

# User Manual

# Sonic Wave I

## 3D Sound Processor



Version 3.0.1

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# SAFETY INFORMATION

- This equipment must be EARTHED.
- Only suitably trained personnel should service this equipment.
- Please read and take note of all warning and informative labels.
- Before starting any servicing operation, this equipment must be isolated from the AC supply (mains) by removing the incoming IEC mains connector.
- Fuses should only be replaced with ones of the same type and rating as that indicated.
- Operate only in a clean, dry and pollutant-free environment.
- Do not operate in an explosive atmosphere.
- Do not allow any liquid or solid objects to come into contact with the equipment. Should this accidentally occur then immediately switch off the unit and contact your service agent.
- Do not block ventilation slots.

# Introduction

The Sonic Wave I 3D sound processor is specially designed to enlarge the listening zone of conventional surround sound and enables perfect audio imaging for all listeners. In conventional setups, only listeners in the center of the loudspeaker array are in the sweet spot and therefore get the impression that the sound is reproduced spatially. With the Sonic Wave I, everyone has the same impression of spatial audio regardless of his or her position. Using Sonic Emotion<sup>TM</sup> audio processing based on wave field synthesis (WFS), the Sonic Wave I processor is able to enlarge the sweet spot to the whole listening area. Stereo or 5.1 content can be rendered using plane audio waves, which allow for a consistent listening angle of all input channels in the entire audience. Moreover, audio objects with position information can be rendered as point sources. In this case, the perspective to the audio source (e.g. instrument, singer, etc.) remains meaningful within the entire audience. As a result, the listening experience is dramatically improved, not only in the sweet spot but also in the entire audience while using the Sonic Wave I.

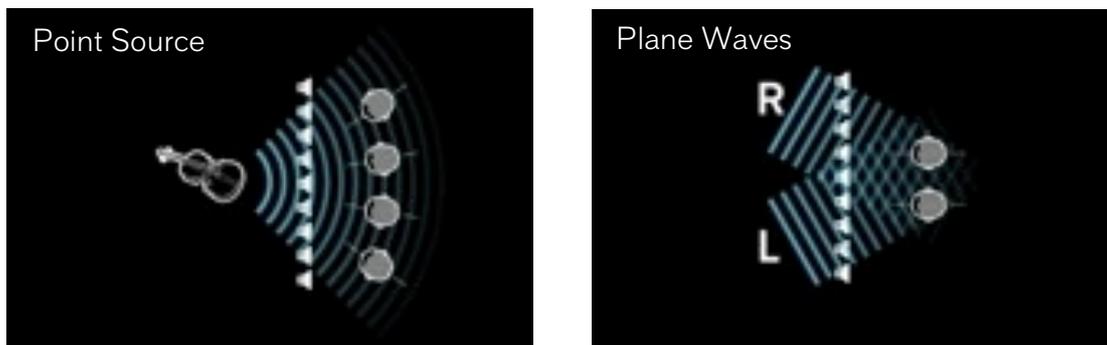


Figure 1.1

## The Software

The software component of the Sonic Wave I entails two core tools mainly the Sonic WaveDesigner and the Sonic WavePerformer.

With the **Sonic WaveDesigner** application you design and configure your system according to the loudspeakers set up in the room. This step is done once and let's the Sonic Wave I processor calculate the filters and parameters, which are used for the rendering. Regardless of the amount of speakers and their position, audio material fed in to the Processor can be positioned as virtual sound sources in the room.

The **Sonic WavePerformer** allows you to set the virtual sound sources (stored media files or live inputs) in the room. The virtual sound sources can be static and stored as Presets in to the memory of the processor, or are controlled by tools as the audio unit Plug-In "Wave Interface AU" and because of this dynamic timeline based sound source movements can be created.

# 1. Sonic Wave I Topology

The Sonic Wave I processor is the heart of any given audio system: Audio inputs are routed from any DAW, player or live console, through ADAT or MADI. The Sonic Wave I processor, controlled by the WavePerformer software component or/and the WaveAutomation AU plugin, sends the processed signal through ADAT or MADI to any converter where from the audio signal gets amplified and played back by the loudspeakers.

Moreover, for time code based multimedia integration that includes Video and DMX control, the Processor can work with the Coolux Media Server.

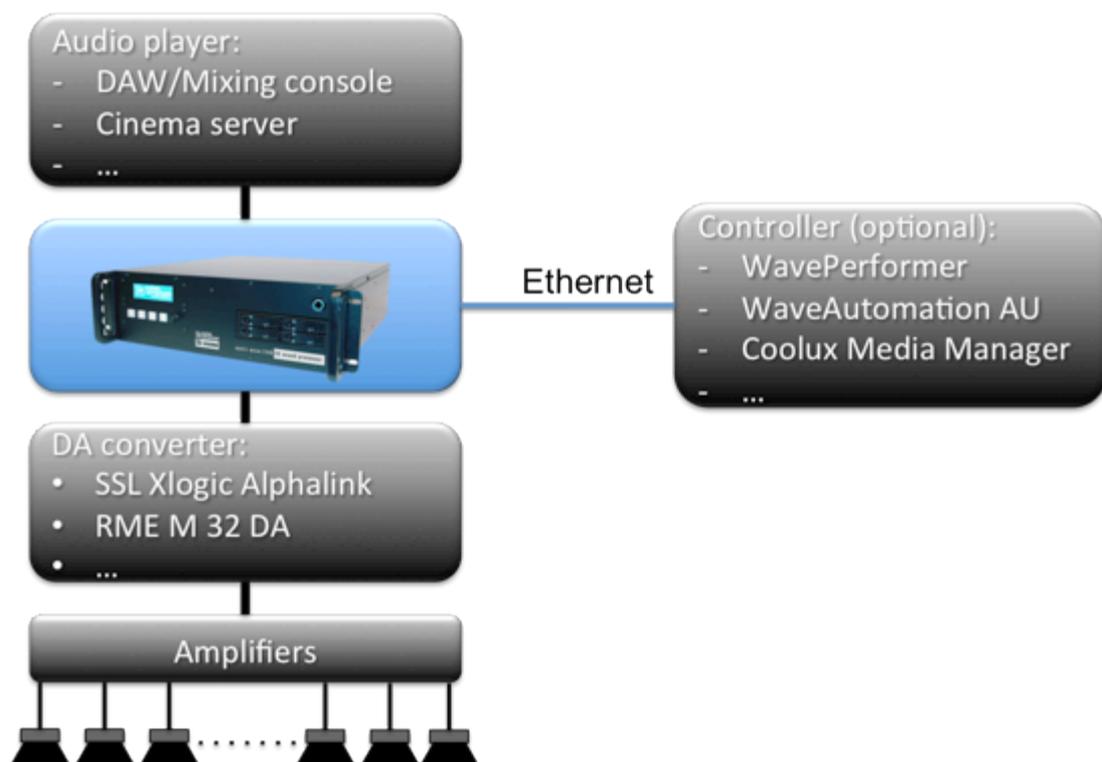


Figure 1.2

# HD Option

The Wave I HD processor option is an additional 24 channel hard disk audio playback engine, specifically designed to be controlled by the Media Manager show control software from Coolux Media Systems.

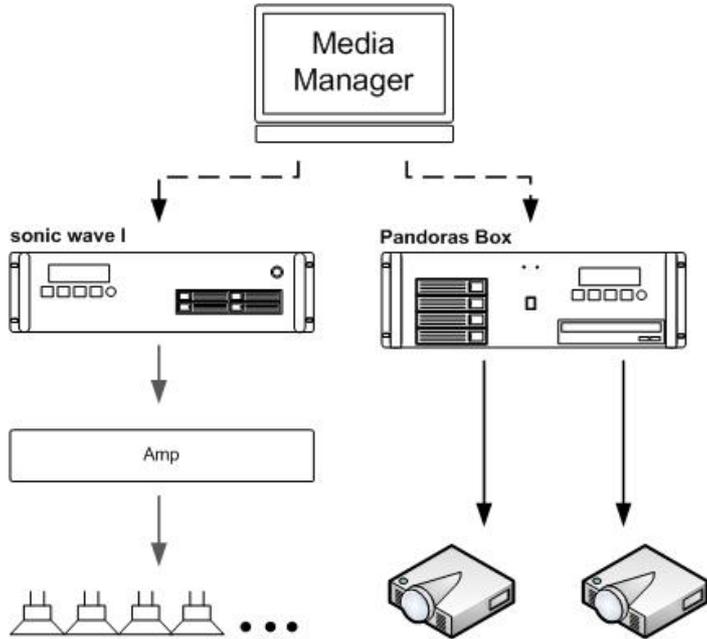


Figure 1.3

# 2. Sonic Wave I Hardware

## Connections

### ADAT Version

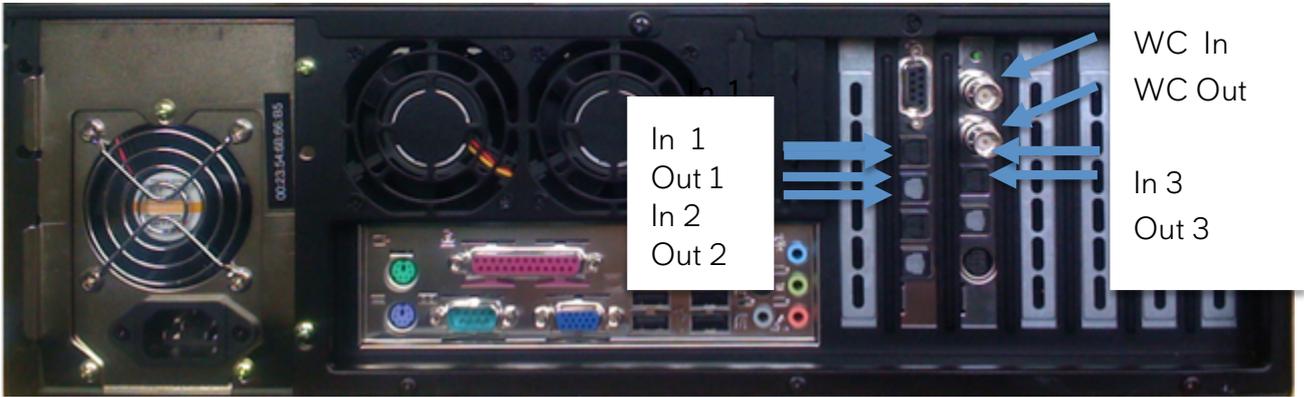


Figure 1.4

### MADI Version

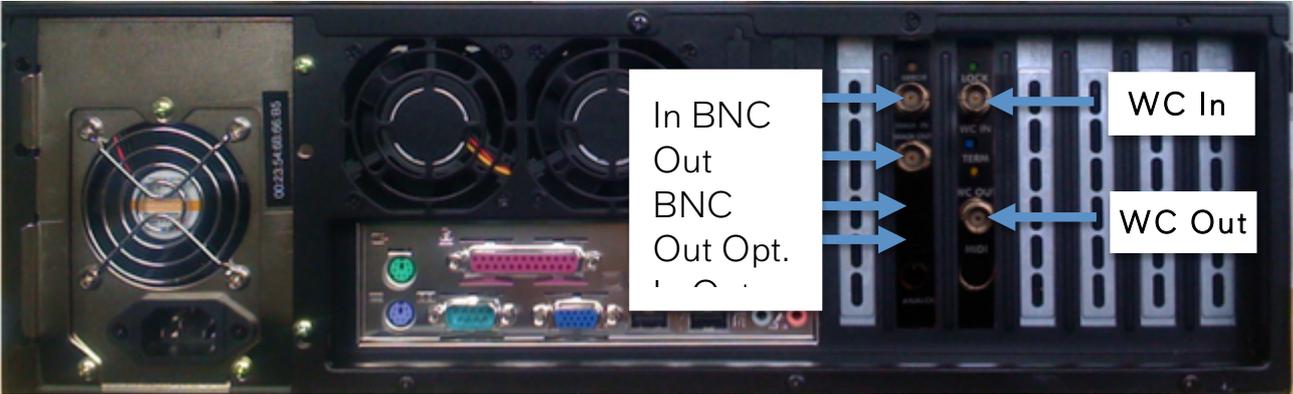


Figure 1.5

## Hardware Revisions

The pictures, Figure 1.4 and 1.5, show the back plate of the Hardware Revision 1 “Pluto”.

The Hardware Revision 2 “Neptun” of the Sonic Wave I processor comes with two Ethernet ports. For communication with a control PC the **left** connector on the back must be used. See Figure 1.6 below.

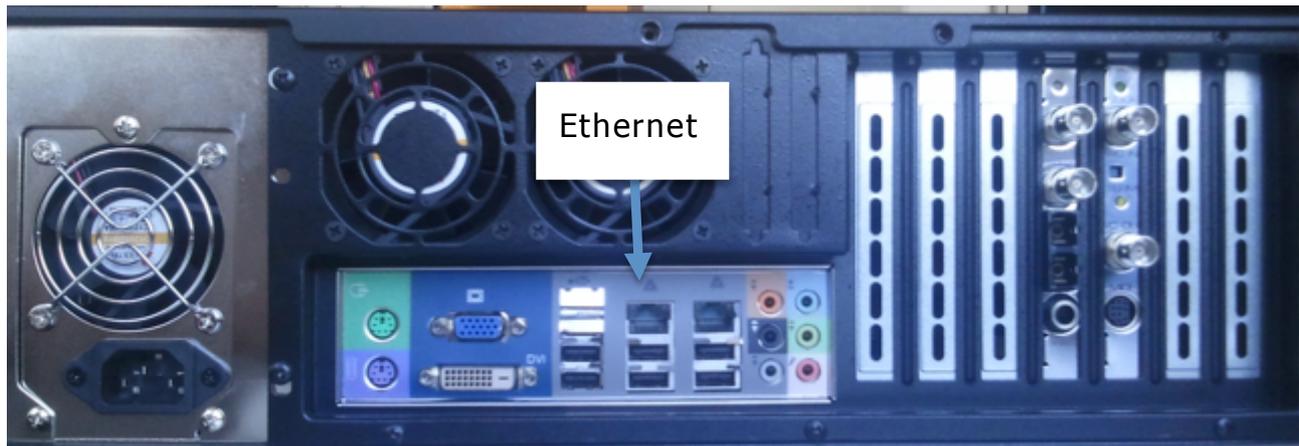


Figure 1.6

## System Dongle

The Sonic Wave I processor comes with a system dongle in which all system specific preferences are stored. The dongle is configured by Sonic Emotion<sup>TM</sup>.

The dongle is processor dependent and only works with the specific Sonic Wave I processor it is intended for.

It must - at any time - be plugged in in one of the USB port of the Sonic Wave I processor.

## 3. Control Elements

### Display Menu

The display menu of the Wave I processor provides access to some of the main functionalities. The main page is the home window. From the home window, the encoder adjusts the master volume. The selected source position preset and network information are displayed. By turning the rotary control on the main page, you will have direct access to the master volume.

HD Version

On the display home screen, you see if a Coolux Media Manager is connected and its IP address. The main page contains also information about the usage status of the storage hard disk used for the audio files and there is an additional menu page for resetting the disk.

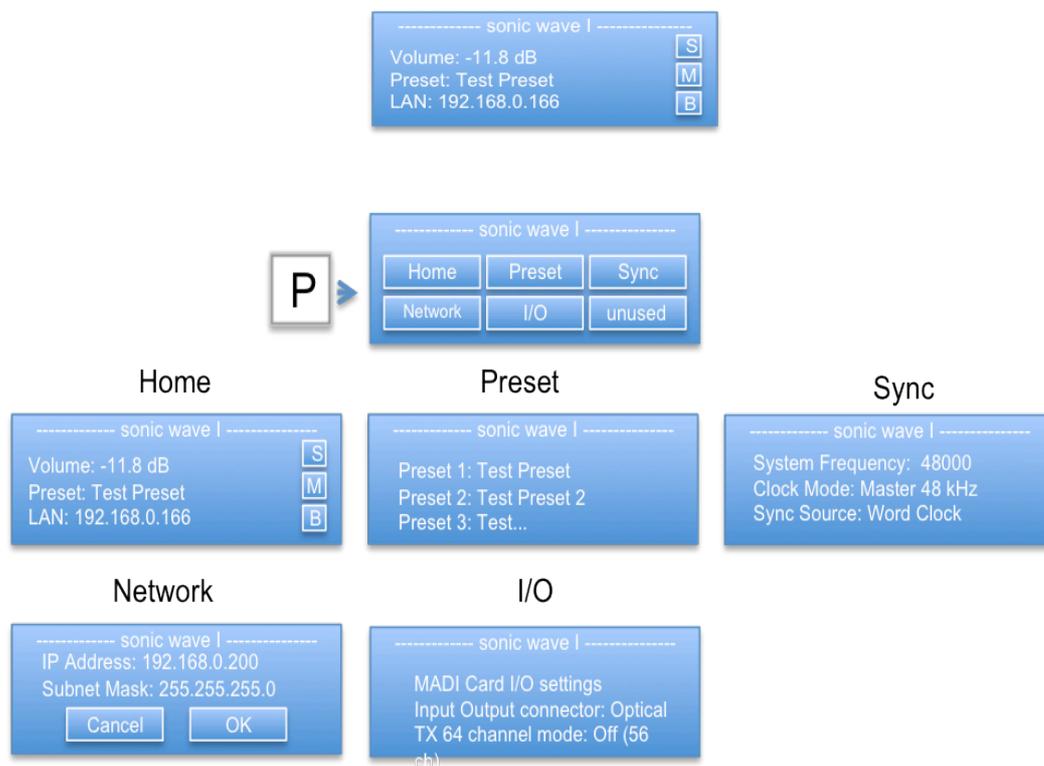


Figure 1.7

Rotary control

The rotary control next to the display allows you to navigate the menu and change parameters.

Buttons

**M:** Disabled

**B:** Disabled

**P:** Preset Menu - Enter the preset menu by pressing P and move through the menu options by turning the rotary control:

Home: Home window is shown

Preset: The saved presets are shown and can be selected by turning the rotary control and press enter (E).

IO (only on the MADI version): Press Enter to select between Coaxial or Optical IO and confirm by pressing Enter again

Network: Use the rotary control and press enter (E) to select and adjust the IP configuration.

Sync Options: Use rotary control and press enter (E) to select the sync mode and reference signal for the digital audio interface.

**E:** Enter

## 4. System Configuration

### Software Installation

The Wave I configuration software package (Windows XP & 7) is made to set up and control your system and create presets. To start the installation process, double click on the file you will receive per email or downloaded from the Sonic Emotion FTP Server. Alternatively, insert the Wave I configuration CD into your computer and start the installation by double clicking on the Wave I configuration icon “config” (software is part of the system delivery). The installer will put both WaveDesigner for the system setup and WavePerformer for the control of the system on your PC.

### PC Configuration

Before running the applications, the PC network settings must be set-up to enable the control of the system.

1. The Sonic Wave I processor can be controlled either by a LAN or a WIFI connection. Make sure the unused connections are disabled.
2. Turn off the firewall  
Go to: Start -> Preferences -> Windows Firewall  
  
If you have third party firewalls installed, please make sure that they are turned off as well.
3. Make sure that the IP Address of your PC is set manually and is in the same range as the Sonic Wave I Processor. By default, the PC can be set to any IP address 192.168.0.1 - 192.168.0.254, except of 192.168.0.200. Any WIFI router used must also be in the same IP range.  
The default IP address of the Sonic Wave I Processor is 192.168.0.200. It can be changed on the processors display menu (page 12).
4. The Subnet Mask has to be: 255.255.255.0

Go To: Start -> Connections -> All Connections -> LAN or WLAN-Connection (regarding what connection you are using)

Then double click “Internet protocol (TCP/IP)”

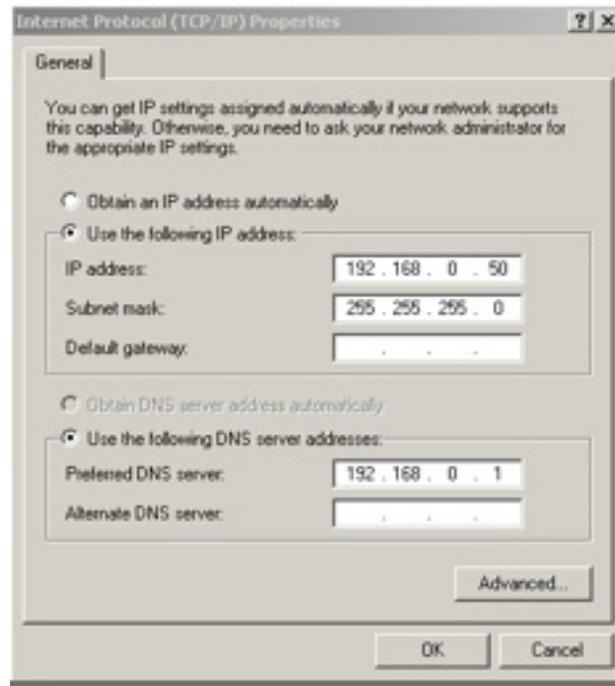


Figure 1.8

## Mac OS X - Setup within Virtual Box

The Mac OS X Version of the Sonic Wave I configuration software package will be available in the near future. Should this however be your preferred operating system, you could use virtualization software like VirtualBox to install a virtual Windows machine on a Mac OS X host. VirtualBox from Oracle is free to use and can be downloaded from <http://www.virtualbox.org>

To enable network communication from the virtual Windows machine to a connected Wave I processor, the following Network settings have to be configured:

### Mac OS X (Host):

Set the network adapter that is used for communication with the Wave I processor to a static IP address in the same range as the processor. The subnet mask must be set to 255.255.255.0. Make sure to disable wireless if you use a cabled connection or that there is no other cable plugged if you connect over AirPort. Make sure there is no firewall active.

## VirtualBox - Network Settings:

Start the Windows machine in VirtualBox. When it is running, go to the VirtualBox menu bar to **Devices -> Network adapters**. The following Dialogue will open up and appear:

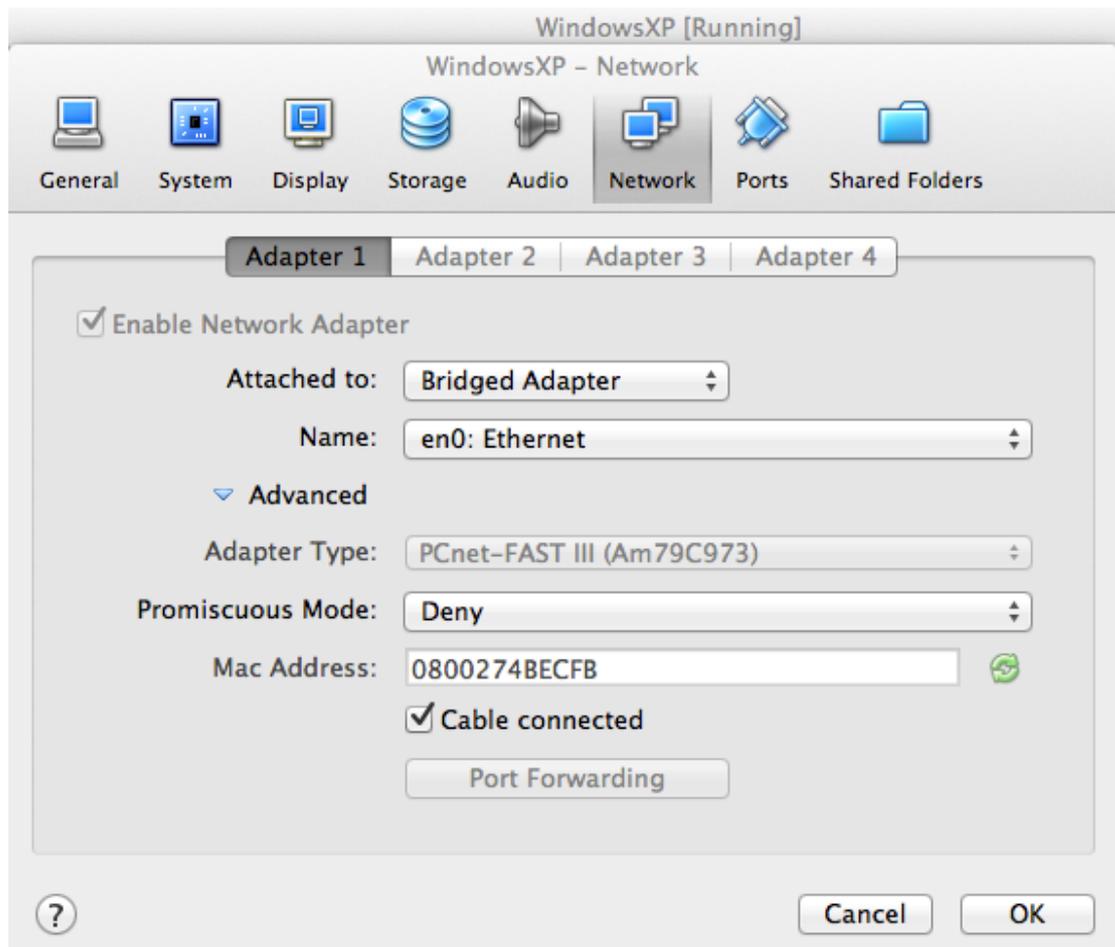


Figure 1.9

Set the attached interface to “Bridged Adapter” and choose to name the device to which you have configured within Mac OS X to the Wave I processor network (Ethernet or WLAN/AirPort).

## Windows (VirtualBox Guest):

In the running virtual Windows machine, go to the network configuration panel. You can follow the same instructions for “PC Configuration”. Make sure to set a static IP-address manually that is different than the one you have assigned in Mac OS X. For example, the Ethernet port in Mac OS X has the address 192.168.0.50, the bridged adapter within the virtual Windows 192.168.0.51. Lastly, make sure that the Windows Firewall is disabled.

## 5. Understanding the Functionalities

Essential for a properly working setup is the understanding and application of certain rules and terms and of how the Sonic Wave I processor handles different types of speakers. By knowing the following rules, it will give you all the possibilities the Sonic Wave I processor offers where then mistakes in the configuration of the processor will inevitably result in an incorrect sound reproduction.

All connected speakers are placed in one or more systems and can be divided into several subsystems. There are also different rendering types (WFS main, WFS support and subwoofer speakers) resulting in different spatial rendering modes.

A minimum setup consists of 2 speakers, however for a real exploitation of the Sonic Wave I processor's capacity and the WFS rendering, eight or more speakers are recommended.

More details on setting up speakers can be found on page 67.

### Loudspeakers Assignment Hierarchy

System - Sonic Wave I for one listening area

One individual listening area is described as a System. There is always one main System accounting for the main listening area. An additional System is, for example, another room, a peripheral / alternative listening area or a production room. Each System can have its own, individual speakers' setup. The sound reproduction is rendered for each System individually referring to its speakers' setup. To date, the Sonic Wave I can handle a maximum of 4 Systems processor.

Subsystem

With a Subsystem you can divide the speakers of a System into groups. This is used for practical and functional reasons:

In windows, such as Speaker Setup and Equalizer you can select a Subsystem, so that only the speakers belonging to that Subsystem are selectable. When using the *Select All* function, it will then also work to all speakers of the selected Subsystem. This is a convenient way to access speakers of the same type or same orientation.

Along side a main speaker setup, a supported subsystem is used (WFSmain, WFSsupport, description follows); each of these setups must be placed in an individual Subsystem. To date, up to the Sonic Wave I can handle 4 systems processor.

## *Rendering Types*

### WFSmain

WFS stands for Wave Field Synthesis and describes the process done by the Sonic Wave I Processor by rendering the sound sources and reproducing them through the speakers. There will always be a set of WFSmain speakers. In setups with several Systems, each System has its individual rendering. All WFSmain speakers in one System head to one reference point. More details on the reference point are found in *Speaker Setup*, Page 22.

### WFSsupport

WFSsupport speakers are always speakers added to WFSmain speakers, a System cannot consist of only WFSsupport speakers. The task of WFSsupport speakers is to enhance or add sound diffusion to a setup of WFSmain Speakers. WFSsupport speakers are for example:

- Additional delayed speakers further back in a room or under a theatre balcony;
- Additional speakers above a stage that have an array of WFSmain speakers on its platform edge...others

WFSsupport speakers must be part of an individual Subsystem. The WFSsupport Subsystem does not include WFSmain speakers.

### Subwoofers

Subwoofers are speakers that enhance the reproduction of low end / bass sounds. When subwoofers are used, the processor uses low-end sound of all sources fed to a certain speaker within a System or Subsystem. They must be appointed within a set of WFSmain speakers. Their spatial information is important because they receive a dedicated spatial rendering to properly align their contribution to the rendering of the WFSmain speakers.

## **Summary**

A System can consist of one or more Subsystems. A Subsystem can not be shared among several Systems.

A System contains an array of speakers working as WFSmain; Subwoofers can be added to the WFSmains.

WFSsupport speakers usually head the same way as the main, front WFSmain speakers. If placed further back in a room and delayed, they can be heading away from the reference point.

## 6. The WaveDesigner - Setting-up the Sonic Wave I Processor

The WaveDesigner software element is a configuration tool to set up the Sonic Wave I processor for a specific loudspeaker setup. The WaveDesigner sends the loudspeaker information (position, type, rendering) to the connected Sonic Wave I processor, which then creates the corresponding filters. Once this step is completed, the processor is operational and fine-tuning operations can be completed (EQ, crossover tuning for multiway systems, etc.). All settings can also be saved as a project file on to your computer.

It is recommended for stability reasons to use the WaveDesigner on a stable network configuration (private network with the processor, good quality network cable or excellent WIFI connection).

### Workflow

The typical workflow setting up of the Sonic Wave I Processor is done in two different steps. In the first step, the loudspeaker configuration can be edited and the output configuration created. Until this step is completed, the processor is *not* operational. Clicking the “Upload” button transfers the configuration to the processor that creates all the necessary renderings accordingly. The processor can then be used for real time operation including fine-tuning (loudspeaker EQ, etc.).

The typical workflow of creating a new project with the WaveDesigner can be described as follows:

1. Configuration according to installation setup
  - a. Enter the physical position of all loudspeakers used with the processor. A possible way to measure is to start with the center front speaker and using it as the zero point on the X, Y axis
  - b. Adjust loudspeaker type and output assignment
  - c. Assign rendering type of speakers
  - d. Allocate speakers to systems and subsystems
  - e. Upload all above gathered data onto the processor so that it can calculate the filters
2. System fine tuning
  - a. Test loudspeakers to check if the cabling is right. If not, change cabling or indexes in Wave Designer and upload data once more
  - b. EQ processor outputs to match speakers to desired sound color, to adapt different speaker types in setup and adapt the sound to the room acoustics
  - c. Store settings to the internal memory of the processor
  - d. Now, the Sonic Wave I processor is ready to be used and controlled with the WavePerformer
  - e. Save the project file on your computer. In case of an unwanted modification of the processor you can re-upload the project including all settings from your computer to the Sonic Wave I processor

Alternatively, a saved project can be opened in the WaveDesigner. The configuration should then be transferred to the Processor pressing the upload button. The processor then calculates first the filters and restarts. All EQ and additional configuration parameters are then transferred to the Processor. Make sure to store the configuration on the Processor for next restart.

## Using the Value Boxes

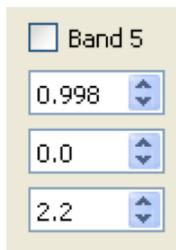


Figure 1.10

Many parameters are configured in value boxes. These provide the possibility to type in values directly, such as: to step up or down with the spin arrows, or by the mouse wheel when the mouse pointer is on the corresponding value box. They also behave like a slider: If pressed with left mouse button on the arrows and mouse moves up or down, the value increases or decreases depending on the deflection of the mouse.

## How to Store Settings/Save Project Files

When a speaker layout has been set and the Upload button is clicked, the WaveDesigner software element sends the position data and all settings to the Sonic Wave I processor, which then calculates the renderings and restarts automatically. *Changes in speaker positions, rendering, loudspeaker type, system/subsystems and output assignments will not be calculated real time!*

Settings - such as equalizer, gains, delays etc. - are made real-time meaning as soon as any parameter is modified; this is audible. Select *Store as default* in the System menu or click the Store button in the upper toolbar to write the settings to the Sonic Wave I processors internal memory. Storing the parameters does not require a restart of the processor. If you were to shut down the Sonic Wave I processor without storing, then all settings that you created in this session will be lost. In any case, if you choose to shut the processor down or close the WaveDesigner software, a dialog will appear prompting to choose between storing onto the processor or saving the project file on your computer.

## Speaker Setup

After starting the WaveDesigner, the program opens and starts with its main window. The window can be scaled to a preferred size and also maximized by clicking on the button in the top right corner.

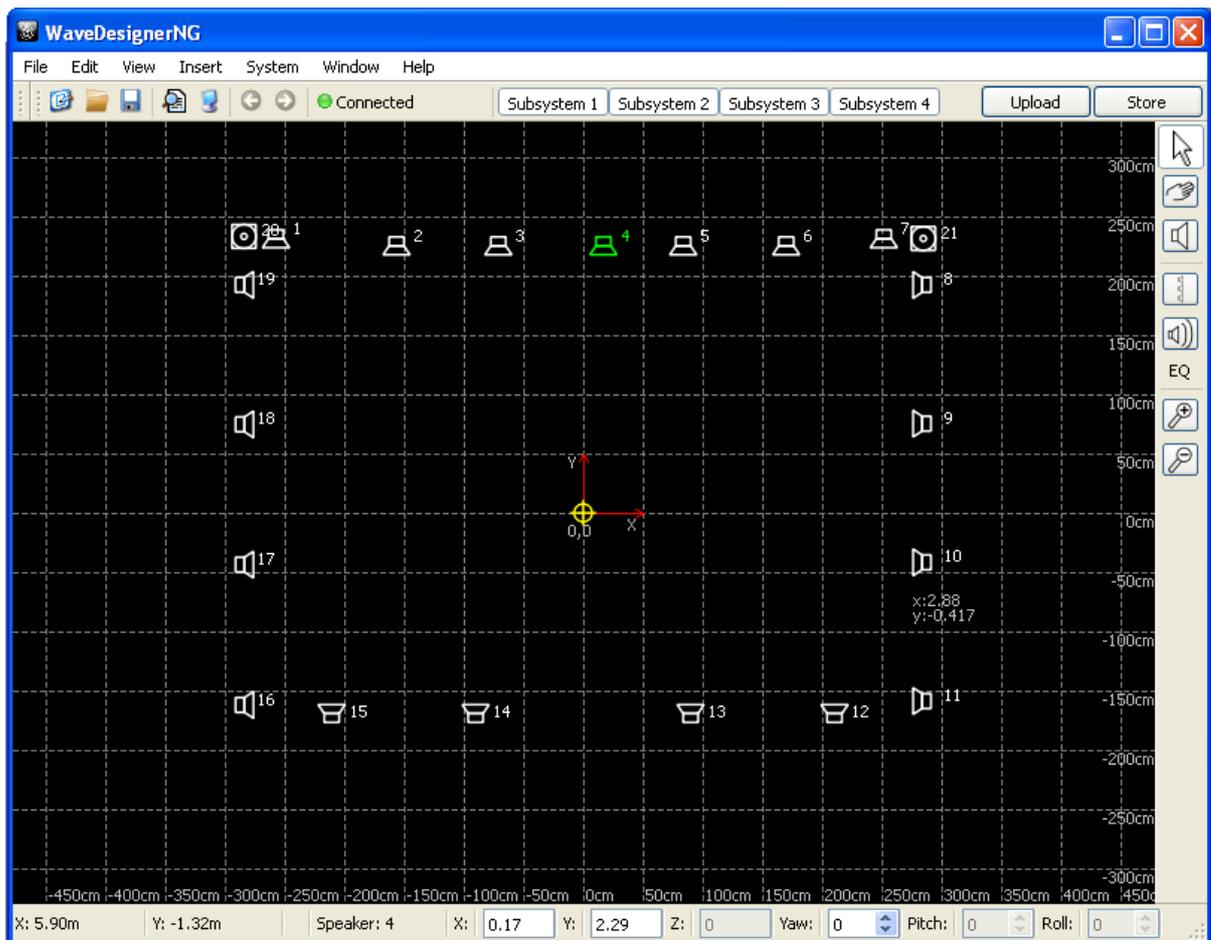


Figure 1.11

### *Loudspeaker placement area:*

In the main workspace of WaveDesigner, the speakers can be freely placed and moved around by drag & drop. The fixed zero point of the drawing area is displayed with red arrows for the X and Y dimension. All speaker positions are displayed in relation to this zero point. To make loudspeaker placement more convenient, a grid is plotted on the workspace to show the actual dimensions of the displayed area. The grid scales automatically on zooming and can be disabled in the view menu (page 24).

*Loudspeakers icons:*

 The loudspeakers are represented as figurative icons that will always remain the same size, independent of the zooming factor. If a speaker is selected, it appears in green color, otherwise it appears in white.

 Subwoofers are displayed with a different icon. Each speaker in the setup is displayed with its given index at the right top. This behavior can be disabled in the view menu.

If the mouse pointer is moved over a speaker, the current position is displayed as a hover effect.

New loudspeakers can be added to the grid either through mouse click on the desired position (if in speaker add mode), with the loudspeaker array dialog or through the insert menu.



Right clicking on the speaker icon opens a dialog to choose Delete Speaker, Speaker Management (page 32), and Equalizer (page 34).

Figure 1.12

*Reference Point:*

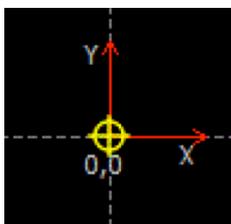


Figure 1.13

An important element of the loudspeaker setup is the Reference Point. When the loudspeaker positions are transmitted to the Wave I processor to create the corresponding filters (upload), all speaker positions are translated into a coordinate system according this Reference Point. Therefore, the Reference Point should be located

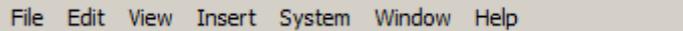
within your loudspeaker setup. The Reference Point is also the origin point for placing virtual sound sources when filter generation is completed (see also WavePerformer, page 38).

The Reference Point is displayed as a yellow crosshair. Its default position is the zero point of the drawing coordinate system for when WaveDesigner is started. The Reference Point can be moved freely with drag & drop or set automatically to a position within the setup. In the Edit menu, there is the option "Reference Point" to reset it to the zero origin or to calculate an optimal position.

**Warning:** For the system to optimally operate, the reference point must be located inside the listening area and all speakers of WFSmain rendering type must face the reference point. If not, the rendering will fail.

## Control Elements

### Menu Bar



File Edit View Insert System Window Help

Figure 1.14

As found in other common PC applications, the WaveDesigner includes a menu bar on top of the program window. Most menu options are accessible through keyboard shortcuts; these are displayed beside the menu entries. Following options are present in the WaveDesigner menu bar:

#### *File Menu:*

On the file menu, you can start a new project (*New*), open a saved project (*Open*) and save the current setup (*Save As*). In the project file, all speaker related information is stored: The position data, output setting, EQ settings and subsystem settings.

The Import option allows reading back an existing loudspeaker configuration from a connected Sonic Wave I Processor (*from Processor*) or import a loudspeaker definition file in the old format from config tool version 1. (*From File*). Please note that in the old txt-file (typically *lsdefinition.txt*) no EQ settings are stored. It is only provided for backward compatibility to the config tool version 1.

Project Files in xml format from WaveDesigner version 2 can be loaded through the file open dialog. However, only position data and EQ parameters from V2 are imported (5 band EQ, no shelving filters, no subsystem or output splitting).

*Print preview* and *Print* give the possibility to preview and print a loudspeaker setup. *Quit* closes the application. However, a dialog always appears first, asking if you want to save the current status beforehand.

#### *Edit Menu:*

WaveDesigner has full undo and redo capabilities, both are accessible in the Edit Menu.

The *Reference Point* option allows to reset the Reference Point to the zero point of the loudspeaker area or to automatically compute a position within the given speaker setup.

*Sort Speakers* opens a dialog that gives the possibility to sort the loudspeakers by automatically reassigning loudspeaker indices. The sort algorithm can be applied clockwise or counter clockwise and the first speaker can be defined. All speakers are given indices in ascending order starting from the position of speaker 1. The algorithm first calculates the angle of each loudspeaker according to the reference point and reassigns loudspeaker indices according to the specified options.

#### *View Menu:*

*Display Grid* turns on and off the grid on the workspace. If enabled, there is a checkmark besides the menu entry.

*Display Index* toggles on and off the display of the Index besides the loudspeaker icons.

*Show Toolbar* allows to show / remove the right toolbar to gain more space for the loudspeaker placement area.

#### *Insert Menu:*

*Add Speaker* opens a dialog to add one speaker to the workspace and set all parameters at once. The loudspeaker will be added at the specified position after hitting the OK button.

*Add Array* opens a dialog to add an array of speakers to the workspace. The array can be shaped as a line or in a circular shape. To add an array, the number of speakers, length, center point and orientation of the line or radius, start and end angle of a circular array have to be specified. On OK, the array will be added to the grid. All positions are meant relative to the 0,0 point.

#### *Processor:*

In the processor menu, you can shutdown the Sonic Wave I processor if connected, and collect system info.

You can also *Store default values*: Settings such as equalizer, gains, delays etc. are made real-time meaning as soon as any parameter is modified, this is audible. Select *Store as default* in the System menu or click the Store button in the upper toolbar to write the settings to the Sonic Wave I processors internal memory. Storing these parameters does not require a restart of the Processor. If the Sonic Wave I processor is shut down without storing, all settings you have done in this session will be lost. In any case, if you choose to shut the Processor down or close the WaveDesigner software, then a dialog will appear asking you if you want to store to the Processor or also save to the project file on your computer.

#### *Window:*

Open the dialog windows for Subsystem Control (page 33), Equalizer (page 34) and Speaker Management (page 37) and Output Assignment (page 38)

#### *Help Menu:*

The help menu shows the *about* box that tells you the current software version.

## Upper Tool Bar



Figure 1.15

The upper toolbar of WaveDesigner gives quick access to some of the functionalities that are also present in the menu bar. These are New, Open, Save, Print preview, Print, Undo and Redo.

Following this step is an Indicator showing if WaveDesigner is connected to a Wave I processor. If connected, the dot is green, if not, red. The display changes automatically if you connect or disconnect the network connection to the Processor.

The four Subsystem tabs enables you to view/hide the speakers of the associated subsystem.

### *Upload:*

On the right hand side of the upper tool bar is the Upload button. This is a very important element of WaveDesigner. Pressing the upload button sends the defined loudspeaker setup (positions, speaker properties, output assignment) to the Sonic Wave I processor which then calculates the renderings. After uploading, the processor is restarting automatically and online parameters that may have been loaded from a previous project are transferred to the processor (speaker management, eq's, delays, etc.).

Changing the speaker positions cannot be calculated real time! For each change, the processor is restarting after parameter calculation. The process and success of creating the filters is reported by a dialog.

Before the definition file is uploaded, several checks are done to prevent unexpected behavior. If one of the following conditions fails, an error message is displayed:

- Connection: There has to be a network connection to the processor.
- Number of speakers: At least 2 speakers have to be present to enable 3D sound rendering. There is also a maximum number of speakers that can be used with a Sonic Wave I processor corresponding to its number of output channels (mostly 24 or 32).
- All WFS main speakers have to be faced towards the Reference Point.
- A Subsystem can only include either WFSmain or WFSsupport speakers.
- Each index number can only be present once in the loudspeaker setup.
- A physical output can only be used once.

*Store:*

This button has the same function as *Store default values* in the Processor Menu in the Menu bar: Settings like equalizer, gains, delays etc. are made real-time meaning as soon as any parameter is modified, this is audible. Select *Store as default* in the Processor menu or click the Store button in the upper toolbar to write the settings to the Sonic Wave I processors internal memory. Storing these parameters does not require a restart of the processor. If the Sonic Wave I processor is shut down without storing, all settings you have done in this session will be lost. In any case, if you choose to shut the Processor down or close the WaveDesigner software a dialog will appear asking you if you want to store to the Processor or also store to the project file on your computer.

Right Tool Bar

On top of the right-hand tool bar, there are three buttons to toggle the different operation modes of WaveDesigner.

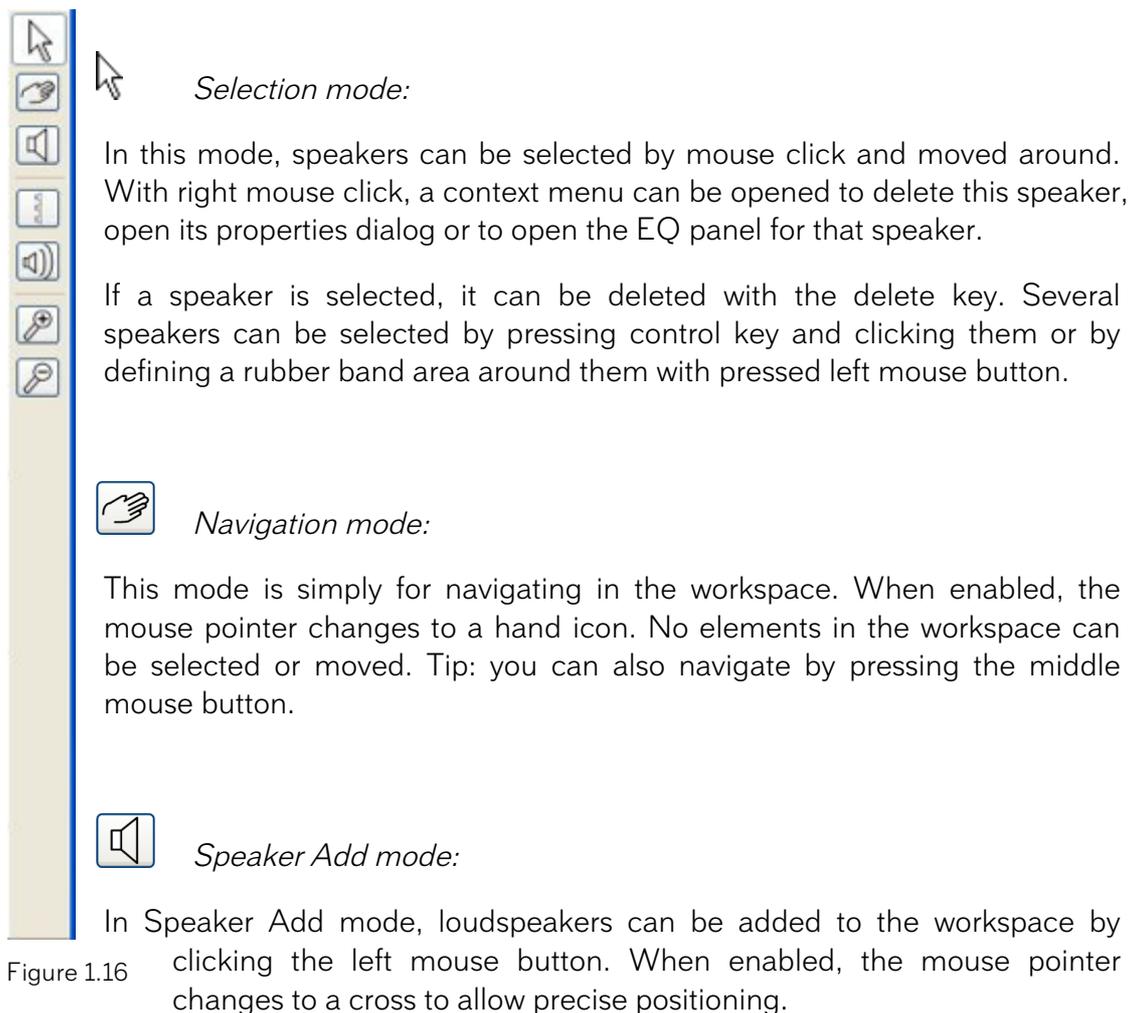


Figure 1.16



*Add Speaker Array* and *Test tool*. These tools are described on page 28 and 30.



*Zoom:*

On the lower side, there are buttons for zooming in and zooming out the workspace.

**Tip:** you can zoom in and out with a mouse wheel.

Add Array Dialog

#### *Linear Array:*

With the Linear Array option, the speakers are aligned in a straight line. The number of speakers, the overall length of the line and the coordinates of its center point can be defined. Orientation sets the orientation of the loudspeaker array.

In a loudspeaker setup where speakers are mounted to the walls of a room with even distance, the Array Dialog gives an easy way to define the setup for the Sonic Wave I processor.

All values are referenced to the 0,0 point.

#### *Circular Array:*

The Circular Array option gives the possibility to add multiple speakers in a circular alignment. There are controls to set the number of speakers, the radius of the circle, center point coordinates and start and end angle of a section.

In this way, loudspeakers can be automatically aligned either as full circle or only as an arbitrary portion defined through start and end angle.

All values are referenced to the 0,0 point. Angle 0 is given towards the Y positive axis in counter clockwise order.

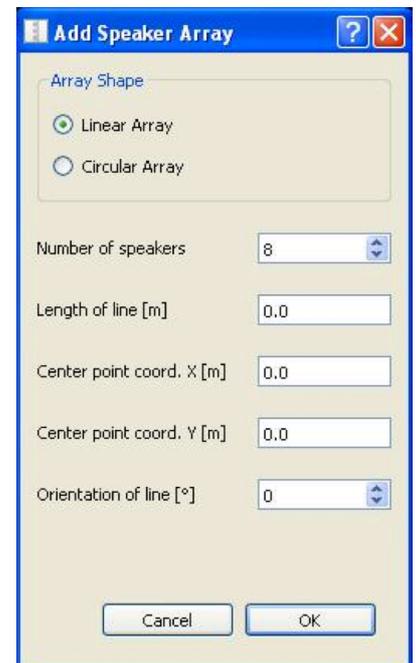


Figure 1.17

## Status Bar



Figure 1.18

The Status Bar underneath the main loudspeaker placement area shows some useful information about the position grid. On the left side, the current mouse position is displayed as X and Y coordinates in meters. When a speaker is selected by clicking, the properties of that speaker are displayed on the right side (Index, X, Y, Z, Yaw, Pitch, Roll).

The X, Y and Yaw parameters can directly be edited in the status bar by entering new values or hitting the arrows for the Yaw spin box. If multiple speakers are selected, the difference of old and new value is applied as an offset to all selected speakers.

The Z, Pitch and Roll options are disabled. They will be enabled in future versions of the software.

## Output Assignment

This window can be opened in the menu bar: Window - Output Assignment. Each speaker in the setup has certain settings as already seen in the Speaker Management. Additionally in this window, the speakers can be distributed into Systems, Subsystems, Rendering type (these are explained on page 16), and for the active crossover the output channel can be selected. Seen in Figure 1.19

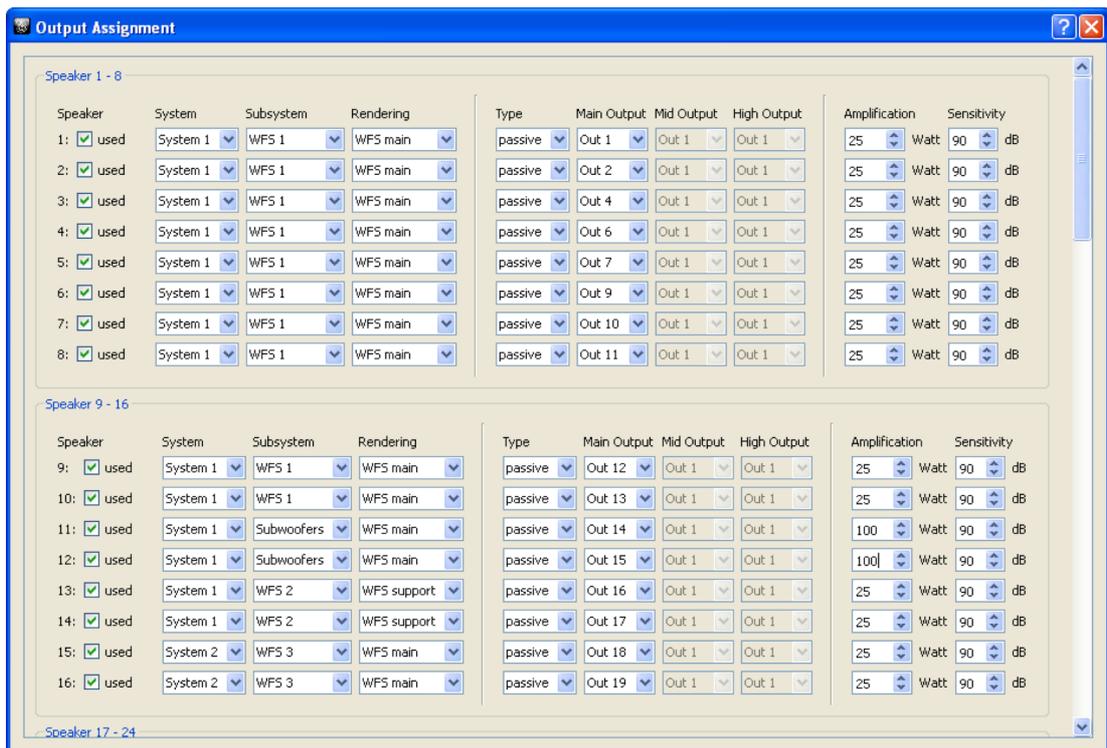


Figure 1.19

## Speaker

The speakers are numbered; these numbers correspond to the Index number shown on the main window. The checkbox turns the speaker on or off, removing or adding it to the configuration for filter calculation.

## System / Subsystem / Rendering

Each speaker belongs to a System, Subsystem and has a certain rendering type. These settings are explained on page 16.

In case of multi-amplified speakers, the settings can be as follows: You can select “two way” or “three way” if the connected speaker is active. The following pull-down

menus select the physical outputs to use. Additional settings like crossover frequencies, level, delay, limiter, polarity etc. are accounted for in the Speaker Management window (page 33).

Eventually the amplifier power and sensitivity is set. This is important so that the Sonic Wave I processor can deliver the same output level to the speakers, as well as when different kind of speakers are connected.

## Upload configuration

Pressing the “Upload” button transfers the configuration to the processor. The processor then calculates the renderings and gets configured according to the defined configuration. Once the filter calculation is done, loudspeaker positions and all parameters for the output assignment window should not be modified unless uploading again the configuration.

## Test Tool

The test tool provides a line-check to test the cabling of the Wave I processor to the loudspeakers. It can be opened through the symbol button in the right tool bar.

When starting the General Test, the Sonic Wave I processor automatically iterates through all configured outputs assigned in WaveDesigner. It connects the chosen input to all speakers starting from the first one and plays the given input signal for a few seconds on each speaker. The current active speaker changes its color to blue in the workspace. If Individual Test is enabled, only the selected loudspeakers in the workspace are used for the loudspeaker test. The volume of can be changed during test with the slider.

*Cancel* stops the running test and sets the Sonic Wave I processor back into normal operation mode with the current filter set and routing.

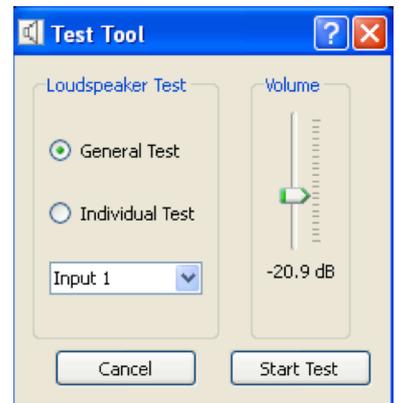


Figure 1.20

## Subsystem Control

From the Window tab in the Menu bar the Subsystem Control is opened. Here the Subsystems can be labeled. All speakers belonging to a Subsystem can be adjusted in gain and delay. These parameters are added to parameters done individually to the speakers in that Subsystem. They allow for adjusting subsystems among each other.

The usage of Subsystem is explained on page 16.

Speakers are added to Subsystems in the Output Assignment window explained on page 38.



Figure 1.21

## Equalizer

Each output or speaker has its dedicated parametric equalizer. When in Selection Mode (page 27), Equalizer dialog can be opened via the context menu by right clicking the speaker. This window can also be opened in the menu bar: Window - Equalizer or through the button in the toolbar labeled “EQ”.

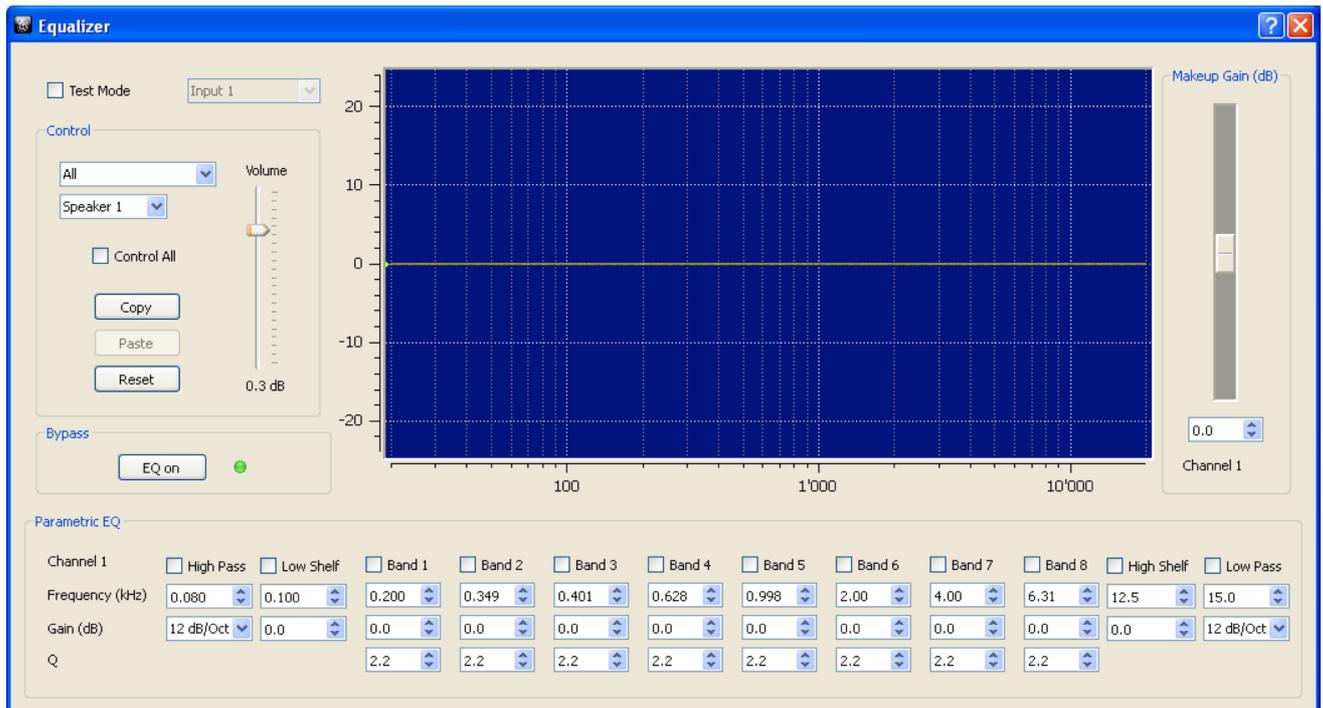


Figure 1.22

The main area of the EQ panel shows a plot of the frequency response for the selected speaker.

On the left side is a control box for general options:

### *Speaker Selection:*

This section has two dropdown boxes for selecting the speakers.

The first dropdown box allows selecting a specific subsystem or all subsystems at once.

The second dropdown box provides a limited list of speakers identified by their index. This list corresponds to the selected subsystem or all speakers if “all” is selected in the first dropdown box. Selecting a speaker retrieves the corresponding EQ controls from the Sonic Wave I processor or the local status if a Sonic Wave I is not connected. The user can then modify these settings interactively.

#### *Control All:*

If the checkbox is enabled, the current EQ settings are sent to either all speakers of the selected subsystem or all speakers of the setup depending on the settings of the first dropdown menu. A warning popup window appears and allows cancelling the action. All following changes are also applied to the selected speaker list. The speaker index or the selected subsystem is also indicated in the upper left corner of the Parametric EQ panel giving feedback to the user on what is currently controlled. The makeup gain remains individual to each speaker and is not affected by the control all setting.

#### *Test Mode:*

If this checkbox is enabled, the signal of the selected input is directly routed to the speaker selected in the control area. This way each speaker can be listened to and equalized separately. The input can be selected with the corresponding dropdown menu.

#### *Volume:*

This slider controls the master volume of the Sonic Wave I processor. This controller corresponds to the volume control on the WavePerformer Main Window.

#### *Copy/Paste:*

The copy button takes a snapshot of the current EQ settings. It enables the user to switch to another speaker and apply these settings with the Paste button.

#### *Reset:*

Reset flattens the EQ curve of the current speaker or the selected list of speakers when Control All is active.

#### *Bypass:*

The Bypass button switches on or off the EQ on the Sonic Wave I processor. The current state is indicated through a green or red LED.

The Sonic Wave I processor offers equalizers with 8 fully parametric bell filters, high and low shelving filters and a high pass and low pass filter. All EQ related controls are grouped together in the Parametric EQ box.

#### *High Pass / Low Pass*

The High pass and Low pass filters can be switched on with the checkbox. The frequency spin box controls the frequency where the filter is applied. The slope adjusted in steps in a dropdown menu.

#### *Makeup Gain:*

On the right side of the response plot, there is a slider for a general makeup gain. This control always operates on one speaker only. The corresponding speaker index is indicated on the lower part of the panel. Its main use is for level adjustment when dissimilar loudspeakers are used in the setup or exhibit slightly different levels after EQ.

## Speaker Management

When in Selection Mode (page 27), a Speaker Management dialog can be opened via the context menu by right clicking the speaker. This window can also be opened in the menu bar: Window - Speaker Management.



Here you can define your speaker as being treated as a passive speaker using its own processing or you can create an own crossover to feed a multi-way speaker directly from the Sonic Wave I Processor. Also you can adjust output gain for each way, invert phase (polarity) and use a limiter.

### *Subsystem:*

With a subsystem chosen here, the speaker selection in the next drop box is filtered to the members of the selected subsystem. Select *all* to make all speakers viewable.

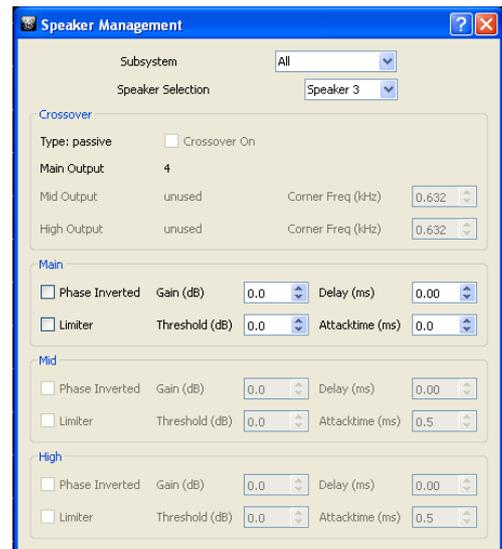


Figure 1.23

### *Speaker Selection:*

This dropdown box has entries for all speakers in the setup identified by their index. If a speaker is selected, the corresponding output setting controls are read from the Sonic Wave I Processor and can be modified by the user interactively.

### *Crossover:*

You have the choice of using a full range (passive) speaker or 2 to 3 way speaker systems using dedicated outputs of the Sonic Wave I processor. Select type of speaker, turn on the crossover with the checkbox and enter the corner frequencies of each way. This parameter is directly taken into account if a Sonic Wave I processor is connected.

### *Low / Mid / High:*

Every crossover output has their own gain, can invert phase (polarity) and has an own peak limiter. Amplifier power and sensitivity, and physical output each way are selected in the Output Assignment window (page 38).

## 8. Control the Sonic Wave I Processor with WavePerformer

WavePerformer is an application, which provides an easy and intuitive way to interactively control the sound field while using the Sonic Wave I processor. Once you have created and uploaded filters for your loudspeaker-setup in the WaveDesigner (page 16), you can define the position of virtual sound sources while playing them back on your setup. The Source Positioning window shows a positioning area where all or selected sound sources are displayed. Each sound source represents one input channel. Sound source 1 corresponds to the first physical input channel, sound source 2 to the second one, etc.

The system reproduces the current sound position in real-time. Depending on the distance from the listening area, the sound wave characteristics change. Sound sources that are close to the listening area are played back at its focused position. With increasing distance from the reference point, the sound wave becomes more plane and is heard from the same direction (angle) in the entire room, allowing a sweet spot free playback of surround sound. In addition, if distance attenuation (page 43) is selected, the volume is decreasing with increasing distance from the reference point.

The WavePerformer also allows basic diagnostic tools for the Sonic Wave I processor (running, momentary input level, IP address, HD status, sync setting). In the Level Tab the levels for all 24 input channels can be set and also be muted.

The current positions and levels for all sources can be stored as a static pre-set which can be recalled through the WavePerformer or also on the display of the processor itself.

### Using the Value Boxes



Figure 1.24

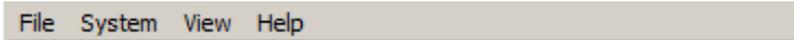
Many parameters are configured in value boxes. These provide the possibility to type in values directly, to step up or down with the spin arrows, or by the mouse wheel when the mouse pointer is on the corresponding value box and they also behave like a slider. If pressed with left mouse button on the arrows and mouse moved up or down, the value increases or decreases dependent on the deflection of the

mouse. Each band can be enabled with the checkbox above its parameters.

**Note: The WavePerformer can only be used when the speakers connected to the Sonic Wave I processor have been setup using the WaveDesigner software.**

## Control Elements

Menu bar



File System View Help

Figure 1.25

### *File Menu:*

The file Menu gives you the possibility to load and save presets from the preset list and manually Import a layout from the processor or from a file. Furthermore, here you can quit the WavePerformer application.

### *Processor:*

In the processor menu, with Save Default Preset you can save the currently open layout as the default preset. This is then the state the Sonic Wave I processor will be in when it is powered up.

Shutdown will turn of the Sonic Wave I processor.

### *View:*

Display Grid turns on and off the grid on the workspace. If enabled, there is a checkmark besides the menu entry. Display Index toggles on and off the display of the Index besides the loudspeaker. Clip Distance selects the behavior after the maximum distance (page 30). Show Toolbar allows to remove the right toolbar to gain more space for the loudspeaker placement area.

### *Help Menu:*

The help menu show the about box that tells you about the software version.

## Upper Tool Bar

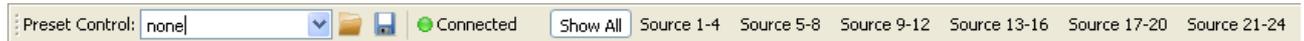


Figure 1.26

### *Preset Control:*

The Preset Control allows saving and loading different source setups. The data included into a preset are: Source positioning, input levels, activation of distance attenuator and equalizer settings. Not included are sync settings. If you want a certain preset to be the default preset of the Sonic Wave I processor, there is an option in the file menu system->save default preset. After booting up the WaveProcessor, it will be set to this state.

To save a static sound source set up, place the sound sources to the desired positions and control the levels, edit the name of the preset in the top left menu and then click on the save button. The preset will now be available on the Sonic Wave I processor and can be selected with its name in the preset menu on the display.

### *Source Groups:*

Right above the main source are 6 toggle buttons to control which sources should be displayed on the panel. You can select which groups are shown (sources 1-4, 5-8, 9-12, 13-16, 17-20, 21-24) or select all sources.



### Left Tabs

With the tabs on the right side of the window, you can choose between the Source Positioning panel, the Input selection panel, the Routing panel, the EQ panel and the Sync panel. These panels are described further down (page 42).

Figure 1.27

## Right Tool Bar



### Zoom:

On the topside are buttons for zooming in and zooming out the workspace.

**Tip:** You can zoom in and out with a mouse wheel.

### Volume:

Here you can adjust the overall system volume. This controller corresponds to the volume control on the WaveDesigner Equalizer window.

Figure 1.28

### Mute:

Mutes all outputs.

## Status Bar

The Status Bar underneath the main area shows some useful information about the position grid. On the left side, the current mouse position is displayed as X and Y coordinates in meters. When source is selected by clicking, the properties of that source are displayed on the right side (Index, X, Y, Z, Angle, Distance).



Figure 1.29

The X, Y, angle and distance parameters can directly be edited in the status bar by entering new values. If multiple sources are selected, the difference of old and new value is applied as an offset to all selected speakers in Cartesian (X, Y) coordinates. The Z option is disabled. It will be enabled in future versions of the software.

In Preset Status, you can see what preset is currently loaded.

## Source Positioning Panel

The main part of the workspace shows the Source Positioning. In its center is the loudspeaker setup that the Sonic Wave I processor is currently configured for. If you are connected to a processor, the loudspeaker setup and all source values are automatically downloaded from the system. You can also manually import the speaker setup in the Menu with “File->Import from system” or from a locally stored ldefinition.txt through the “File->Import from file” option.

Sources can be grabbed with a mouse click and dragged around. The current position values of the selected source are also displayed in the status bar underneath the source area.

A specific source can also be quickly selected via keyboard short cut “ctrl+1” - “ctrl+0” for sources 1-10 and “alt+1” - “alt+6” for sources 11 - .20

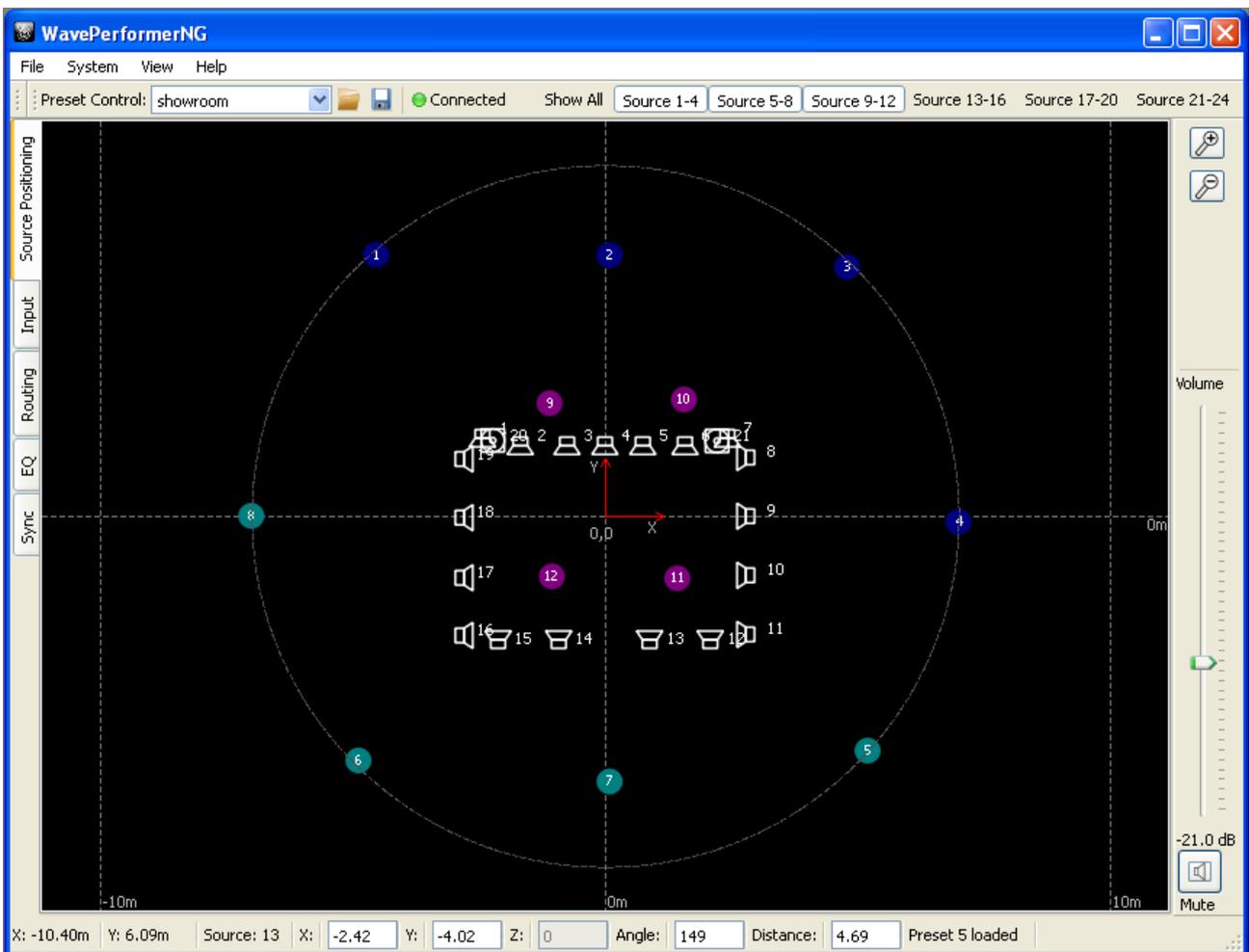


Figure 1.30

The inner dashed circle in the source placement area represents the distance at which the level attenuation starts (0 dB distance). If Distance Attenuation is enabled in the Level Panel, the level decreases when a source is moved further away and gives a natural feeling of increasing distance.

If the mouse pointer is moved over a virtual source, its current angle and distance position is displayed with a hover effect.



Figure 1.31

#### *Maximum Source Distance:*

The ring within the source placement area visualizes the maximum distance from the center of which sources can be placed. If sources are moved outside this ring, they are clipped. The maximum distance is depending on the loudspeaker setup and corresponds to the maximum source distance in the current filter set on a connected Processor. Above this distance, virtual source rendering is kept constant except for distance relative volume attenuation. The clipping at setup dependent distance can be disabled in the view menu (page 24), so sources can be moved within the full range of distance up to 200 m.

#### *Multiple Select:*

It is possible to select several sources at the same time and move them as a group, so they will keep their relative positions to each other. To select multiple sources, draw a rectangle with a mouse around the sources to group, select them manually with pressing ctrl-key while clicking them or use the keyboard shortcuts for group selection (ctrl-key + number or alt-key + number, see above).



Figure 1.32

If multiple sources are selected, they appear with a cyan circle around them. The master source for moving is marked with a red circle; also the values in the status bar correspond to this master source. The master is simply selected by clicking on one of the selected sources. The group can thus be moved by keeping left clicked source down and move the mouse pointer into the workspace.

#### Input Panel

The input panel gives you direct access to the level control and source of all 24 input channels. There is a horizontal scroll bar on the lower end of the panel to access all

channels. Level can be controlled through sliders with a dB display and also be muted directly with a checkbox.

These settings can be saved in a preset using the Preset Control toolbar. To save all settings for the default state after a system boot, go to File menu->System->Save

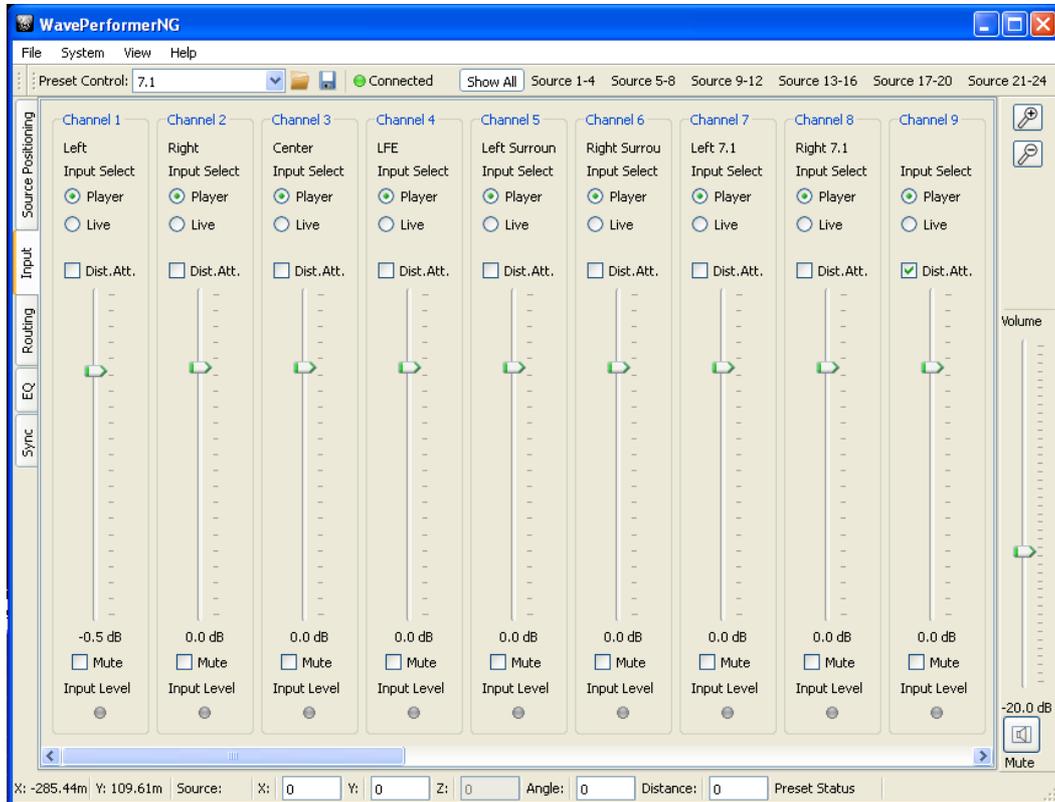


Figure 1.33

Default Preset.

*Peak LED:*

The peak LEDs give basic feedback of the current input level. If no or very low input signal is present, the led turns grey, if input is ok it turns green and by clipping it, it turns red. This way you can verify if you have connected the right input or if the internal HD playback works.

*Input select:*

If you have the HD option installed, you can select the input method of each channel. The input channels can be used either with the internal playback engine with the Coolux Media Manager or as live input from the physical input of the wave Processor. To change the input, simply mark the player live from the selection box.

*Distance Attenuation:*

The distance attenuation button above each fader enables the level drop function. When distance attenuation is selected the level of the sound source drops with increasing distance of the source from the listening area and enables realistic perception of the distance of the sound source.

## Routing Panel

The routing panel provides high level routing possibilities for all input sources separately. The routing panel provides a gain and delay control for each input/source to each subsystem. It also allows for control the rendering of each subsystem, choosing between automatic rendering using WFS or direct out to a given speaker of the subsystem. All these settings are stored in presets and can dynamically be recalled. They do not modify any subsystem adjustment performed in the WaveDesigner, they simply add to it.

Basic use of this panel enables to assign inputs to individual subsystems, modify the balance between subsystem assignments for a given source, delay subsystems among each other for a given input, etc.

If required, an input source can be routed directly to one dedicated output/speaker per subsystem. For each directly routed path, the gain and delay can be adjusted.

Inputs are displayed by group of 8 for better readability. They can also be labeled in this panel.

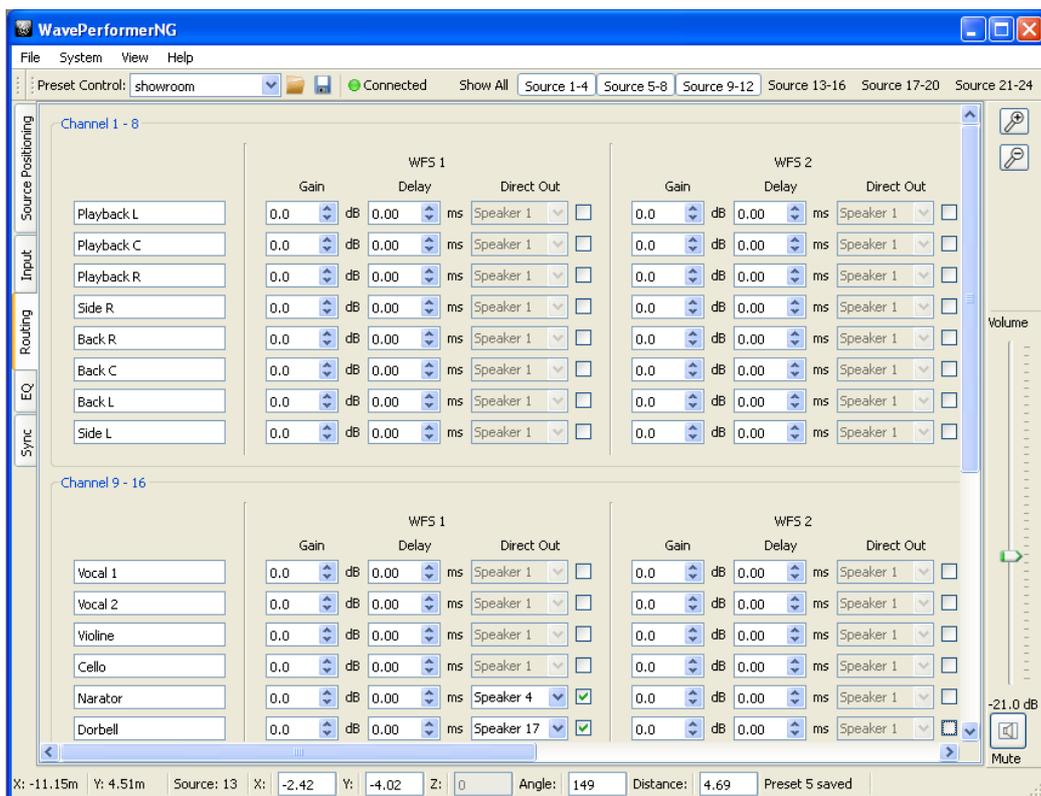


Figure 1.34

## EQ Panel

Each input has an own parametric equalizer. The main area of the EQ panel shows a plot of the frequency response for the selected speaker. This input EQ is recorded in presets. All inputs can be controlled at once. This functionality enables to provide the system with a global sound color, to the taste of the visiting sound engineer without modifying the installation/output EQ of the setup.

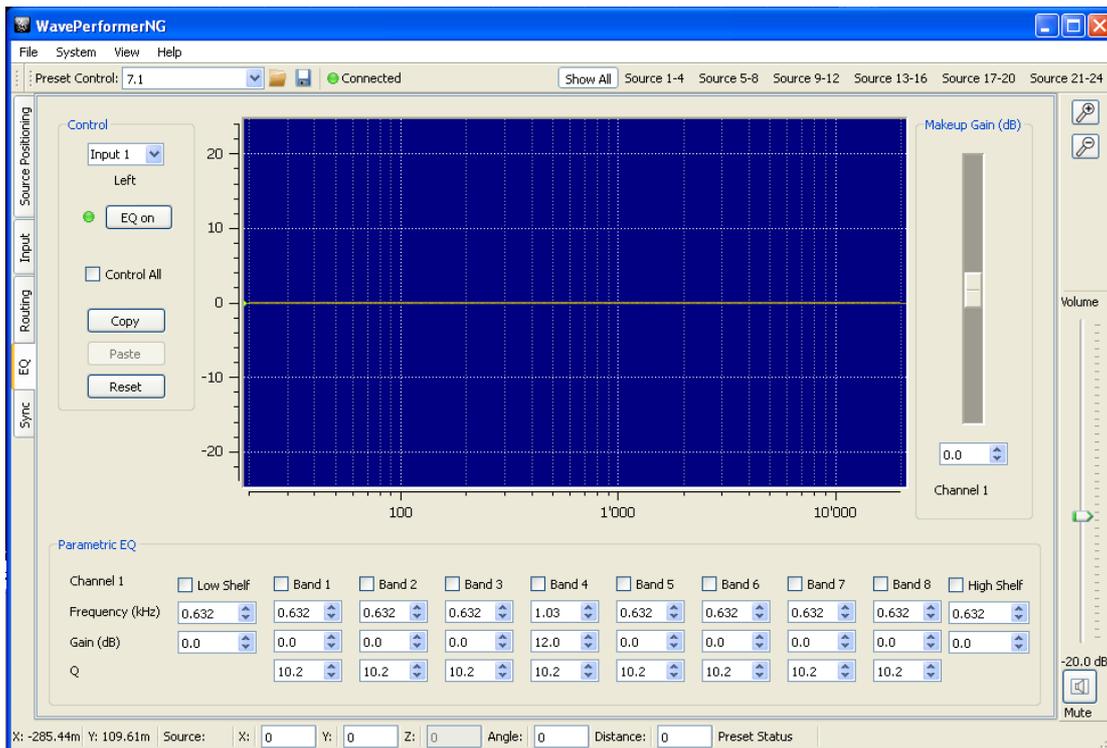


Figure 1.35

The main area of the EQ panel shows a plot of the frequency response for the selected input.

On the left side, the control box is for general options:

### *Speaker Selection:*

This dropdown box has entries for all inputs in the setup identified by their index. If a different input is selected, the corresponding EQ controls are read from the Sonic Wave I processor and can be modified by the user interactively.

### *Control All:*

If the checkbox is enabled, the current EQ setting is sent to all inputs and all following changes are also applied to all inputs in the setup.

### *Copy/Paste:*

The copy button takes a snapshot of the current EQ settings. It enables the user to switch to another speaker and apply these settings with the Paste button.

### *Reset:*

Reset flattens the EQ curve of the current speaker or of all the speakers should the Control All be active.

### *On:*

The On button switches on or off the EQ on the Sonic Wave I processor. The current state is indicated through a green or red LED.

The Sonic Wave I processor offers an equalizer with 8 fully parametric bell filters and a high and low shelving filter. All EQ related controls are grouped together in the Parametric EQ box.

### *Makeup Gain:*

On the right side of the response plot, there is a slider for a general makeup gain. The slider boosts the input for the chosen input or for all inputs, should Control All be enabled.

### Sync Panel

The Sync Panel allows remote access to the sync options of the digital audio interface of a Sonic Wave I processor. Dependent on interface option, the panel shows different controls for ADAT or MADI.

Whenever a change is made in the configuration, the new settings are stored so the Sonic Wave I processor remains in this state after restart.

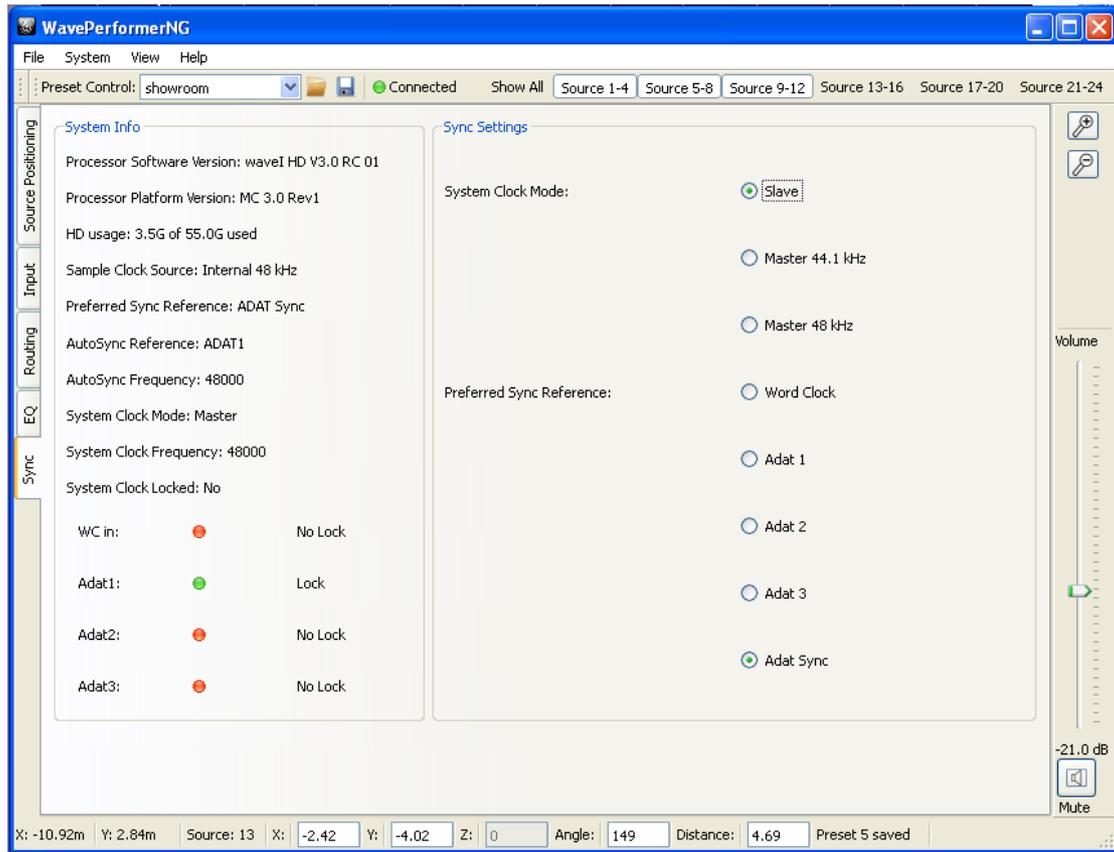


Figure 1.36

### ADAT:

If a Sonic Wave I processor with ADAT interface is connected, the panel display the current status on the left hand side. The used clock source and its sampling frequency are shown as well as the current status for each input.

On the right hand side, the controls are to switch the different Sync modes of the Wave I processor. It either can be operated as Master with 44.1 kHz or 48 kHz or as Slave which syncs to a given input signal. The preferred input source can be selected from Word Clock, ADAT Sync (automatically takes a valid signal from one of the ADAT inputs) or one of the ADAT inputs. If set to Slave and no valid input signal is given, the Wave I processor automatically falls back to Master 48 kHz mode. In all settings, the current sync signal can be distributed through the Word Clock output.

### *MADI:*

For MADI, the sync panel provides according options to choose the clock input source from MADI or Word Clock In.

In addition to the sync options, the panel provides access to the MADI settings of the Wave I processor. The Input/Output option can be chosen from coaxial and optical and the interface can be set to 64 channel TX mode. The 64 channel mode only can be enabled if the connected device is configured accordingly and is capable of automatically switch between 56 and 64 mode; otherwise the Wave 1 takes the setting of the connected device (PC or converter).

### Warning:

- The slave mode with MADI input can only be activated if a proper MADI input (Coaxial or Optical) is selected (i.e. there is a sensible signal at the input of the Wave I processor).
- If intermediate sound is heard, there is a problem of sync (not same for input and output streams). This is an indication that the input device and the Wave I processor are both set as Master.
- If distorted sound is heard, there is a problem between master frequency of the Wave 1 processor and the input signal clock frequency. This can also occur in MADI with inconsistent settings of the 64-channel TX mode.
- When set to slave, if preferred sync is not available (e.g. no word clock connected and set to word clock), the system automatically switches to available sync (i.e. MADI input).

## 9. HD Option

### Media Manager Configuration

After installing the Media Manager software on your computer, install the wave extension for media manager. The installer process asks you for the location of the media manager installation directory where the extension has to be installed.

To create a new project (File -> New Project), as shown below create a new sequence by right clicking on the “Sequences” icon in the project window.

Assign a sonic emotion folder in the new project: Drag and drop the sonic emotion folder from the device type window into the new project. This is also the place where the audio will be stored later. Copy “sonic emotion audio.clb” into the devices window.

Double click on “[1] sonic emotion audio” to see all audio layers - each layer is able to play audio independently.

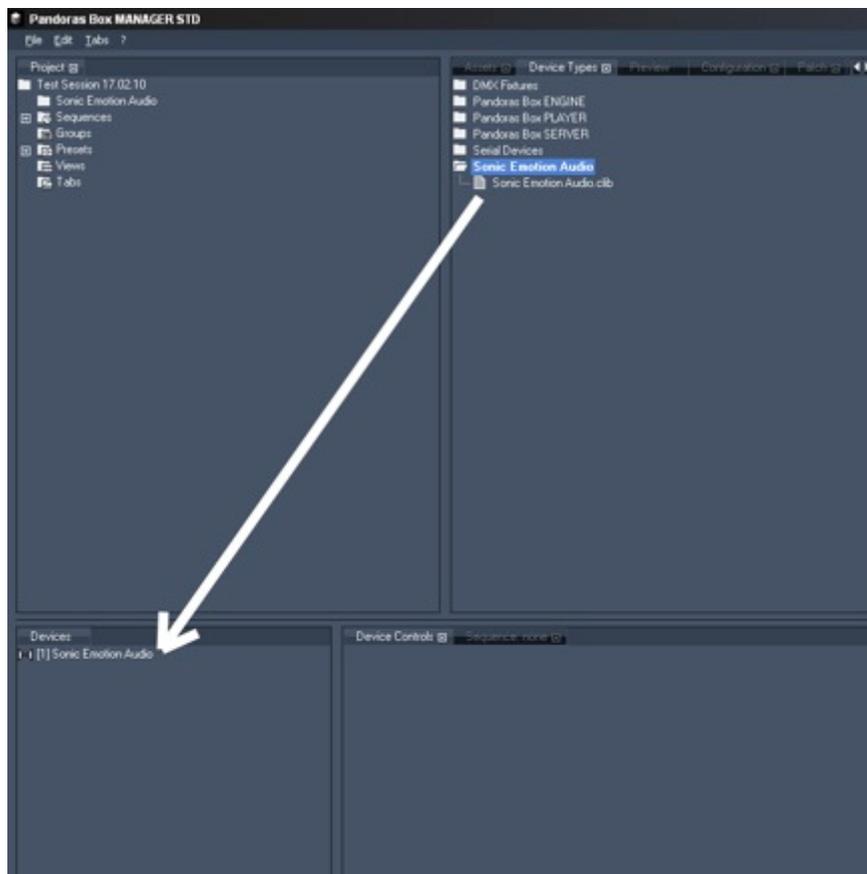


Figure 1.37

Click on the + (maximize) next to a specific layer to view all available layer settings. All layer parameters can be viewed in the right window at the same time.

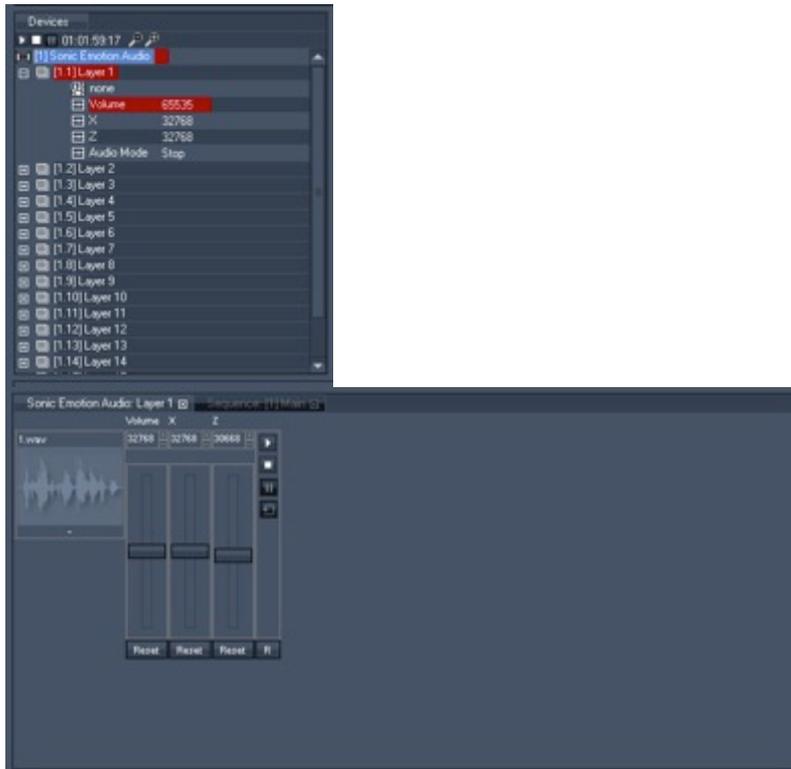


Figure 1.38

Drag audio files from the sonic emotion folder directly to the timeline. The icon under the layer with no title will become the name of the audio you selected.

Note: The Media Manager works only with 48 kHz, 16/24 Bit mono .wav audio files.

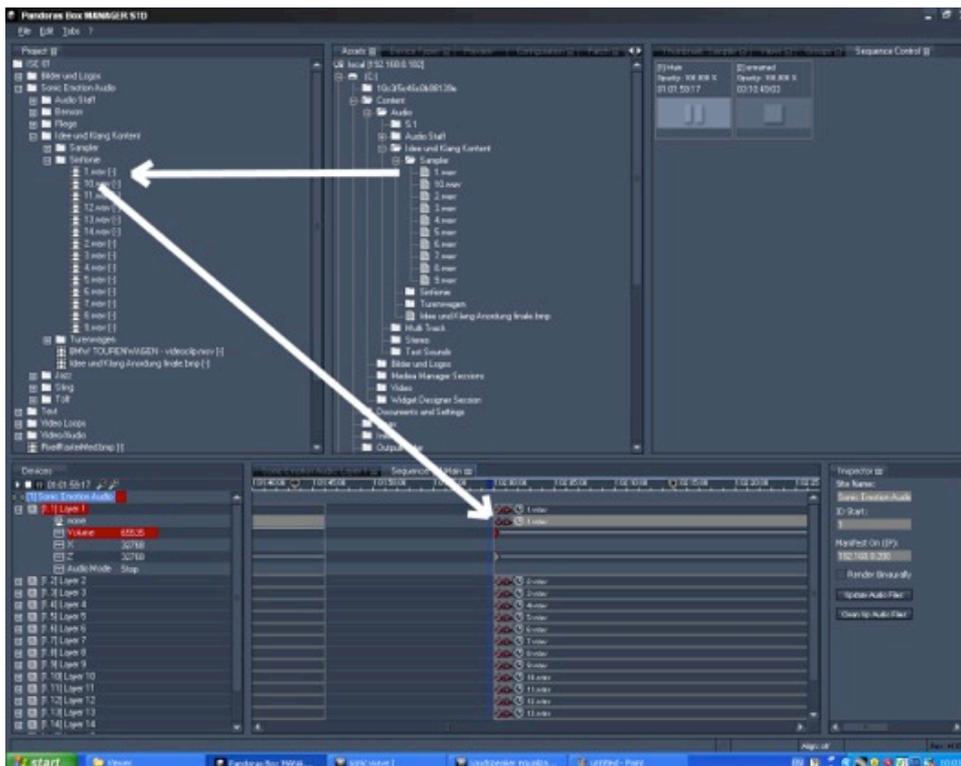


Figure 1.39

## Upload Audio Files

After arranging the project, save all used audio local on the Wave I HD processor by clicking the “Update Audio Files” button: The audio will automatically spread through the network connection to the Wave I HD. The Wave I HD Processor display will show the progress of the file transfer.

To set the connection of the Media Manager to the Sonic Wave I HD processor, type in the IP address of the Sonic Wave I HD processor in the inspector window at “Manifest to IP”.

The system will now be ready to run the project and play out audio files.



Figure 1.40

**Note:** If there are any problems with updating the audio, then please delete all audio files from the drive by using the display menu on the Sonic Wave I HD processor.

**MAKE SURE THAT ALL COOLUX SOFTWARE IS  
TURNED OFF BEFORE DELETING THE AUDIO FILES!**

## 10. OSC Interface

The Sonic Wave I processor comes with an interface for the OSC protocol. Open Sound Control (OSC, <http://opensoundcontrol.org/>) is a content format for messaging among computers, sound synthesizers, and other multimedia devices that are optimized for modern networking technology.

OSC enables direct communication with the processor from standard applications like MaxMSP, the Widget Designer from Coolux (<http://www.coolux.de/products/widget-designer/>) or iPad interface frameworks like TouchOSC (<http://hexler.net/software/touchosc>) or Lemur (<http://liine.net/en/products/lemur/>).

This section gives a brief overview on controlling the Sonic Wave I processor with OSC.

### **OSC settings**

The communication port of the Wave I Processor is **2564**. The device sending the OSC commands must be in the same network and some OSC applications require specifying the target address. This would be the IP address the Wave I processor is configured to. The target port must be set to 2564.

The Sonic Wave I processor is only receiving OSC commands and not sending back information.

### **OSC messages**

Several OSC commands are available in the OSC interface of the Wave I. They are listed in different categories that are presented below.

#### Processor:

These messages are for global operations of the system (preset recall, level, ...).

`/SetMasterLevel int (Level 0-400)`

Master level change in linear scale (100 corresponds to 0 dB, 400 to 12 dB, 0 is mute)

e.g. `/SetMasterLevel 90`

`/SetMasterLevelDB float (Level in dB -40 ... +12)`

Master level change in logarithmic scale in dB

e.g. `/SetMasterLevel 3.0`

`/SetMasterMuteOn`

Mutes the whole audio output of the Sonic Wave I processor

`/SetMasterMuteOff`

Unmutes the whole audio output of the Sonic Wave I processor

/SetRecallPreset int (PresetNo 1-x)

Recall preset number. Warning: for stability reasons, presets cannot be recalled more often than every 5 seconds. All attempts to recall a preset in a shorter delay will be dropped.

e.g. /SetRecallPreset 1

/SetLevelByld int int (SrcIndex 1-24, Level 0-400)

Set Input level for the given source, linear scale (100 corresponds to 0 dB, 400 to 12 dB, 0 is mute)

e.g. /SetLevelByld 2 200

/SetSourceLevelDB/SrcId float (SourceIndex 1-24, Level in dB -40 ... +12)

Set Input level for given source, logarithmic scale in dB

e.g. /SetSourceLevelDB/9 -6.0

/SetSourceMuteOn/SrcId (SrcIndex 1-24)

Mutes the input of the given Source

e.g. /SetSourceMuteOn/1

/SetSourceMuteOff/SrcId (SrcIndex 1-24)

Unmutes the input of the given Source

e.g. /SetSourceMuteOff/1

/SetSourceDistanceAttenuationOn/SrcId (SrcIndex 1-24)

Activates the Distance Attenuation for the given Source, so the level drops with increasing distance.

e.g. /SetSourceDistanceAttenuationOn/21

/SetSourceDistanceAttenuationOff/SrcId (SrcIndex 1-24)

Deactivates the Distance Attenuation for the given Source

e.g. /SetSourceDistanceAttenuationOff/9

/SetSourceName/SrcId string (SrcIndex 1-24, source name as string)

Sets the Source name of the given source for display in WavePerformer

e.g. /SetSourceName/3 Trumpet

/SetSourcePosition int int int (SrcIndex 1-24, Angle 0-360, Distance 0-2000)

Set source position (angle in degrees/counterclockwise, distance in dm). This message uses a deprecated syntax; it is preferable to use the messages below.

e.g. /SetSourcePosition 2 122 235

### High level source position messages

The following messages are source position related but offer more elaborate interaction possibilities. Positions can be changed in either Cartesian (X, Y) or Polar (Angle, Distance) coordinates. Moreover, the X, Y, and distance parameters could either be described in "absolute" coordinates (in meters) or in "relative" coordinates that automatically scale to the installation dimensions. Relative coordinates can be manipulated between -1 and 1. For distance, 1 corresponds to the maximum distance as defined in the WavePerformer section; -1 corresponds to a position opposite to the reference point (same distance as relative distance 1 but with 180

degrees added). Similarly, absolute negative distances correspond to opposite positions with a positive distance (i.e. adding 180 degrees to source angle).

The relative coordinates enable to manipulate sources in a meaningful way that properly scales to the installation size. It should be preferred for remote interfaces for best use of screen space and use of full parameter range.

Source “absolute” messages:

/SetSourceCartesianAbsXY/SrcId float float (SrcIndex 1-24, X m, Y m)

Set source position in Cartesian coordinates (X, Y)

e.g. /SetSourceCartesianAbsXY/1 1.2 -2.5

/SetSourceCartesianAbsYX/SrcId float float (SrcIndex 1-24, Y m, X m)

Set source position in reversed Cartesian coordinates (Y, X)

e.g. /SetSourceCartesianAbsYX/1 -2.5 1.2

/SetSourcePolarAbs/SrcId float float (SrcIndex 1-24, Angle -360.0 - 360.0, Distance -200.0 - 200.0 m)

Set source position in Polar coordinates (X, Y)

e.g. /SetSourceCartesianAbsXY/1 1.2 -2.5

Source “relative” messages:

/SetSourceAngle/SrcId float (SrcIndex 1-24, Angle -360.0 - 360.0)

Set source angle in Polar coordinates (Angle only)

e.g. /SetSourceAngle/9 310.

/SetSourceDistance/SrcId float (SrcIndex 1-24, Relative Distance 0.0 - 1.0)

Set source angle in relative Polar coordinates (Distance only). Range limited to 0.0 - 1.0.

e.g. /SetSourceDistance/10 0.5

/SetSourceCartesianRelXY/SrcId float float (SrcIndex 1-24, X -1.0 - 1.0, Y -1.0 - 1.0)

Set source position in “relative” Cartesian coordinates (X, Y)

e.g. /SetSourceCartesianRelXY/3 0.1 -0.9

/SetSourceCartesianRelYX/SrcId float float (SrcIndex 1-24, X -1.0 - 1.0, Y -1.0 - 1.0)

Set source position in “relative” reversed Cartesian coordinates (Y, X). Works in touchOSC with XY Pad in horizontal orientation

e.g. /SetSourceCartesianRelYX/3 -0.9 0.1

/SetSourcePolarRel/SrcId float float (SrcIndex 1-24, Angle -360.0 - 360.0, Distance -1.0 - 1.0)

Set source position in relative Polar coordinates.

e.g. /SetSourcePolarRel/10 -112 0.35

## Pair relative messages

In pair relative messages, two sources are set at the same time. Currently, the two sources can only be consecutive source indices with a first odd source index (1 and 2, 3 and 4, ..., 15 and 16). They should be declared as a four-digit number like 0102 for sources 1 and 2 or 1516 for sources 15 and 16.

Pair relative messages require two types of messages to be sent. First, a position message in either "relative" Cartesian or Polar coordinates that would correspond to the barycenter position of the two sources (average angle and distance). Second the pair width (angle difference between source 2 and 1). This kind of control is particularly meaningful for stereo pair manipulations.

Pair position messages:

/SetSourceCartPairXY/SrcPairIndex float float (SrcPairIndex 0102, 0304..., x relative [-1 1], y relative [-1 1])

Set pair barycenter in "relative" Cartesian coordinates (X, Y)

e.g. /SetSourceCartPairXY/0304 0.1 -0.9

/SetSourceCartPairYX/SrcPairIndex float float (SrcPairIndex 0102, 0304..., x relative [-1 1], y relative [-1 1])

Set pair barycenter in "relative" reversed Cartesian coordinates (Y, X)

e.g. /SetSourceCartPairYX/0304 0.1 -0.9

/SetSourcePolarPair/SrcPairIndex float float (SrcPairIndex 0102, 0304..., angleOffset, distanceOffset)

Set pair barycenter in relative Polar coordinates.

e.g. /SetSourcePolarPair/10 -112 0.35

/SetSourcesWidthPair/SrcPairIndex float (SrcPairIndex 0102, 0304..., angle -180.0 - +180.0)

Set pair width (angle difference between the two sources of the pair)

e.g. /SetSourcePolarPair/10 -112 0.35

## Subsystem control

The following controls provide a low level access to all functionalities of the routing panel of the WavePerformer. Please note that values in the routing panel are not constantly updated for stability reasons. The panel should be exited and entered again for displaying the transferred values with OSC.

/SetSubSystemLevelSrc/SrcId/SubsysId float Level (SrcIndex 1-24, SubsystemIndex 1-4, Level 0 - 1.0)

Set subsystem gain (linear values) for source SrcId and subsystem SubsysId.

e.g. /SetSubSystemLevelSrc/8/2 0.5

/SetSubSystemDelaySrc/SrcId/SubsysId float (SrcIndex 1-24, SubsystemIndex 1-4, Delay 0 - 170 ms)

Set subsystem delay in ms for source SrcId and subsystem SubsysId.

e.g. /SetSubSystemDelaySrc/7/3 10.2

/SetSubSystemDirectOutOn/SrcId/SubsysId (SrcIndex 1-24, SubsystemIndex 1-4)  
Enables direct out for source SrcId and subsystem SubsysId.  
e.g. /SetSubSystemDirectOutOn/4/1

/SetSubSystemDirectOutOff/SrcId/SubsysId (SrcIndex 1-24, SubsystemIndex 1-4)  
Disables direct out for source SrcId and subsystem SubsysId.  
e.g. /SetSubSystemDirectOutOn/4/1

/SetSubSystemDirectOutChannel/SrcId/SubsysId/Output (SrcIndex 1-24,  
SubsystemIndex 1-4, OutputIndex 1-64)  
Selects direct out speaker number for source SrcId and subsystem SubsysId.  
Warning: there is currently no check if the speaker belongs to corresponding  
subsystem. This functionality must be handled with care.  
e.g. /SetSubSystemDirectOutOn/4/1

## **EQ control**

The following controls provide a low level access to all functionalities of the Input EQ section of the Wave I Processor. It mimics the behavior of the EQ Panel in the WavePerformer. Please note that the values there are not constantly updated for stability reasons. The panel should be exited and reentered for displaying the transferred values from OSC.

/SetInputEQControlAllOn  
Activates the control all feature of the EQ, similar to the control all checkbox in WavePerformer. If enabled, all following commands are applied to all input channels, not regarding the passedSource Index.

/SetInputEQControlAllOff  
Deactivates the control all feature of the EQ, all following EQ commands will only be applied on the given Source Index.

/SetInputEQBypassOn/SrcId (SrcIndex 1-24)  
Enables Bypass mode of the Input EQ for the given Source  
e.g. /SetInputEQBypassOn/7

/SetInputEQBypassOff/SrcId (SrcIndex 1-24)  
Disables Bypass mode of the Input EQ for the given Source  
e.g. /SetInputEQBypassOff/7

/SetInputEQBandOn/SrcId/BandId (SrcIndex 1-24, BandId 1-8)  
Activates the parametric EQ filter for the given Source and band number.  
e.g. /SetInputEQBandOn/1/2

/SetInputEQBandOff/SrcId/BandId (SrcIndex 1-24, BandId 1-8)  
Deactivates the parametric EQ filter for the given Source and band number.  
e.g. /SetInputEQBandOff/21/5

/SetInputEQBandFrequency/SrcId/BandId float (SrcIndex 1-24, BandId 1-8,  
frequency in Hz 20-20000)  
Sets the frequency of the parametric EQ filter for the given Source and band number.  
e.g. /SetInputEQBandFrequency/1/6 1200.0

/SetInputEQBandGainDB/SrcId/BandId float (SrcIndex 1-24, BandIndex 1-8, gain in dB -12 ... +12 )

Sets the gain of the parametric EQ filter for the given Source and band number.

e.g. /SetInputEQBandGainDB/9/4 3.0

/SetInputEQBandQ/SrcId/BandId float (SrcIndex 1-24, BandIndex 1-8, Q 0.5 ... 20)

Sets the Q factor of the parametric EQ filter for the given Source and band number.

e.g. /SetInputEQBandQ/5/6 1.2

/SetInputEQLowShelfOn/SrcId (SrcIndex 1-24)

Activates the Low Shelf filter for the given Source.

e.g. /SetInputEQLowShelfOn/12

/SetInputEQLowShelfOff/SrcId (SrcIndex 1-24)

Deactivates the Low Shelf filter for the given Source.

e.g. /SetInputEQLowShelfOff/12

/SetInputEQLowShelfFrequency/SrcId float (SrcIndex 1-24, frequency in Hz 20 - 20000)

Sets the frequency of the Low Shelf filter for the given Source.

e.g. /SetInputEQLowShelfFrequency/1 250.0

/SetInputEQLowShelfGainDB/SrcId float (SrcIndex 1-24, gain in dB -12 ... +12)

e.g. /SetInputEQLowShelfGainDB/2 -3.0

/SetInputEQHighShelfOn/SrcId (SrcIndex 1-24)

Activates the High Shelf filter for the given Source.

e.g. /SetInputEQHighShelfOn/6

/SetInputEQHighShelfOff/SrcId (SrcIndex 1-24)

Activates the High Shelf filter for the given Source.

e.g. /SetInputEQHighShelfOff/6

/SetInputEQHighShelfFrequency/SrcId float (SrcIndex 1-24, frequency in Hz 20- 20000)

Sets the frequency of the High Shelf filter for the given Source.

e.g. SetInputEQHighShelfFrequency/18 15500.00

/SetInputEQHighShelfGainDB/SrcId float (SrcIndex 1-24, gain in dB -12 ... +12)

Sets the gain value of the High Shelf filter for the given Source.

e.g. /SetInputEQHighShelfGainDB/3 6.0

# 11. Wave Interface AU Plug-in

The wave interface AU is an Audio-Unit based plug-in made to be used with Logic Audio. Program your creative sound designs by moving the sound sources around the room with our wave interface AU. Through the real time processing, you can dynamically move all the sound sources. Warning, this software is only available for Logic version 9 on OSX computers with Intel Processors.

## Installation

Double click on the wave interface AU icon. The installation window guides you through the installation.

To insert the interface into an audio channel in Logic, go to “Mixer” and click on the insert button to view the list of plug-ins. You will find the wave interface AU under:

Audio Unit -> sonic emotion -> wave interface AU

## Viewer Function

By default, the wave interface AU shows the source that represents the used audio channel. By pressing the arrow button in the right top of the window, a dialog box pops up, where you can decide which source you would like to view.

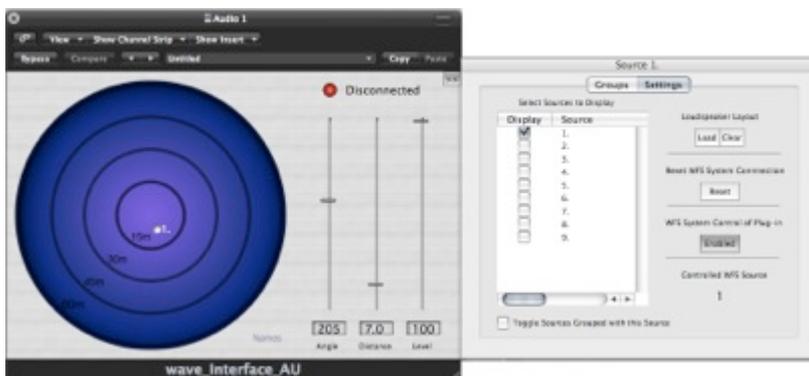


Figure 1.41

Group Settings

To create a group, first insert the plug-in into one additional channel. This plug-in will be the Master of the group. Select now in the tap menu “Group Master” and add as many sources within that group you like. All sources will now follow the group master. To automate group movements, only the Master needs to be automated. The Button “toggle group sources” shows you all groups that are in your group in the same plug-in viewer.



Figure 1.42

Press the selected hot key when altering parameters to affect all grouped sources together.

## 12. Max MSP Plug-In

With the Max MSP plug-in, you can control all functions of the Sonic Wave I processor through Max MSP. This allows you to program your own interface and link the control to different peripherals like joysticks or tracking systems.

Notice: This software is available for MaxMSP version 5 and 6 on OSX computers with Intel Processors.

This section gives a brief overview on controlling the Sonic Wave I processor with the software Max MSP.

The Max MSP patch „wfs.sourcesCtrl.maxpat“ allows for the control of system parameters such as angle and distance of all virtual sound sources. The user can set the designated parameter within a Max MSP patch at any time. This patch relies on the wfs.zsonicnet.mxo object that has been developed in collaboration with IRCAM (<http://www.ircam.fr>).

Installation of the Max MSP Object

The Max MSP plugin is available as a so-called external object for Max MSP. To be integrated, follow the outlined steps:

Extract the file “wfs-3.4.2-base.zip” into any folder of your computer.

Add the “wfs-3.4.2-base” folder to the Max MSP search path (via Options/File Preferences), so that the “wfs.zsonicnet.mxo” object can be found by the “wfs.sourcesCtrl.maxpat” patch or by custom patches.

The “wfs.sourcesCtrl.maxpat” patches located into the subfolder “abstractions”.

## Patches

The “wfs.sourcesCtrl.maxpat” patch is a simple user interface to manipulate parameters on zsonicNet manually.

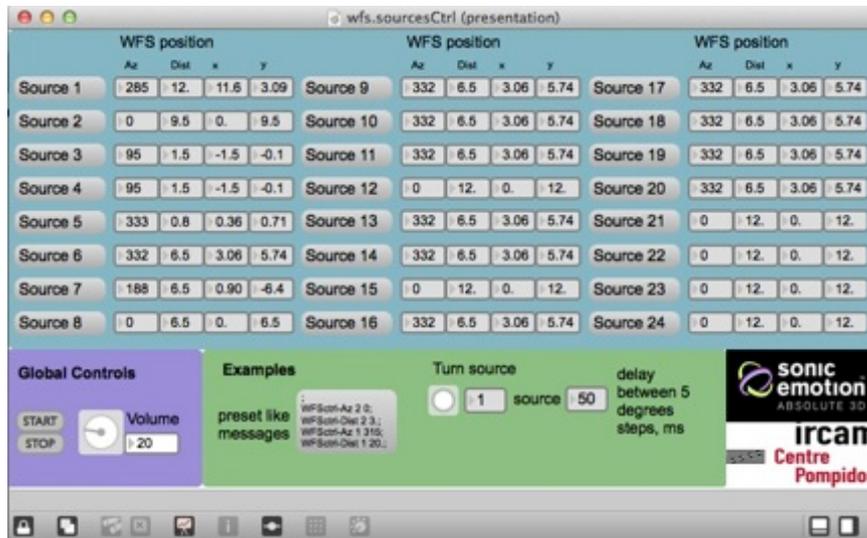


Figure 1.43

It is also possible to define an automated change of parameter values with Max MSP specific automation formats (e.g. MIDI or OSC). No additional software is required.

The information of azimuth and distance should be sent to the receive objects WFSctrl-Az and WFSctrl-Dist of the “wfs.sourcesCtrl.maxpat” patch using send objects with similar names. The messages to be sent are of the type “sourceId\_n azimuthVal\_f” (ex: 1 30.) through a “send WFSctrl-Az” object and “sourceId\_n distanceVal\_f” through a “send WFSctrl-Dist” object. The green panel of the “wfs.sourcesCtrl.maxpat” patch provides examples of this kind of communication.



## 14. Trouble Shooting

The most common error can occur when the system is turned on without the system dongle attached. If this was the case you have to do some changes in the BIOS of the Wave I processor.

1. Connect a monitor (VGA connector on the back side) and a keyboard to the Wave I processor.
2. Plug in the system dongle
3. Start the Wave I processor and press and hold the delete key while the system boots.
4. Go to :        “Advanced”                -> Onboard Device Configuration
  - > Onboard LAN       -> [Enabled]
  - > LAN Boot Rom     -> [Enabled]
  - “Boot”                   -> Hard Disk Drives
    - > 1<sup>st</sup> Disk       -> [USB:OCZ RALLY2]
    - > 2<sup>nd</sup> Disk     -> [1<sup>st</sup> FLOPPY DRIVE]
  - > Boot Device Priority
    - > 1<sup>st</sup> Device   -> [USB:OCZ RALLY2]
  - “Power”               -> APM Configuration
    - > Power On By PCI Devices       -> [Enabled]
    - > Power On By PCIE Devices     -> [Enabled]
5. Press F10 to save and exit
6. Start the system with the dongle inserted

# 15. System Specifications

Description	Wave field synthesis rendering unit for processing of up to 16 input and 24 output channels.	
Audio Input	Digital MAD1 (coaxial or optical) or ADAT	24
	Internal playback engine (HD option)	24
Audio Output	Digital MAD1 (coaxial or optical) or ADAT	32
Audio Processing	Sample rate and bit depth	48 kHz 24 Bit
Storage	60 GB	SSD
Connectivity	Ethernet /LAN (RJ45)	Yes
Latency	Processing-Time: End-to-end	< 7ms
Power Supply	Power (max)	360W
Required AC Mains	230 Volts / 50Hz with PFC	5.0A
	115 Volts / 60Hz with PFC	8.0A
AC Mains Connector	Integrated EMI Filter	IEC
Dimensions	19" Rack Case (Units)	3 U
Safety standard	CE, FCC	

Figure 1.44

## Planning the Installation

The Sonic Emotion affiliation distributors worldwide will provide you with all the necessary support in designing and planning your next installation.

Here are simple basic rules you may want to be aware of about the loudspeaker setup depending on the system you want to install.

There are two types of installations:

- *Frontal only systems (theatre / auditorium for stage amplification, front of house system for indoor / outdoor)*
- *Peripheric systems (effect systems for shows / events, auditorium)*

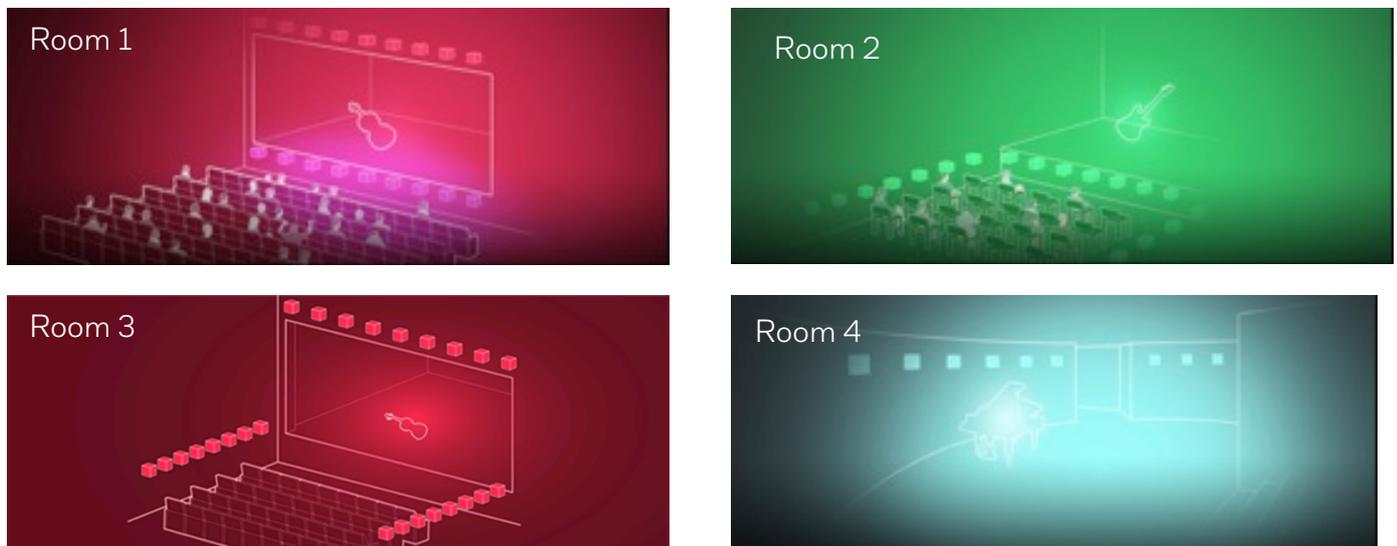


Figure 1.45

## Speaker Setup

All connected speakers are placed in one or more systems and can be assigned into several subsystems for control splitting. Each loudspeaker has to be declared with a rendering type: WFSmain, WFSsupport or subwoofer.

### Frontal System

As a recommendation, a minimum of 8 loudspeakers should be installed along the stage opening, covering its full width of the audience area. The number of loudspeakers has to be defined depending on loudspeaker placement, loudspeaker characteristics (sensitivity, directivity), and required Sound Pressure Level.

The speakers should be oriented vertically such that each of them covers a large portion of the listening area. Wide dispersion speakers in the horizontal plane are preferred for limiting individual speaker localization. Vertical dispersion should be defined according to application scenario. Wide vertical dispersion might be preferable for small rooms. More directive speakers in the vertical direction would be preferable in larger rooms. All speakers should be facing the audience.

The loudspeaker system is preferably positioned onstage to provide accurate vertical localization precision and must be accounted for as WFSmain rendering type.

It can be complemented with a secondary speaker array located above stage. It is recommended to use loudspeakers having an enhanced vertical directivity (<60 degrees). A lower number of speakers can be considered (5 to 9 speakers) to cover a stage of 15 to 25m width. The speakers should be less directive in the horizontal direction (>90 degrees dispersion). They should be declared as a separate subsystem from the lower array and have WFSsupport as rendering type.

The respective contributions of the upper and lower loudspeaker array can then be adjusted on the Subsystem control panel of the WaveDesigner (page 23).

### Spacing

As a general rule, it is recommended that *loudspeaker spacing* does not exceed *half of the minimum distance of the loudspeakers to the audience* with reasonably directive speakers (aperture >90°). Using more directive speakers, loudspeaker spacing may be reduced to favor fusion between contributions of individual loudspeakers in order to create the sound field wave front.

## Side and Rear Setup for Peripheric Systems

For peripheric designs, side and rear may comprise between 10 and 14 speakers for mid-size venues (400 to 1000 seats). For larger venues, or specific installations, please contact your distributor.

Loudspeaker should be spread at approximately equal distances for optimum coverage of the listening area. They may preferably 2-4 m located above audience level for optimum performance.

The speakers should have the diversion and the mounted angle that each of them largely covers the whole listening area.

## Subwoofers

Subwoofers can be added to complete the loudspeaker system in the lower frequency range. The Sonic Wave I processor will drive them as dedicated speaker system.

## WFS Support Speakers

WFS support speakers are added to a main frontal system. Their task is to improve the level coverage in the listening area. They usually face the same direction as the frontal system. WFS support speakers are - for example - additional delayed speakers further back in a room or under a theatre balcony, additional speakers above a stage with an array of WFS main speakers on its platform edge...etc.

## Speaker Requirements

The goal of the Sonic Emotion's Absolute 3D sound reproduction is to enlarge the acoustic sweet spot to the whole audience listening area. The ideal speaker for this application has a very wide horizontal diffusion (90 ° or more), the vertical diffusion is large enough to cover the nearest listening position to the one furthest away.

In some cases, a minimum of 5 speakers will be reproducing an audible event. High power handling has to be thought of in choosing the speakers.

## 16. System Tuning with the built-in EQ

Most PA-Systems for larger venues should be tuned in to achieve the best results in energy distribution and sound coloration for the whole audience. This can be due to some characteristics of high power speakers or to resonance effects that occur in the venue at certain frequencies. Most of the general recommendations for system tuning apply also for a Sonic Wave I driven loudspeaker system. Here are some basic guidelines to make your system sound perfect.

### Measurement Toolkit

#### Laser Meter

In many installations, the speaker positions are defined already in the planning phase and can be read from CAD plans to be transferred in WaveDesigner to configure the Sonic Wave I processor. If the positions have to be measured on site, a Laser Meter for exact distance measurement is a very helpful tool. To optimize the 3D sound algorithm, the precision of the entered geometric data should be as exact as possible. In general, the margin of error should never exceed 5-10 % of the average loudspeaker spacing.

The Laser Meter also helps to find the correct microphone position for individual speaker measurements at a given reference distance.

#### Measurement Software and Audio Interface

There are many acoustic measurement software tools available for different platforms (for example CATT, ARTA, Clio, Smaart...). It's the users choice which program he prefers or would like to work with. They all come with similar feature sets. For acoustic measurement, it is recommended to use a professional audio interface with high quality analog/digital convertors and at least one 48 V microphone input. If the Audio Interface has ADAT or MADI outputs, it can be connected directly to the Wave I processor inputs. Otherwise a upstream A/D convertor has to be used.

Each speaker in the setup should be measured individually. If it is not possible to do all measurements, at least one speaker of each subsystem (same type or same array position) should be measured.

For measuring, the test mode in the EQ panel of the WaveDesigner can be used. If enabled, the signal of the chosen input can be sent directly and exclusively to the given output. Parameter changes for this speaker can be checked back interactively.

#### Measurement Microphone

At least one microphone should be used for the acoustic measurements. There are many dedicated measurement microphones available from different brands and in

all price ranges. The microphone should be positioned 1 meter in front of the speaker that is measured, in the axis of the high frequency tweeter.

Better results can be achieved when 2, 3 or even more microphones are used. These should be calibrated and placed on a fixed array to measure also the off-axis response of a loudspeaker. The data of all microphones can be merged in the measurement tool to analyze the complete behavior of a speaker.

## Tuning objective

In contrast to classical surround sound system systems, for which the same level and delay is active at the reference listening position (sweet spot), the Sonic Wave 1 expects that all speakers provide the same amount of power into the listening environment. This is the basic rule for tuning. More generally, the tuning will target to make all speakers “sound the same” in the listening environment.

Similarly, delays must not be aligned towards the reference point but so that all speakers exhibit the same latency. Different latencies can occur if some amplifiers have internal AD DA converters and built-in EQ. Latency can be monitored by measuring the impulse response of each speaker always from the same reference distance in front of the speaker (for example 1 meter, depending on speaker type and size) and check for propagation delay (timing of first wave front). It should be the same for all speakers. This delay can be adjusted in the Speaker Management panel.

## Basic Tuning with SPL

For a homogenous distribution of the 3D sound field, it is important to calibrate the output levels for all attached speakers. The SPL can be measured with a pink noise signal. The test signal should be sent to each speaker and the SPL measured always from the same reference distance in front of the speaker (for example 1 meter, depending on speaker type and size).

After defining a Reference Level, this has to be applied to all speakers. To reach the target, the level of each output can be adjusted individually in WaveDesigner, either with Makeup-Gain in the EQ-Panel or Output Gain in Speaker Management.

## Fine Tuning with EQ

On top of the basic tuning of the output levels, a more sound coloration related tuning can be done using the Equalizer. This might be needed to compensate for the deficiencies of the speakers and their local environment in the listening room.

The measurement is usually done using a sweep signal in a certain frequency range. Before creating the frequency plot, the impulse response should be cut in time domain to extract a window of only the direct sound.

The frequency response should be measured in best case for all speakers individually. This could be done simultaneously with the SPL measurement, so the microphone has to be moved around only once. If it is not practicable to measure all speakers, at least some different speakers should be measured and combined together to get an average measurement.

The measured frequency response can be compared to the predefined target curve and adjusted interactively by using the controls in the WaveDesigner EQ Panel.

There are different recommendations for the EQ target curve of a sound system. For example the ISO X-Curve for cinemas defines a flat curve up to 2 kHz and above that a slope going down by 3 dB per Octave. For music content, normally less steep slopes are used.

The Output EQ settings in WaveDesigner are stored only once and should be used to tackle existing holes and peaks in the frequency response. The target should be a more linear and neutral curve.

For adapting the system to different kinds of content or to get a taste of the operating sound engineer, it is recommended to use the Input EQ in the WavePerformer.

Thank you again for choosing Sonic Emotion's Sonic Wave I - 3D sound processor. With our multiple worldwide patented technology, we are committed to bringing you our ground breaking Absolute 3D™ sound solutions to you and your clients. For more information about Sonic Emotion, please visit our webpage at [www.sonicemotion.com/professional](http://www.sonicemotion.com/professional)

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