E-Line B

User Manual

Version 1.0

Description

Featuring a mic/line input stage, phantom power and software configurable trim, E-Line fits the requirements of both commercial A/V and I.T. installations. As a Power-over-Ethernet device, a single CAT5/6 cable on a 100Mb connection provides audio, control and power to the device. Hardware isn't the only innovative element of this product. From network redundancy to our innovative auto-discovery protocol, E-Line provides un-paralleled level of abstraction to get audio up and running. With our ZeroConf automatic configuration and hostname labeling of devices, setup of an E-Line system is really only a drag & drop away.

Finally, aside from being a Plug&Play AVB-ready interface, E-Line answers the needs for small & low power Digital Signal Processing (DSP). With our proven plug-in technology, DSP4YOU's platform delivers flexibility without the headaches of learning to program a new DSP platform. With the ability to upgrade plug-ins over the network, E-Line will evolve over time to better fit your client's needs.

Hardware
- o   400MHz quad-core processor
- o   2 x IN, 2 x OUT balanced configuration
- o   Software controlled gain trim (0/36/48dB)
- o   Software controlled Phantom Power
- o   24-bit resolution - 48/96kHz sample rate
- o   100Base-T Ethernet
- o   Redundant Ethernet connector
- o   Power-over-Ethernet (PoE)

Firmware
- o   ZeroConf setup
- o   Self discovery of device
- o   DHCP or Link Local addressing
- o   Plug&Play configuration
- o   Remote firmware upgrade over network

On-Board DSP
- o   28/56bit fixed point DSP
- o   48kHz sample rate
- o   Enabled based on the selected Plug-in (DSP configuration)
- o   Metering, Automatic Gain Control, Parametric equalizers, Compressor/Limiter, delay, phase, gain
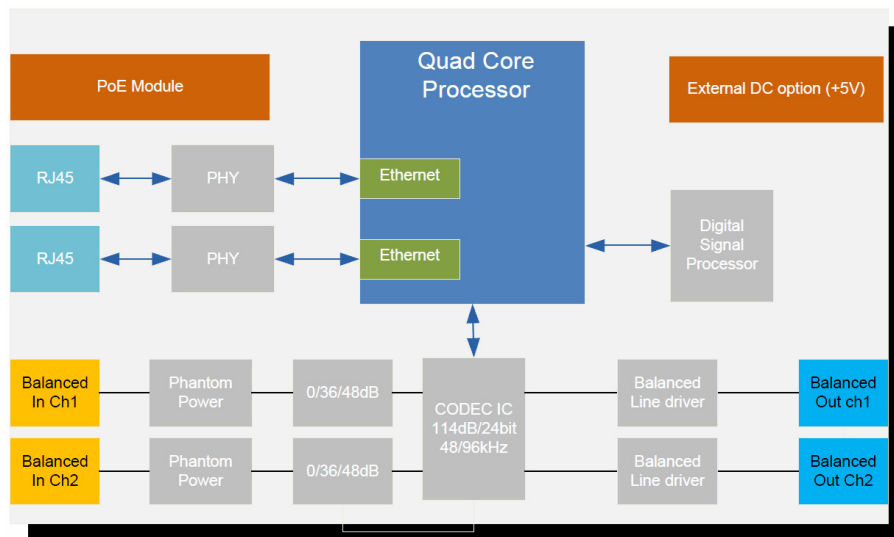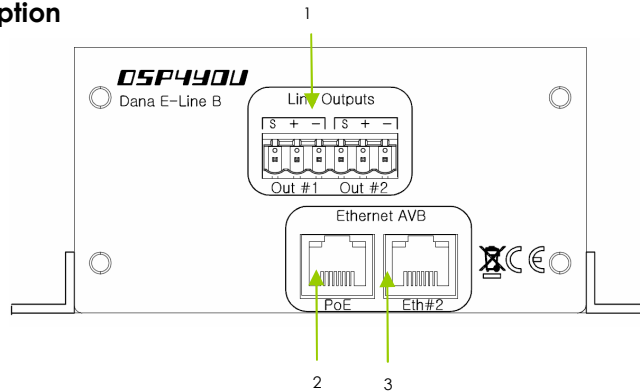
System Diagram

Table of Content

1 Product Overview

1.1 Front Panel Description

1. Line outputs on Phoenix style Plug-in terminal. Provides connectivity for balanced audio outputs

2. Network connection #1 on RJ45 connector with Power over Ethernet enabled. Connect to your Ethernet network.

3. Network connection #2 on RJ45 connector. It provides connectivity for future redundant or daisy chain link.

1.2 Rear panel description
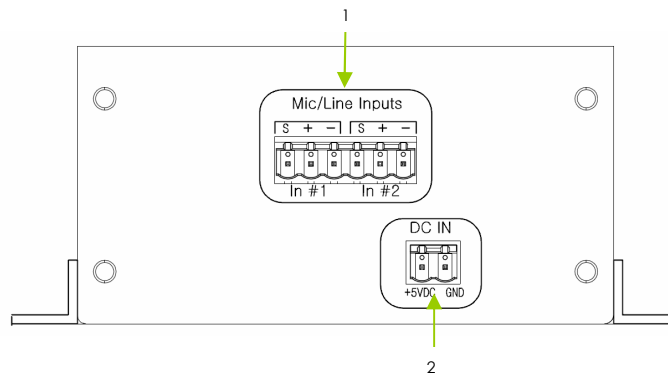
1. Mic/Line inputs on Phoenix style Plug-in terminal. Provides connectivity for balanced/un-balanced microphone or line audio inputs

2. DC input for device powering when Power over Ethernet isn't use. Requires a stable +5VDC supply.

1.3 Feature description

1.3.1 Audio Video Bridging

AVB defines a group of network protocols for the distribution of time synchronized and low latency Audio & Video streams over IEEE802 networks. By leveraging a combination of existing 802 network technologies along with standards specifically designed for the purpose, AVB technology lays the ground work for un-paralleled guaranteed media streaming over Ethernet networks. The overall concept of AVB is actually rather simple. Without getting into too much detail, the three core protocols specify:
- Timing and synchronization
- Bandwidth allocation through the Stream Reservation Protocol (SRP)
- Traffic shaping to ensure that low priority Ethernet traffic does not interfere with AVB traffic

Engineered from the ground up for media streaming applications, AVB has a definitive edge over legacy Ethernet technology in the sense that it allows bandwidth allocation and priority rules based on timing. Unlike similar audio over IP (AOIP) technology, AVB will dynamically assign and defend bandwidth allocation for AVB streaming thanks to the concept of Stream Reservation Protocol (SRP).

Terminology for AVB streaming goes as follow:
- o **Audio Video Bridging (AVB):** General descriptive for a group of protocols providing audio/ video streaming, timing, synchronization, Quality of service (QoS) , control and discovery.
- o **AVB Endpoint**: AVB powered device, capable of transmitting and/ or receiving audio streams using P1722/ P1733 transport protocol.
- o **Talker:** AVB endpoint transmitting audio to the network. (Source)
- o **Listener:** AVB endpoint receiving audio from the network. (Sink/ Destination)
- o **Talker/Listener:** AVB endpoint that is both transmitting and receiving. All AVB endpoints used on Dana series are by default Talker/Listener devices.
- o **Precision Time Protocol (PTP):** Allows devices on the network to get a notion of global time in the effort to synchronize with each other. PTP component in each AVB module can act as a Grand Master (providing clock) or as a slave (receiving clock). Once a grand master negotiates and is selected as a sync source, all units will synchronize to it.
- o **Streams:** General term describing packetization of one or multiple audio/ video channels over the network. Stream can be unicast or multicast. For the time being, the AVB module only supports unicast streaming. Future revisions will provide additional features.
- o **Stream ID**: Unique 64-bit stream identifier used by AVB transport protocols to identify streams.

1.3.2   Digital Signal Processing

E-Line is fitted with a small fixed point Digital Signal Processor (DSP) providing basic filtering tasks such as gain control, signal metering, Low/High pass filtering, parametric equalization and dynamic range control (Comp/limiter).

This feature is optional and may be opted out at the time of ordering. Note that the Digital Signal Processing function can however be enabled at a later time using a unique license key, only valid for a single unit.

Contact our Sales team for more information on how to purchase the license key.

1.3.3   Power over Ethernet (PoE)

Power over Ethernet is the ability to provide remote power to devices over Ethernet cables. PoE requires Cat5/6 cables to operate and the standard is organized in classes. E-line is a Class2, 802.3af device for powering up to 15.4W.

A wide range of PoE enabled switch and power injectors are widely available in typical I.T. retail shops. Please consult your local I.T. supplier for more information.

2   Setup guide

2.1   E-line Box content

Box Content
- E-line module in steel enclosure
- Removable wall mount ears
- Step-by-step startup guide
- Phoenix style terminal plug-in terminal blocks

Mounting instructions
The E-line unit ships with removable ears allowing wall/ceiling mount installation. Remove the 4 x M3 screws to modify the configuration of your unit. The following drawing illustrates the dimension of the box and keyhole locations.
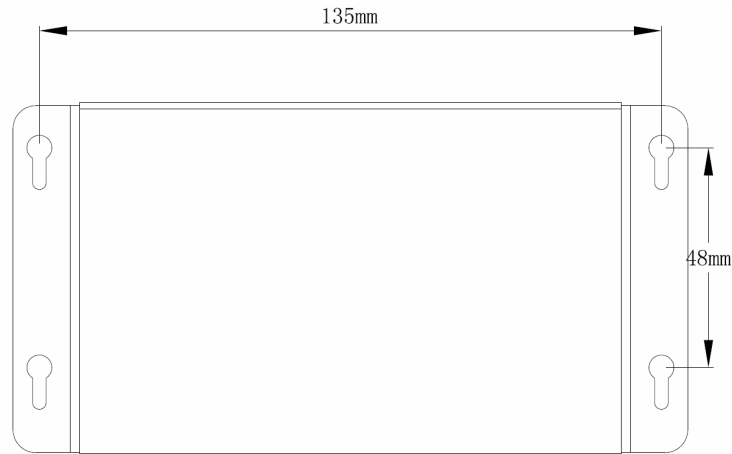
2.2   Connectivity

2.2.1   Network

E-line requires at least one Ethernet connection for configuration and audio streaming. Configuration is performed using the provided software and using a single Ethernet cable.
- A standard-straight through Ethernet CAT5/6 network is required for connectivity through a network switch.
- A crossover CAT-5/6 cable is required for direct connectivity to a PC/Mac machine that doesn't support auto-switching.

E-line devices utilize "Zeroconf" technology for plug&play integration.
- If a DHCP server is present at boot up, the E-line will automatically acquire an IP address
- If no DHCP server is present at boot up, the E-line will use the Link Local Address (Auto IP) P 169.254.0.xxx
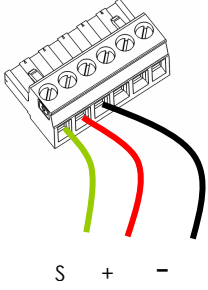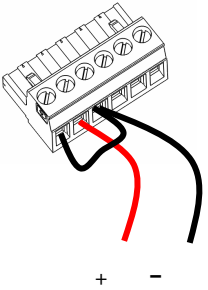
Network requirements:
- Audio Video Bridging systems requires special AVB enabled network switches (so called AVB bridge) to enjoy the advanced features of AVB such as the Stream Reservation Protocol. Such AVB bridge will have the capability to shape the traffic of the network such that any AVB traffic has higher priority.

- In the mean time, standard 100/Gigabit network switches will still allow audio and control streaming without any issue. To insure audio streaming without audio dropouts, we recommend that you install E-line on a dedicated Ethernet network (at least 100Mbit) for safety reason. On Ethernet networks with low traffic (bandwidth subscription), it's possible to share the network with other network devices.

If in doubt, don't hesitate to contact our technical support team at support@dsp4you.com

2.2.2 Analog audio connectivity

E-line can accept two Balanced and Unbalanced audio inputs/ outputs. See the instructions below for audio connectivity:

Balanced connection	Un-balanced audio
S = > Cable Shield + = > Positive cable - = > Return cable	S = > Jumper link to - + = > Positive cable - = > Return cable (jumper to shield)
 S + −	 + −

2.2.3 DC power connectivity

E-line can be powered from two type of power supply:
- o Power over Ethernet (PoE): Using the PoE port, E-line can receive power from a PoE switch or Power injector. Consult the PoE section for more information about PoE.
- o If PoE isn't available on the network, a single 5VDC supply (not provided) will suffice to power the device. Refer to the pin out on the front panel to insure correct connectivity.

2.3 System setup requirements

2.3.1 PC systems

In the event of E-line being part of a system without a Dana server, the device requires an initial configuration to operate correctly. A windows PC environment requires the following specs:
- CPU 1GHz or higher
- 128MB video card
- 1 x 10/100MB network connection
- Latest version of Adobe Flash web plug-in from Adobe.com website : http://get.adobe.com/flashplayer/
- Latest version of the Adobe Air environment from Adobe Website: http://get.adobe.com/air/
- Keyboard & Mouse

2.3.2 Configuration from a Dana server

The following software installation is only required for system configuration without a Dana Server. If the E-line is part of a system involving at least one Dana server, all AVB endpoints will be available for configuration from the device tree in the Dana Server Web Interface.

Please refer to section 3.0 for more information about configuration steps.

2.4 AVB Streamer Tools setup guide

The AVB Streamer tool is an *Air* application based on the Adobe Air environment running on a PC. It has the following system requirements:

Software
- Microsoft• ® Windows® Vista® SP1/ XP pro SP2
- Microsoft• ® .NET framework v3.5
- Adobe AIR environment

Hardware
- PC with 1GHz or higher processor clock speed recommended / Intel® Pentium®/Celeron® family, or AMD

K6®/AMD Athlon®/AMD Duron® family, or compatible processor recommended.
- 256 megabytes (MB) of RAM or higher recommended
- USB 2.0 port
- Keyboard and mouse or compatible pointing device
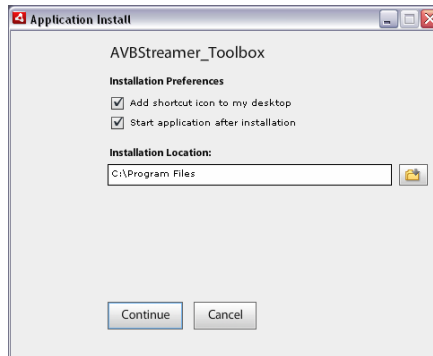
Step1: Pre-installation steps
- Install .net framework and .Air environment on your PC.

Step2: Getting AVBStreamer Tools install package
- Get the latest version of AVBStreamer tools from www.dsp4you.com. Login with your user account to gain access to the secure section of the website.
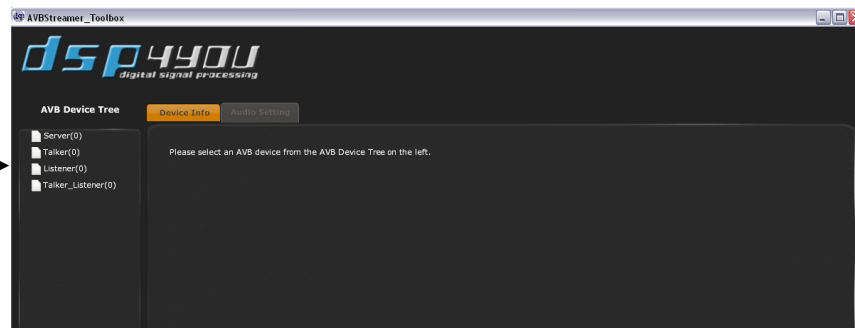
Step3: Installation
- Launch AVBStreamer Toolbox.exe

Following a successful installation, AVBStreamer tools will be automatically launched and discover modules on the network. See the default startup screen below.


3 System Configuration

3.1 User interface overview of the AVB Streamer toolbox

E-line configuration software provides a simple user interface for configuration of the AVB and DSP setting of E-line currently connected on the network. Note that AVB Streamer does not allow "offline" mode without being connected to the network.

➢ A Device tree on the left side lists all discovered AVB devices on the network
➢ A center section tabbed based structure allows access to the various sections of the user interface
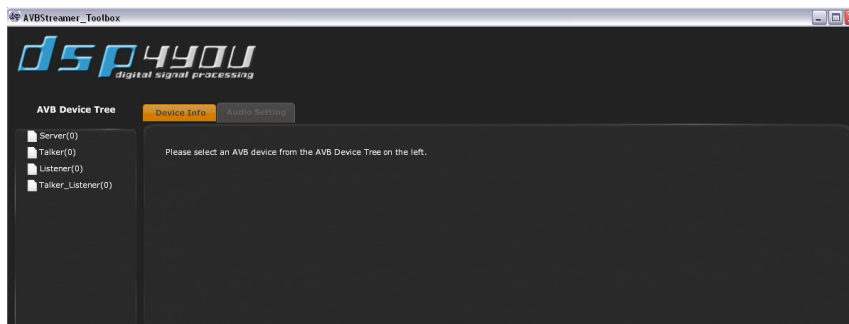
Tabbed Structure
- ▪ **Device info**: Provides overall view of the current settings of E-line device including the model number, firmware version, IP settings.
- ▪ **Audio settings**: Digital Signal Processing section of the interface. Provides control to the basic gain control and advanced DSP algorithms running on the on board Digital Signal Processor. Note that the digital signal processing section will only be enabled if this feature was purchased.

3.2   E-line configuration

NOTE The following section will show print-screens from the AVB Streamer toolbox. Accessing the E-line directly from Dana server will result in the exact same User interface. As mentioned earlier on, the AVB Streamer toolbox software is only required in the absence of a Dana Server.

3.2.1   Device info page

AVB end points are automatically discovered and listed as part of the AVB tree. Once your PC connected to the network, simply open the AVB Streamer toolbox to have access to all settings.

To access the settings of a specific device, click on the AVB device tree on the left. The device info page will automatically load the settings for this device. See below an example.

3.2.1.1   Rename device

By default, AVB endpoints will carry the name of the MAC Address of the network interface. The default name can however be modified to a more meaningful "hostname".

To change the name of the device, simply type a new name in the text window and click on the SET button.

The renaming is instantaneous and the device will appear in the tree with its new name.

3.2.1.2 Firmware upgrade

E-line firmware and Digital Signal processing embedded inside the device can easily be upgraded to new version over the Ethernet. Click Browse to select the firmware you would like to upgrade the unit with.

Make sure not to un-plug the device during the firmware upload to prevent any corruption of the device.


3.2.2 Audio Video Bridging (AVB) stream configuration

The E-line AVB configuration requires limited setup. The following section will highlight steps involved in building/deleting an AVB stream. Please refer to the AVB primer for the basic terminology used through out this section.

3.2.2.1 Build a Stream

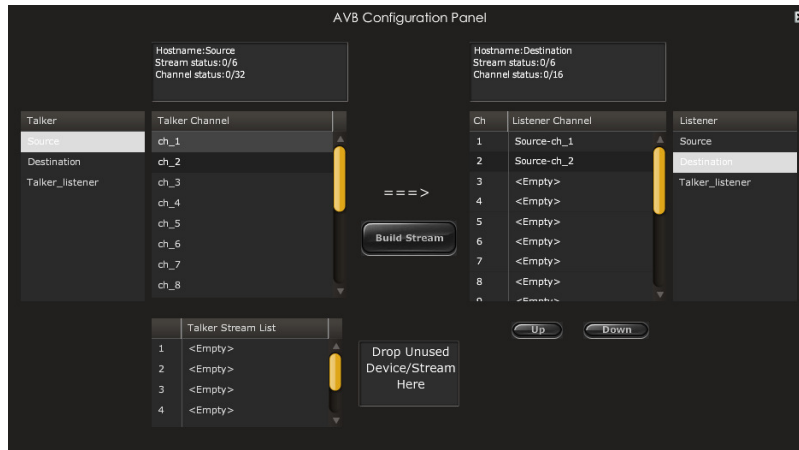Click on the "**Configure AVB Stream**" button to access the following dialog box.
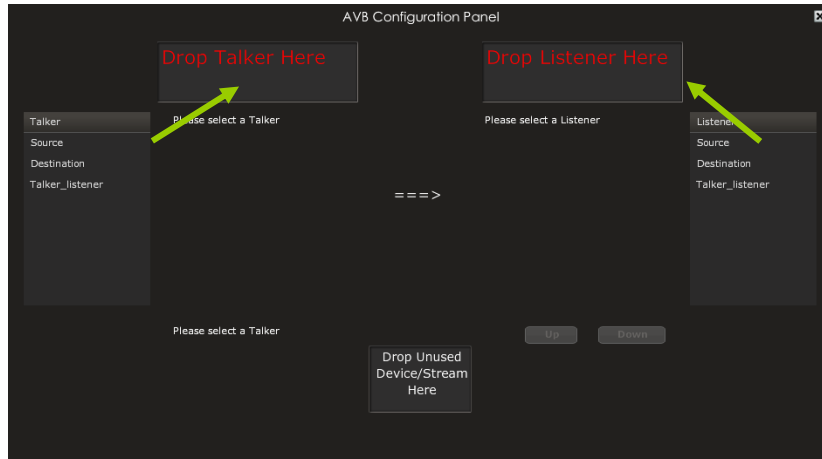
2 simple sections: Talkers (source) on the left, Listeners (destination) on the right.

Select one Talker (i.e. Source) from the Talker list and drag&drop it in the "**Drop Talker Here**" box. Repeat the same step for the Listener side (i.e. destination). The dialog box should now look like this:

With the talker and listener selected, the next step in building a stream is to select the source channels from the talker channel section. You can select one or multiple audio channels (press the CTRL key) from the Talker list. Simply 'drag&drop' them to the Listener channel list as shown below:
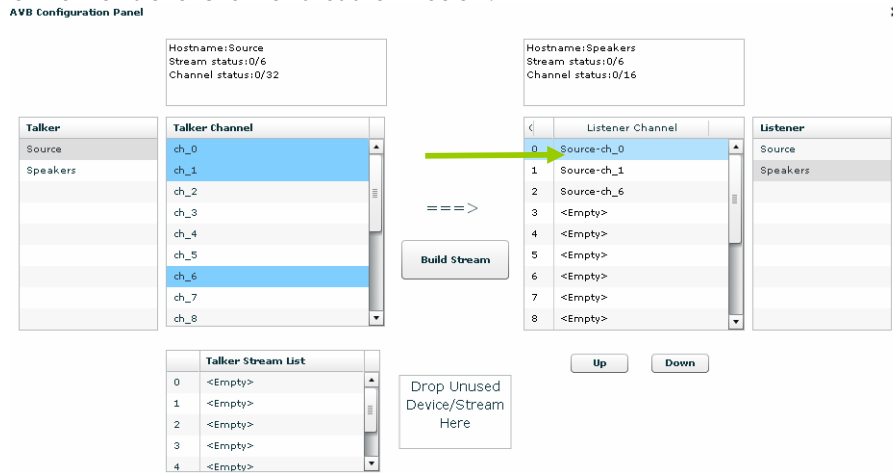

Although the user interface will automatically pack up the talker channel in consecutive order on the listener side, audio channels can be re-arranged. Using the Up & Down buttons, one can re-organize the order of channels on the listener side as shown below.
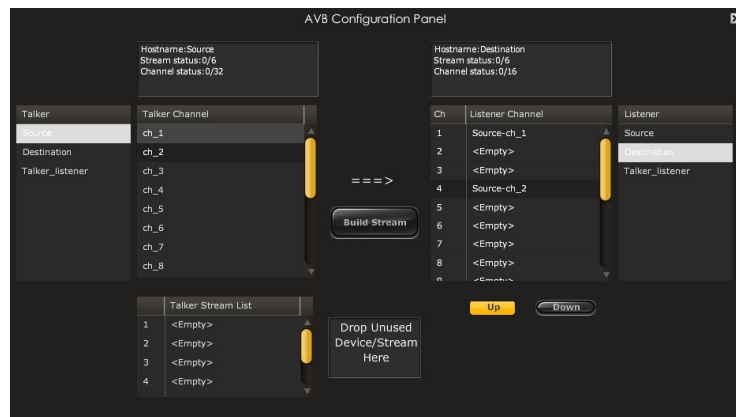

3.2.2.2   Delete a stream

Once a stream is configured, the stream is listed in the Talker stream list (below the Talker audio channels), and is uniquely identified by the Listener's hostname. To delete a stream, simply drag from the Taker stream list the particular stream into the garbage bin.

To delete a stream, simply drag the stream into the garbage bin as shown by green arrow
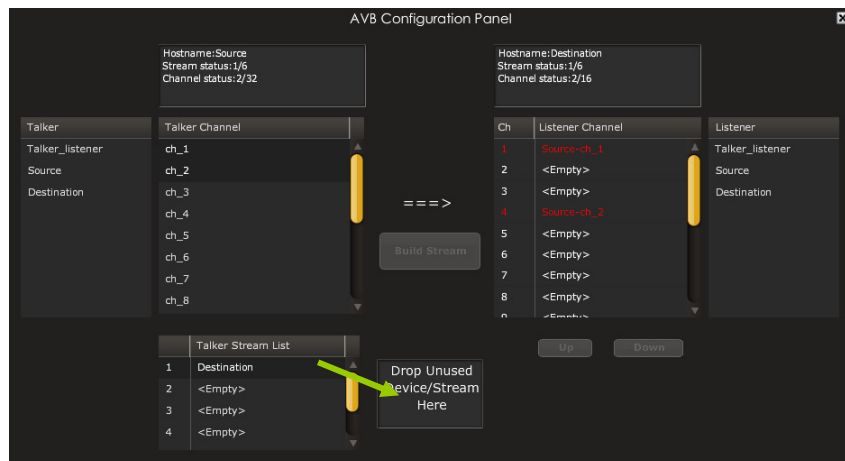
To configure a new stream with a new device, simply drag the Talker/ Listener into the garbage bin.
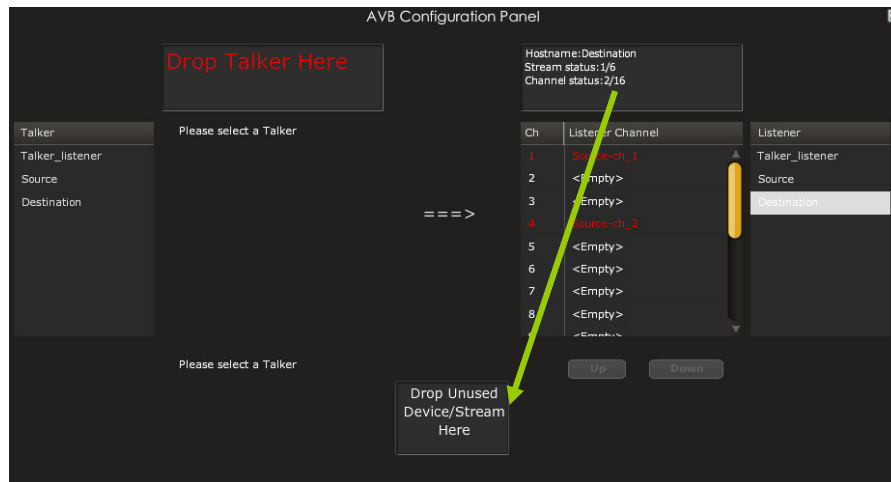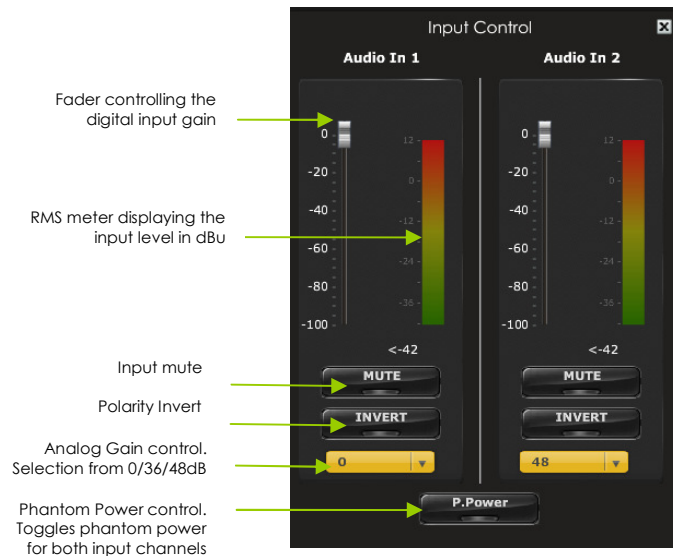

3.2.3   Audio settings

The audio setting page has two different layouts depending if the DSP optional feature was purchased or not.
➢ If the DSP feature was purchased, the Audio setting layout will provide a structure as shown below. Each button controlling a specific algorithm of the on Digital Signal Processor.
➢ If the DSP feature was not selected, the user interface will only have access to Analog in/out and AVB in/out. All other filtering/dynamic range compression will be disabled.
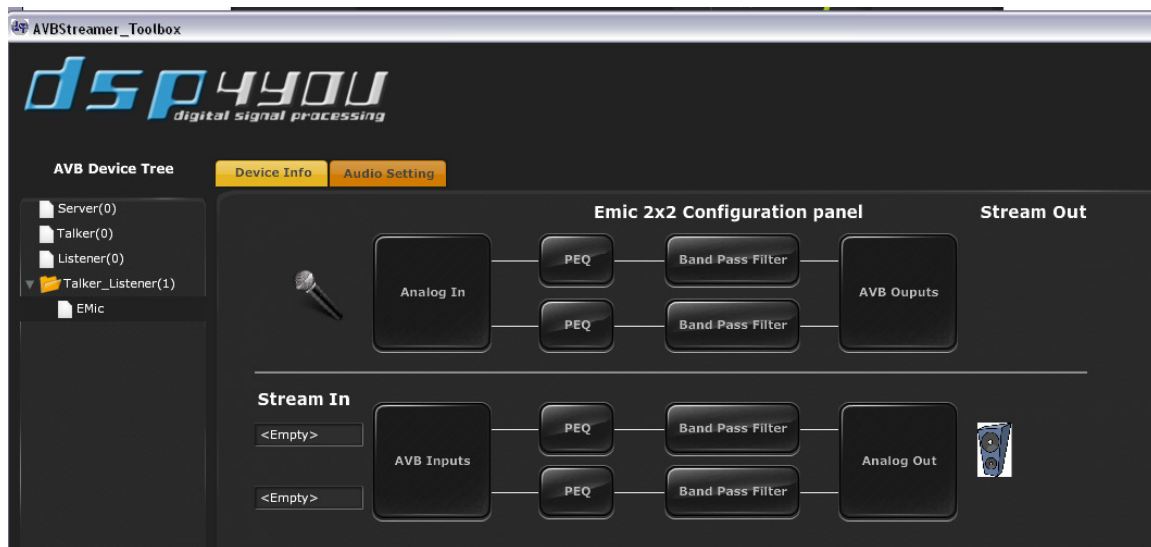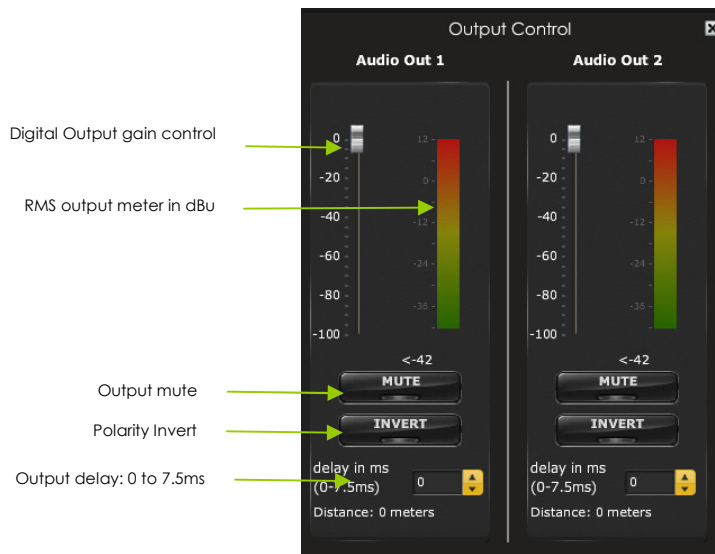

The following sections will describe the configuration panel for each processing block.

3.2.3.1 Analog input control

Fader controlling the digital input gain

RMS meter displaying the input level in dBu

Input mute

Polarity Invert

Analog Gain control. Selection from 0/36/48dB

Phantom Power control. Toggles phantom power for both input channels

3.2.3.2 Analog output control

Digital Output gain control

RMS output meter in dBu

Output mute

Polarity Invert

Output delay: 0 to 7.5ms

3.2.3.3 Parametric Equalizer (PEQ) control

Up to 6 bands of PEQ on each input/output section is available. For each band, the typical PEQ settings go as follow:
- o Frequency (Freq): Using the slider or text box, enter the center frequency of the PEQ filter
- o Gain: controls the boost or dip of the equalizer
- o Q: Controls the number of octaves over which the filter affects the signal.
- o Bypass: Control on a per band basis whether the PEQ is enabled or not.

At any times during the tuning, one can easily mouse over the curve to provide a real time reading of the value.

Band selection by radio button →
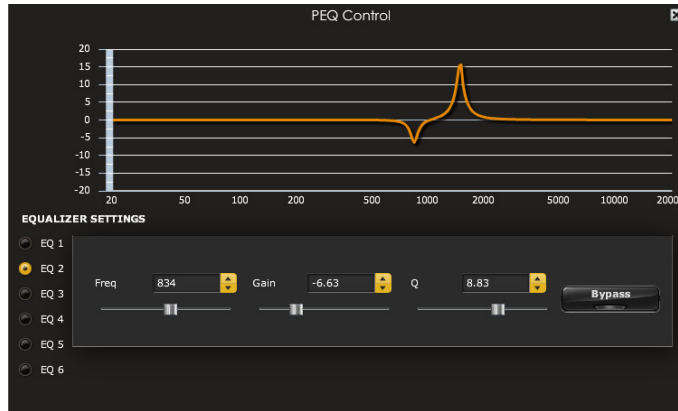
3.2.3.4   Bandpass filter

At the output of the matrix mixer, a bandpass filter made up of 1 x Low pass filter and 1 x high pass filter provides all the flexibility required for multi-way speaker processing applications.
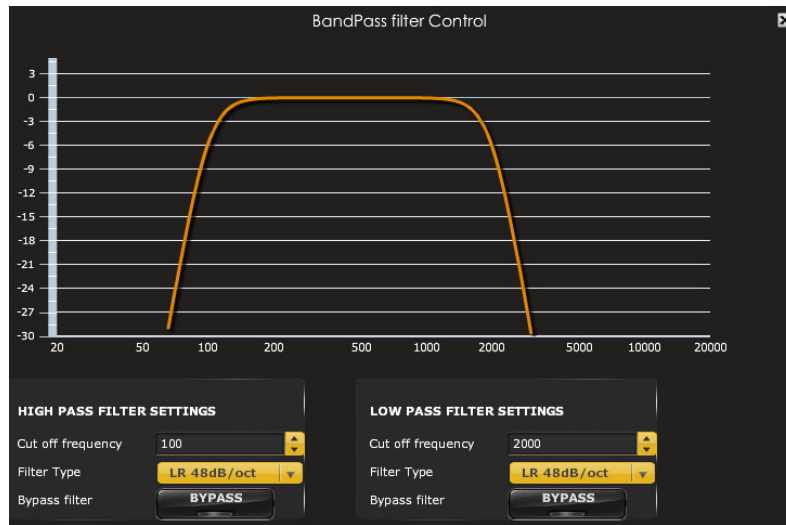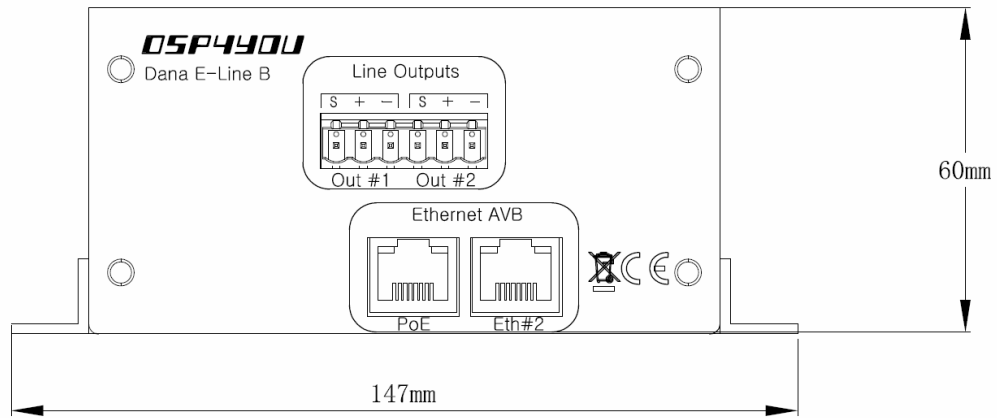

Filter type provided include:
- o   Butterworth (BW): 6/12/18/24/30/36/42/48dB
- o   Linkwitz Riley (LR): 12/24/36/48dB
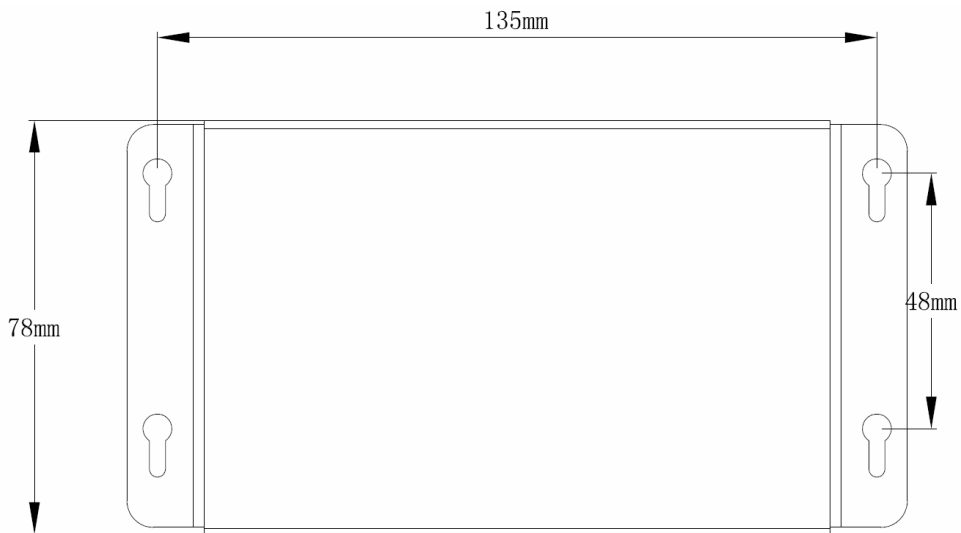
4   Technical specifications

4.1   E-line Technical specifications

Item	Description
Processor	400MHz Quad-Core processor for AVB network stack and TCP/UDP discovery and control
Digital Signal Processor	Fixed point 28/56bit processor
Audio Over Ethernet	Audio Video Bridging (AVB) for streaming of low latency, un-compressed audio over Ethernet networks Supported IEEE standards: 802.1as (timing & synchronization), 802.1Qat (Stream Reservation protocol), P1722 (transport protocol)
Maximum Streaming capabilities	Up to 2 streams in, Up to 6 streams out
ADC/DAC conversion specs	24bits / 48kHz with DSP 24bits / 96kHZ without DSP
Analog input specifications	Maximum input: +8dBu / Input impedance: 10k ohms
Analog output specifications	Maximum output: +8dBu / Output impedance: 600 ohms
Analog gain	Software controlled in 3 steps: 0/36/48dB
Phantom power	Software controlled - +12V
THD	<0.01% 20-20kHz
Dynamic range	104dB, 22-20kHz un-weighted
Power Over Ethernet (PoE)	Class 2 802.3af compliant Powered Device (PD) for remote powering over standard CAT5/6e cables
External DC Power option	Module can be powered by optional +5V DC supply
Connectors	Neutrik XLR type connectors on E-Line W (Wall plate version) Terminal plug-in connector on E-Line B (Box version)
Dimensions	See below

4.2 Mechanical drawings

Front view

Top view