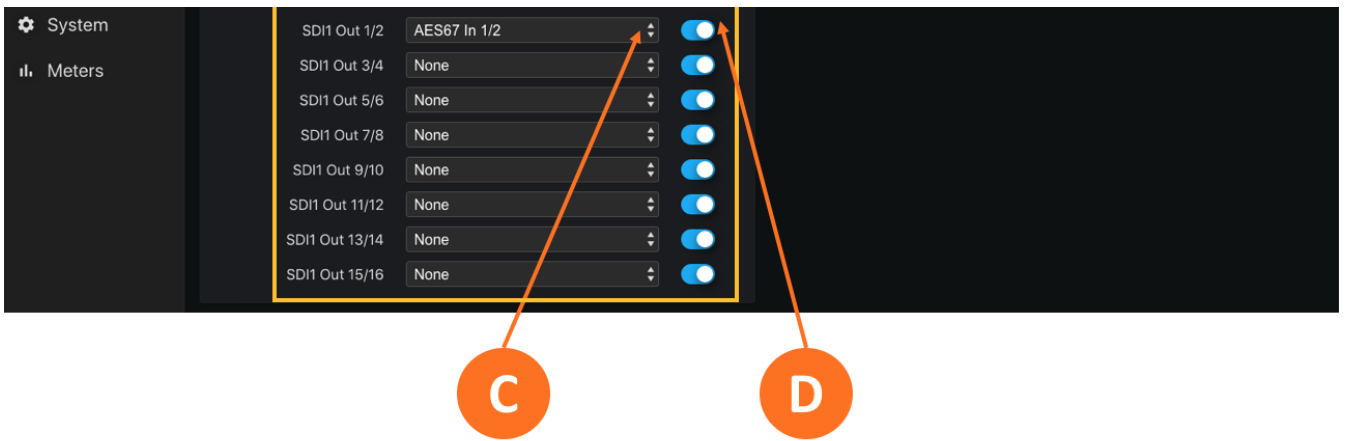


Figure 2 - SDI I/O menu

AES67 I/O

Settings for the AES67 I/O are found under the **I/O Menu**.

To set an AES67 input, enter the Livewire channel number or multicast address of the AoIP source directly in the **Address field** (3A) or use the **channel picker** (3B) to see a list of available sources. Livewire channels will automatically resolve to their corresponding multicast addresses.

Use the **AES67 Output dropdown** (3D) to select any audio pair from either SDI input or any AES67 input pair. Assign the output a Livewire channel number or a multicast address in the **Address field** (3E). As with the input, Livewire channel numbers will automatically resolve to their corresponding multicast addresses.





Figure 3 - AES67 I/O menu

GPI/O

SDI AoIP Node features a rear-panel DB-15 connector for momentary GPIO contact closures. This feature will be implemented in future software versions and is not currently supported in V1.2.006.

GPI/O Pinout

Pin	Function
Pin 1	+5VDC
Pin 2	GPI 1
Pin 3	GPI 2
Pin 4	GPI 3
Pin 5	GPI 4
Pin 6	GPI 5
Pin 7	Ground
Pin 8	Ground
Pin 9	+5VDC
Pin 10	GPO 1
Pin 11	GPO 2
Pin 12	GPO 3
Pin 13	GPO 4
Pin 14	GPO 5
Pin 15	Status OK



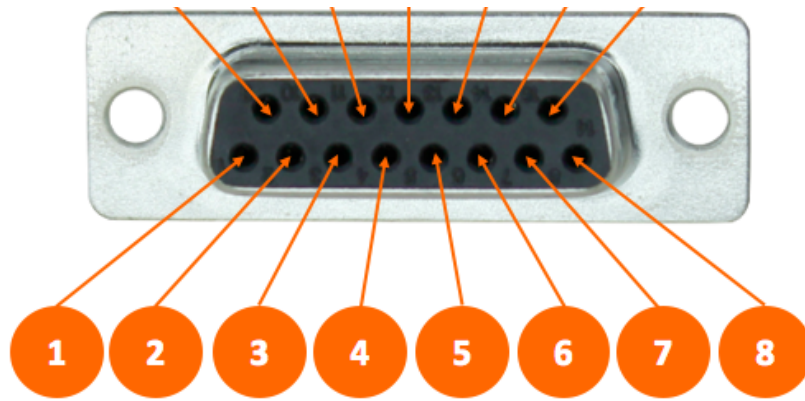


Figure 4- GPIO DB-15 configuration

Delays and A/V Sync

An adjustable video delay is provided in the **Delays** section of the **I/O menu** to compensate for the audio latencies in the broadcast system and to ensure correct A/V sync at the output. Each SDI path has its own **Video Delay** (5A), adjustable by clicking on the millisecond (ms) or microsecond (us) field, entering the desired value, then clicking the green checkmark to save.

In instances where the SDI output needs to be delayed by an even frame (the value of which will vary depending upon frame rate) simply enter that number. It may then be necessary to compensate for the difference between that time value and the latency of the unit by clicking in the **Audio Delay** (5B) field, entering the desired value, then clicking on the green checkmark to save.

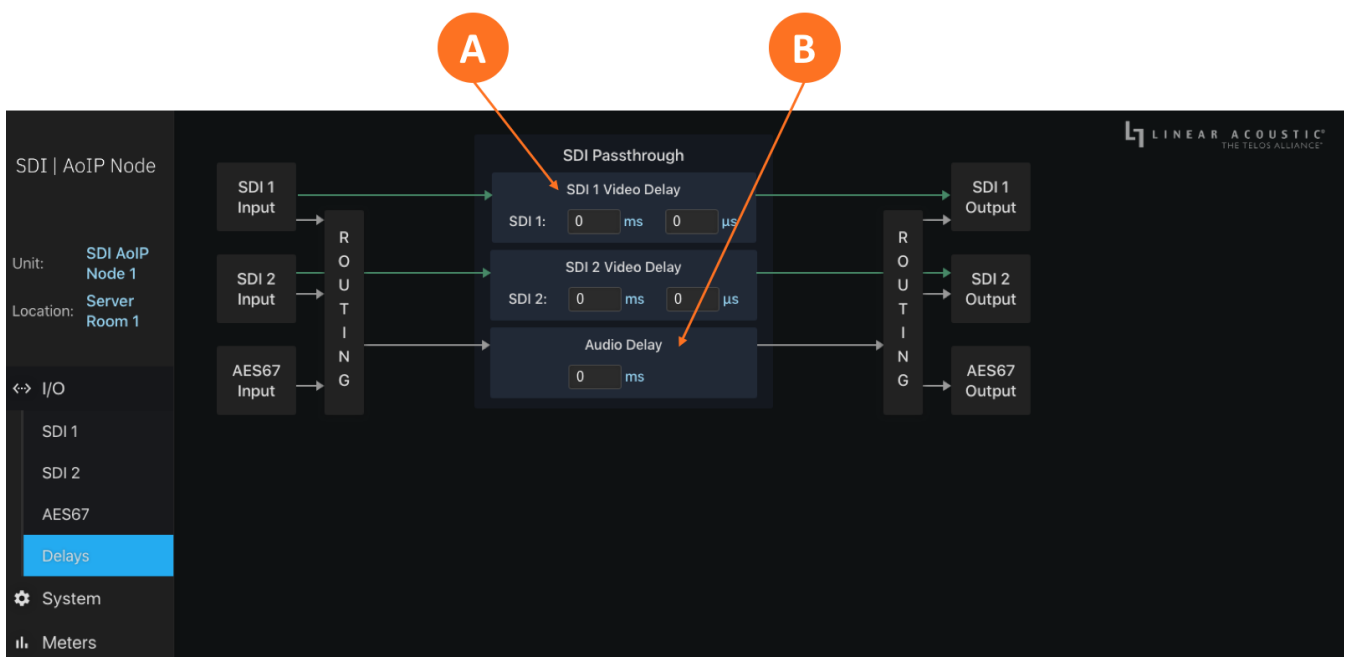


Figure 5 - Delays menu

Latency values are as follows, measured using an SDI input to an AES67 network, through the SDI AoIP

Node, and to an SDI output:

- 121ms with input and output SRCs disabled
- 127ms with input and output SRCs enabled

Network Configuration

Setting IP Addresses

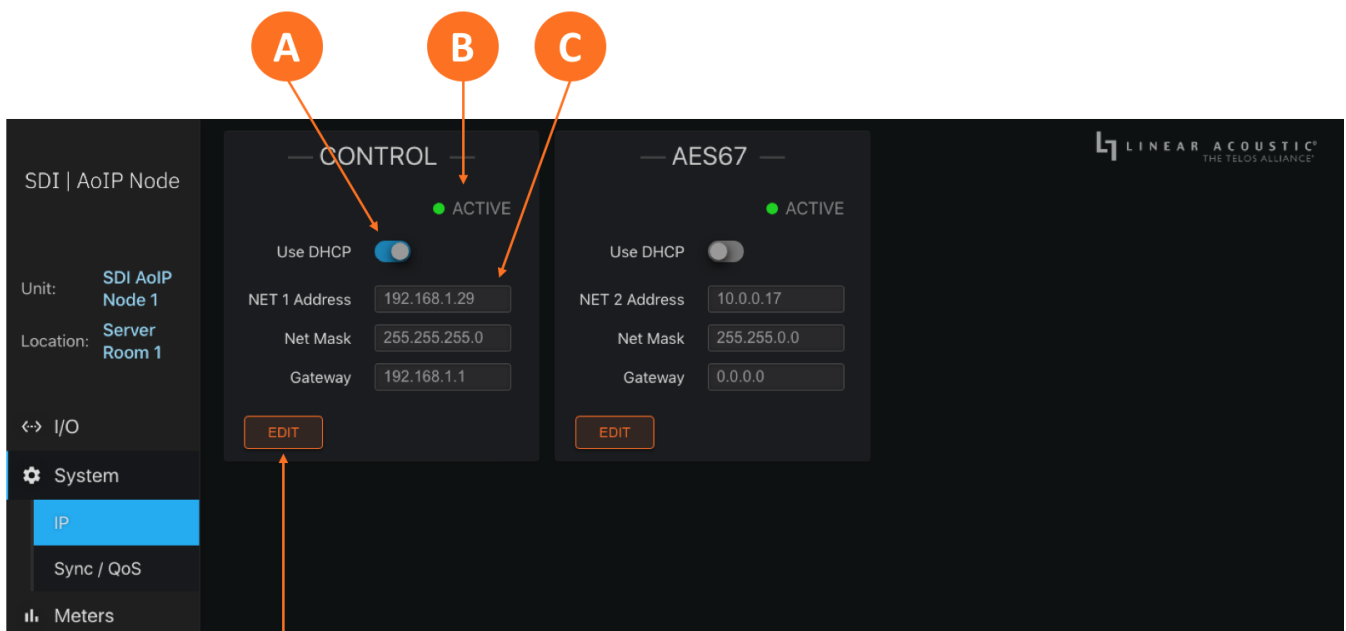
The **IP** section of the **System Menu** contains the fields and controls necessary to set up networking for both the Control port and the AES67 port. The controls for both ports are identical.

The **Active indicator** (B) lights green for when the ports are active.

To make changes to the settings, click on the **Edit button** (D), which is immediately replaced with **Cancel** and **Apply** buttons.

DHCP is enabled by default on the Control port. Toggle the **Use DHCP switch** (A) to turn DHCP on or off. When DHCP is disabled, you may set a static IP address by entering the appropriate values into the **IP address**, **Net Mask**, and **Gateway** fields (C).

Click **Cancel** to discard any changes or **Apply** to save them.



D

Figure 1- IP menu

Important! Both the Control and AES67 connections must be connected to 1000BASE-T (Gigabit) switch ports. If a port will not be used, **it should not** be connected to a switch but **does** require a specific configuration described below. If both the Control and AES67 ports are used, **each must be on a different subnet.**

If either of the two Ethernet ports will not be used, the unused port must be configured as follows:

- **Do not connect the unused port to a network switch**
- Using the steps above for Control port setup, navigate to the IP Configuration screen of the unused port
- Set “Use DHCP” to “Yes”
- Highlight and select “Update”

Network configuration can also be accomplished via the front panel as outlined in the [Quick Start Guide](#).

Sync, QoS, and PTP Settings

As previously mentioned, when the SDI AoIP Node is set up to use AES67 audio at its input, output, or both, it **must** slave to an external PTP clock for reference.

Note: Additional PTP-related settings are included but grayed out and reserved for future use.

The **Slave Only** button (A) must be enabled and the Domain Number must be set for the correct PTP domain. Valid values are 0 - 127. The AES67 PTP profile uses 0; the SMPTE PTP profile uses 127.

A

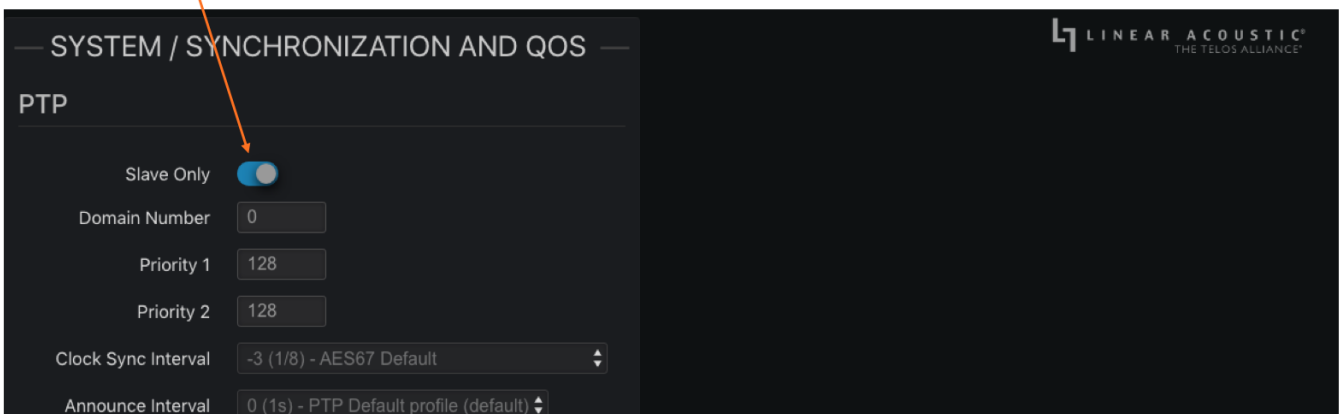




Figure 2 - PTP menu

Specifications

I/O

SDI I/O

- Two auto-sensing 3Gb/s HD/SD-SDI (SMPTE ST425/292M/259M) inputs and two outputs via 75 Ohm BNC female connectors, internally terminated; video formats up to 1081i/60/59.94/50Hz

AES67 I/O

- 16-channels of bi-directional AES67 I/O in support of SMPTE ST 2110-30 workflows
-

Latency (V1.2.006 Software)

- 121ms with input and output SRCs disabled
 - 127ms with input and output SRCs enabled
-

Clock Reference

- 48kHz reference via SDI, AES-3, PTP v2, or internal clock
-

Sample Rate/Resolution/Frequency Response

- 48kHz, 24-bit, 20Hz – 20kHz
-

Ethernet

- Two Gigabit RJ-45 connections, one each for AES67 and Control
-

Parallel GPI/O Control Port

- Future feature; 15-pin female D connector, 0-5V TTL levels; 5 inputs, 5 outputs
-

Front Panel Controls and Indicators

- 5-key navigation cluster
 - Graphical color LCD display
 - LED status indicators for each power supply, status, and reference
-

Power

- Dual internal redundant auto-ranging power supplies, each rated at 100-264VAC, 50/60Hz, 40 Watts maximum
-

Dimensions and Weight

- 19"W x 9"D x 1.75" H (approximately 48.2 x 22.0 x 4.5 cm)
 - Net weight approximately 9.0 pounds (4.08kg)
 - Shipping weight approximately 12.0 pounds (5.44kg)
-

Environmental

- Operating temperature 0 to 50 degrees Celsius (32 to 122 degrees Fahrenheit)
 - Non-operating temperature -20 to 70 degrees Celsius (-4 to 158 degrees Fahrenheit)
-

Intended Location

- Telecommunications center or dedicated computer/machine room
-

Regulatory

- North America – FCC and CE tested and compliant with UL-approved power supplies
 - Europe – Complies with European Union Directive 2002/95/EC on the restriction of use of certain hazardous substances in electrical and electronic equipment (RoHS), as amended by Commission Decisions 2005/618/EC, 2005/717/EC, 2005/747/EC (RoHS directive), and WEEE
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Warranty

- Standard Teles Alliance 2 year limited parts and labor