Interfacing Comrex NX Rack and MultiRack with Wheatnet AoIP Systems

Wheatnet is an Audio-over-IP (AoIP) system developed by Wheatstone. Wheatnet is in use in many studio environments worldwide. While the Wheatnet protocol is proprietary, it also supports a mode that allows inter-operation with devices that support the AES67 AoIP standard available in Comrex NX Rack and MultiRack audio codecs. This document provides a guide on how to set up a Comrex and Wheatnet system to talk to each other.

Unlike most AES67 compatible products, Comrex codecs utilize both transmit and receive AoIP drivers. Each of these operate independently and must be set up separately.

Wheatnet Navigator

Wheatnet settings are configured using the Wheatnet Navigator software. Wheatnet users should be familiar with this software, and it is required to establish routing between devices. To support AES67, the Wheatnet Navigator must be licensed for AES67 operation.

More About Wheatnet

To inter-work with Wheatnet devices, the device that will send audio to the Comrex codec and the device to receive audio from the Comrex codec must have firmware to support AES67 (not all do). Check the manuals and the firmware versions of your devices to make sure AES67 is supported.

Wheatnet natively supports GPIO control of compatible devices on the network. This is not offered under AES67, so GPIO control is not functional when working with Comrex codecs.

Clocking

All AoIP systems require a network clock to synchronize audio within their systems. Generally, one device on the network will function as the Master clock, and all others operate as Slaves to it.

Wheatnet devices natively deliver a Master clock that is not compatible with AES67. By enabling AES67 mode, you are instructing your Wheatnet system to deliver Wheatnet Master Clock but slave to an external AES67 Master clock (PTPv2). Therefore in order to inter-work any AES67 devices with Wheatnet, you will need to install a Master clock device that can deliver an AES67 compliant (PTPv2) clock source. There are stand-alone clock generation devices and software available. Comrex firmware version 4.5p2 and higher has the ability to deliver PTPv2 clock to your network, although the implementation is "experimental."

Discovery

AES67 does not define a method of advertising and discovering AoIP streams. This is the way AoIP streams are found and routed within the network. Wheatnet uses a proprietary protocol for this function, which is not supported by Comrex codecs. Comrex codecs do support SAP and Ravenna discovery, but this is unsupported by Wheatnet.

For this reason it will be necessary to "sideload" the stream information into each device in order for it to find the incoming stream. On the Wheatnet side, the stream info will be manually entered into Navigator based on parameters described here. On the Comrex side, you will copy a small text file (SDP) into the codec's configuration page. This will be extracted from the Navigator after the stream has been created.

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Setting Up A Wheatnet Device For AES67

For the purposes of this guide, we've connected to a Wheatnet analog Blade.

Open Wheatstone Navigator. In the upper left pane, select "System," and select the "info" tab within the system settings.
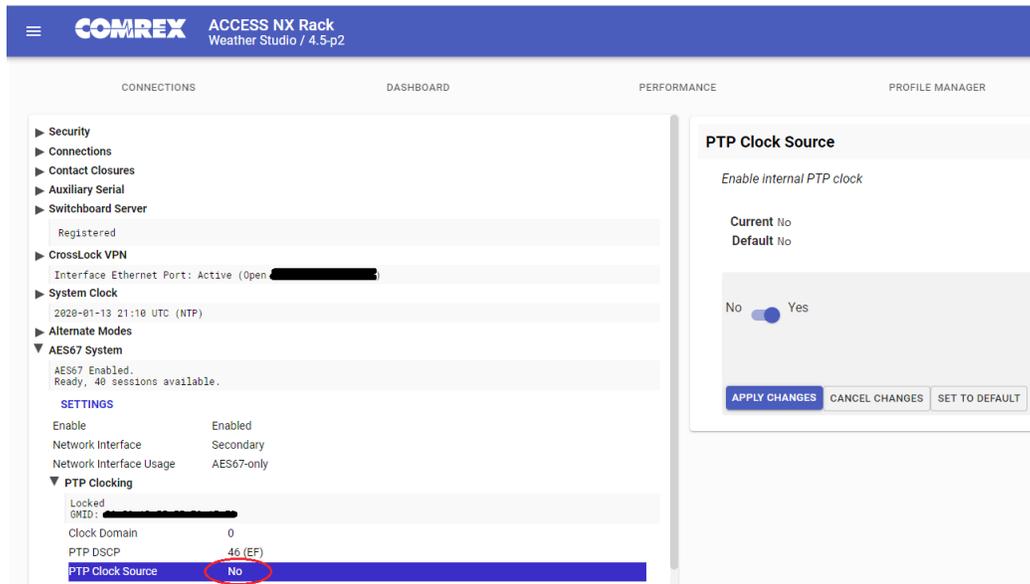

FIGURE 1 **WHEATSTONE NAVIGATOR**

First, make note of the Multicast address range shown under "Route Master Info." You'll need to set the Comrex outgoing streams to within this range.

Under "Clock Master Info," make sure the "Frequency" option is set to 48KHz. Change the "Primary External Reference" setting from "none" to AES67-PTP. If this option isn't available, your Navigator has not been licensed for AES67 operation. Contact Wheatstone in this event.

Make sure your PTP Master clock is running on the network, and set to Domain 0. If the clock is detected by Wheatnet, the PTP status indicator will turn green as shown.
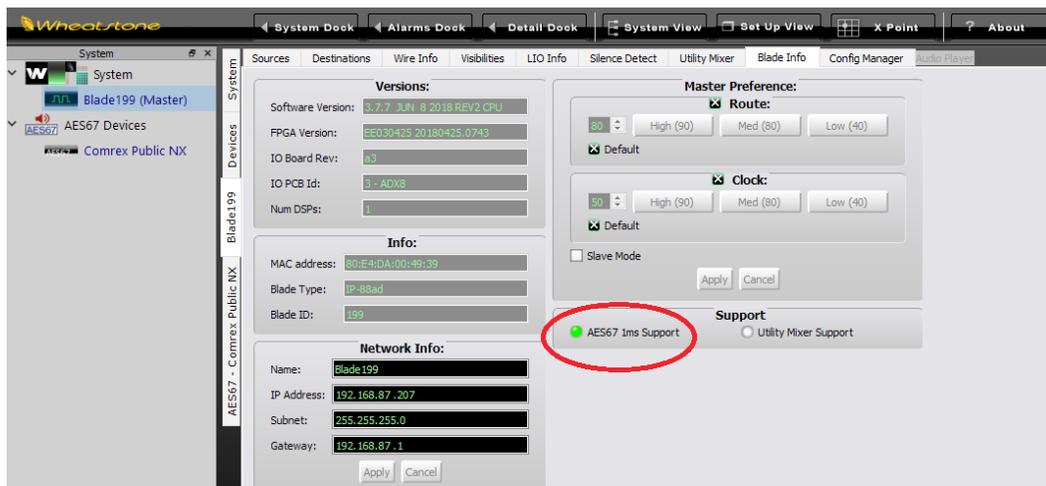
If you'd like the Comrex codec to deliver your PTP master clock, make sure your codec has firmware 4.5p2 or higher. Using the web-based control interface, navigate to the System Settings Tab (on NX Rack) or the Global Setting option (MultiRack) and open the PTP Clocking section under AES67 settings. Change "PTP Clock Source" to "Yes" and choose "Apply." Reboot your codec after this change is made.

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FIGURE 2 **PTP CLOCK SOURCE**

You now have an AES67 compatible Master clock on your Wheatnet network.

One more setting must be changed on your Wheatnet Blade to enable the Blade to accept the default AES67 packet rate of 1mS. In Navigator, select the Blade and choose the "Blade Info" tab. In the lower right section labeled "Support," Choose "AES67 1mS support."

FIGURE 3 **ENABLE 1MS SUPPORT**

Next you will Open the Comrex Codec Web-based user interface page, and navigate to the Network Manger section. You must be sure the Ethernet interface used (typically the secondary) has a valid IP address on your AES67 network.

The default settings of these ports are to use a DHCP server. If you require static addressing (or you have no DHCP server on your network) you must apply static settings here; using a reserved IP address on your AES67 LAN. **Note: When configuring the AES67 port for static operation, the DNS server field must not remain blank. A DNS server address (such as 0.0.0.0) must be entered here, althouth it does not need to be a valid address.**

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Network Manager

FIGURE 4 ETHERNET PORT SETTINGS

Continue with the web-based control page on your Comrex codec and select the "System Settings" Tab. If not done already, enable AES67 operation under that section, as described in the manual. Leave all other AES67 settings at their defaults, as shown. Look for the PTP clocking status to show "locked."

FIGURE 5 AES67 SYSTEM SETTINGS

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Creating An Outgoing AES67 Stream From A Comrex Codec

On the Comrex side, once AES67 is enabled on the codec and the clock is "locked," an AES67 outgoing stream is automatically created to the default Multicast node address. It carries a label taken from the Unit Name setting under the System Settings->Connections section of the user interface.

You'll need to change the outgoing Multicast node address to one within the Wheatnet accepted range, as seen above. Still under AES67 settings, navigate to the "Outputs" section and select the outgoing stream you wish to change (NX Rack has only one output, MultiRack has five).
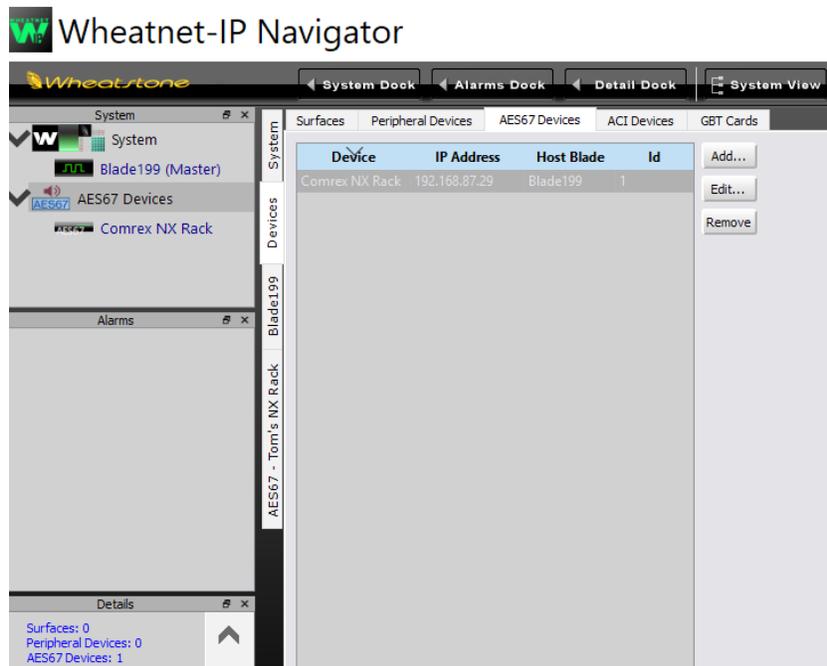

FIGURE 6 OUTPUTS

Set the "Address" field to an address within Wheatnet range that is unused by Wheatnet streams currently, then click "apply."

Click "Advanced Settings" on the bottom of the page, then locate the entry in the output section labeled "payload Type." Change the default 98 to 100 for Wheatnet. Select "Apply." Now disable and re-enable AES67 mode on the codec to initiate the stream to the new address.

Returning to Navigator, we must now create a new AES67 device so Wheatnet can find the Comrex codec and its streams.
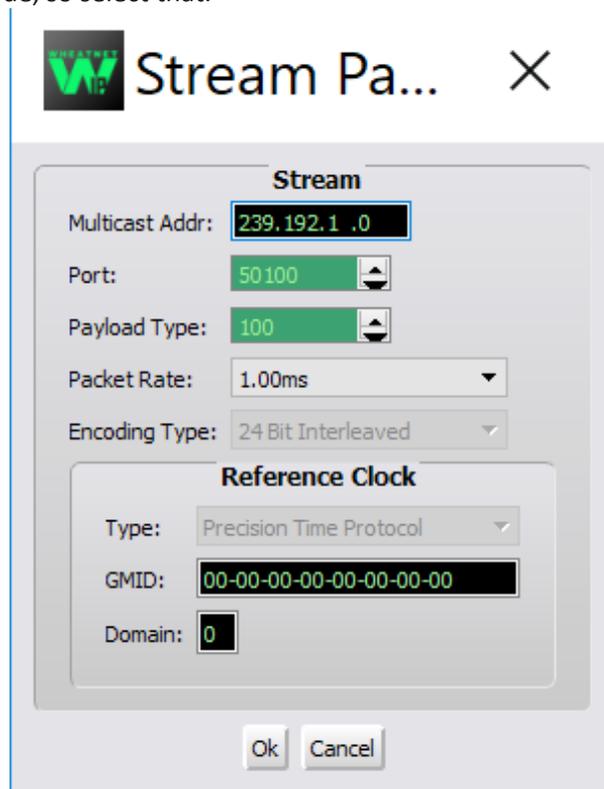

FIGURE 7 ADD NEW AES67 DEVICE

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Select "Devices" under the Main Program window. Find the tab labeled "AES67 Devices" and select "Add" on the right side. Enter a name for your Comrex codec and the IP address of the codec. (Note: this is not the outgoing Multicast address. This is the address of the Ethernet port used for AES67 operation, which is likely the Secondary Ethernet port.)

You should now be able to open a sub-menu under "AES67 devices" and select your Comrex codec by name. Select the "Sources" Tab and choose "Add Source."

FIGURE 8 SOURCES

A couple of special notes here: The default packet size in Wheatnet is 1/4mS, while the default size in AES67 is 1mS. Comrex codecs can not currently support 1/4mS outbound streams. So you must set Wheatnet to receive 1mS packets. You'll see a tick box under "Type Info" to enable an incoming stream at 1/4mS. This is a typo in Navigator and the box actually selects the 1mS mode, so select that.

FIGURE 9 STREAM INFO

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Go to the "Stream Info" tab next.

Set the Multicast Address to the node address set up on the Comrex side. Set the port to 5004, and set the packet rate to 1mS. Click "OK" and then click "Finish."

The Comrex stream should now be routable in the normal way on the Wheatnet Crosspoint router.

Receiving An Incoming AES67 Stream To A Comrex Codec

Before setting any outgoing streams from your Wheatnet device, you must decide whether to use 1/4mS Wheatnet timing or 1mS AES67 timing. Both timings for incoming streams are accepted by Comrex, but using 1mS mode involves more processing on the Wheatnet side. In reality, with the inherent delay of Internet IP codecs, the difference in timing of these streams isn't usually a concern.

You've likely already enabled 1mS operation on your Wheatnet device when setting up the Comrex output, but make sure it's enabled by selecting the device and choosing the "info" tab (e.g. Blade info) and making sure AES67 1mS support is ticked.
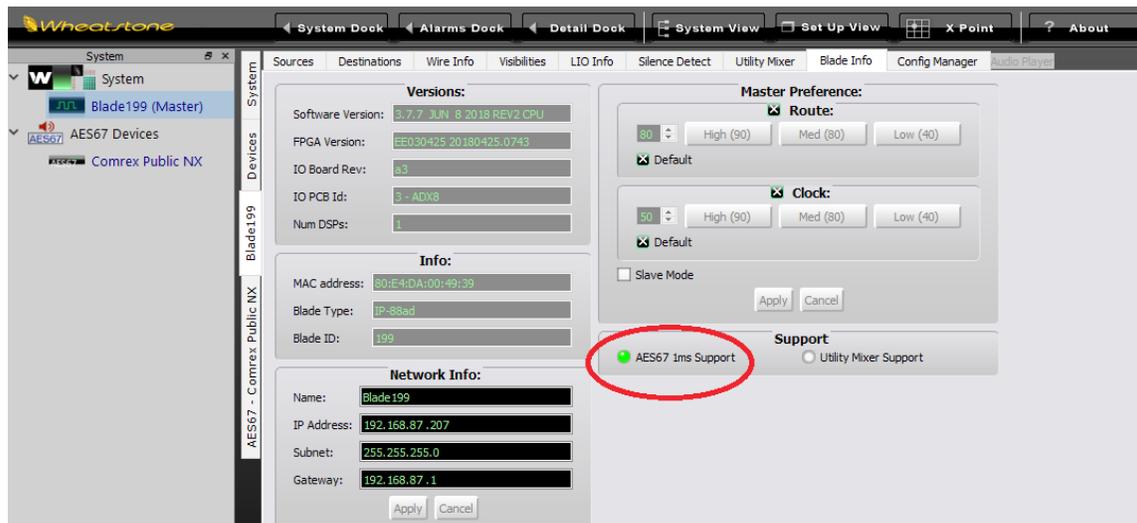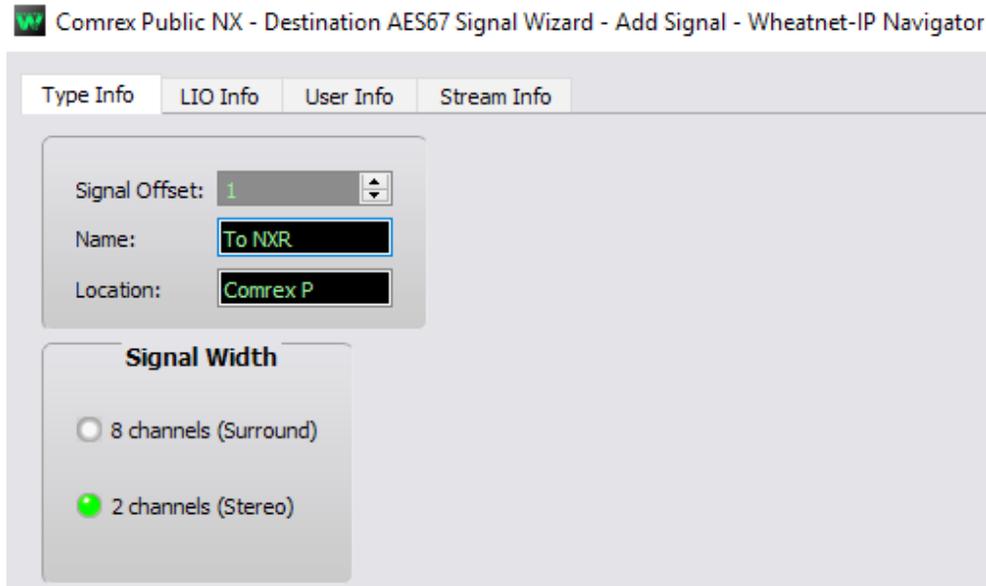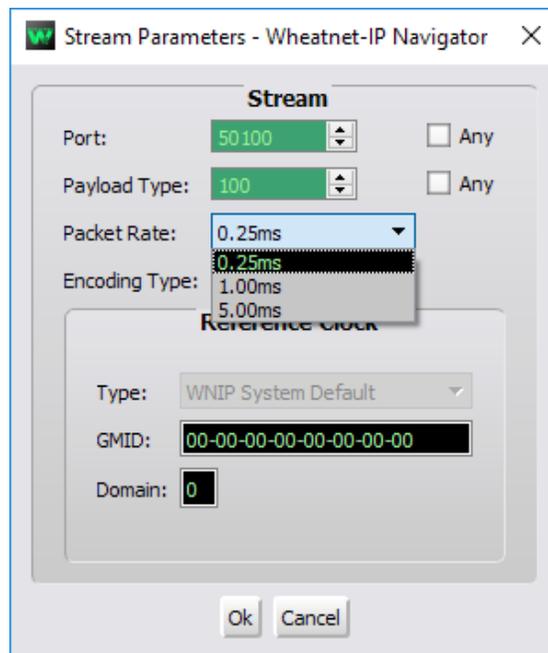

FIGURE 10 AES67 1MS SUPPORT

Sending an outgoing stream from Wheatnet to Comrex is a two-step process on the Wheatnet side. You must first create an AES67 stream from a Wheatnet device, then you must route it to the Comrex codec under Wheatnet. This is because unlike other AoIP systems, Wheatnet will not actually create the stream unless it is routed somewhere. After this is done, you must still locate the stream on the Comrex codec and connect to it.

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First, under AES67 devices in the system box, choose the Comrex codec you defined previously. Select the "Destinations" tab and select "Add" to build a new outgoing stream to the codec. Create a name for the Destination here.

FIGURE 11 NEW DESTINATION

A new stream will be added. Select the "Stream Info" tab and choose "Edit."

FIGURE 12 EDIT STREAM INFO

Leave most of these settings at defaults, but make the choice here between .25mS and 1mS timing based on the description above.

Click "OK" to close the Stream Info pop-up, then "Finish" to close the window.

You'll now have a Comrex destination listed in your Crosspoint switch. Select a source in the switch to route to the Comrex destination. Note that Wheatnet sources don't become active until they are routed somewhere.
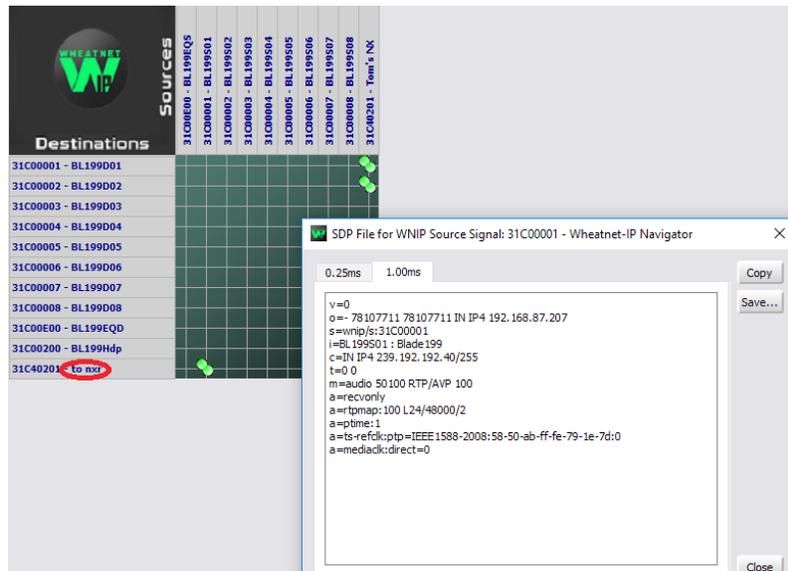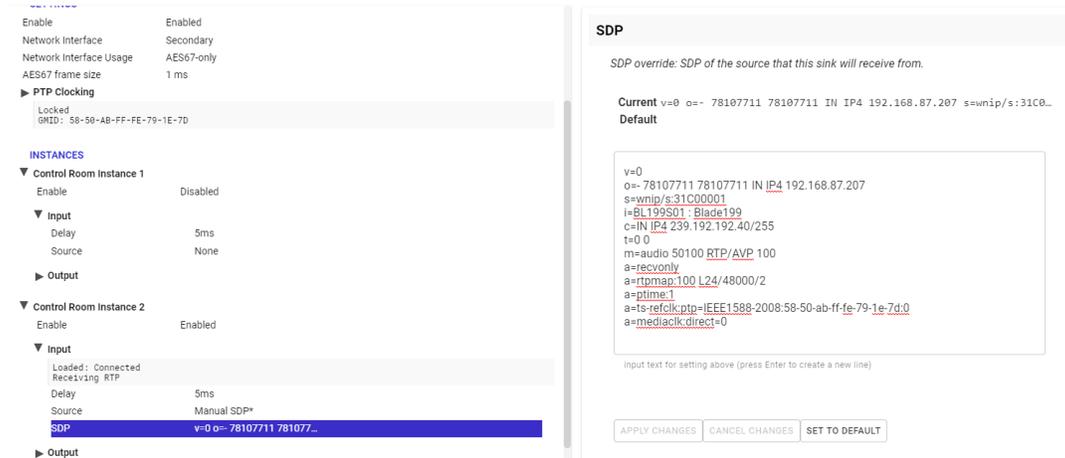

FIGURE 13 CROSSPOINT SWITCH

Right click on the area in the Crosspoint switch that names the source stream for the codec. Choose "Show SDP" for that stream and a window will appear with some text describing this stream. Click the "copy" button to copy this to your computer's clipboard. Note that if you built this stream within Wheatnet using 1mS timing, two SDP windows will appear (1mS and .25mS streams). Choose the 1mS timing window.

Log into the Comrex web-based interface. Under the System Settings Tab, expand the AES67 options, and find the input you wish to assign (NX Rack has one, MultiRack has five). Find and select the "Source" entry under your desired input.

FIGURE 14 INPUTS

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On the right side of the page, a pull-down menu will appear. This will display all detected streams on your network. For Wheatnet installations, this list may be blank. Within the list, choose the option "Manual SDP" and choose "Apply Settings."

FIGURE 15 MANUAL SDP

A new option will appear below the source entry, titled "SDP." Selecting this will open a window that allows you to paste the SDP info that you copied from the Navigator. After pasting all this text, click "Apply."

The codec will now be locked to that incoming stream, and the status message under the selected input should read "Receiving RTP."

If the status does not read "Receiving RTP," or if the incoming stream has distortion or drop-outs, you may need to adjust the "delay" setting under the affected input. This adjusts the amount of buffer used by the AES67 receiver. The default is 5mS, and you can increase or decrease it to fixed values in the pull-down menu.

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