

Yamaha Sound System Simulator
~ Y-S³ Version 2.10 ~
Owner's Manual

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System Requirements

OS	Windows® XP Professional
CPU	Pentium processor 700 MHz (1 GHz or higher recommended)
RAM	256 MB (512 MB or higher recommended)
Sound Card	16-bit 44.1 kHz Stereo
Disk Space	300 MB or more (may differ according to the environment the software is used)
Display	1024 x 768, 256 colors, DirectX 9.0C supported PC, 96 dpi (Normal)*

* The images may not display properly when the screen is set at a DPI other than 96 dpi. We strongly recommend that the property for display colors is set to 32-bit.

Precautions

Y-S³ may cause an unexpected termination of the software under these circumstances:

- When the computer recovers from standby or hibernation mode.
- When OS users are changed using the Fast User Switching function.

If the software terminates, please restart your computer.

Installation

1. Double-click on the "Y-S³" folder.
An executable file "setup.exe" is shown.
2. Double-click on "setup.exe."
A setup window for Y-S³ appears.
3. Execute the installation by following the onscreen instructions.
4. After installation is complete, the Y-S³ folder appears on your computer ("Program Files\YAMAHA\Y-S³" folder, as the default).

Uninstalling

1. Select [Start] - [Settings] - [Control Panel] - [Add/Remove Programs]. The Add/Remove Programs window appears.
2. Click [Change/Remove] of Y-S³ Yamaha Sound System Simulator.
3. Follow the onscreen instructions to uninstall the software.

NOTE: The button names or menus may differ depending on the computer OS.

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1. Y-S³ General Operation

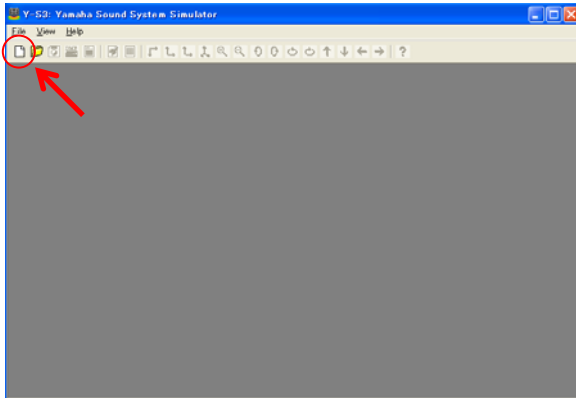
- **Overview**

Y-S³ is a software application that aids in speaker system design, using data entered by the user on room type and size, speaker type, installation conditions, and amplifier and processor type and configuration to calculate the response from the audiences' position. Y-S³ then presents the results as sound pressure distribution and contour figures for use in constructing appropriate speaker systems.

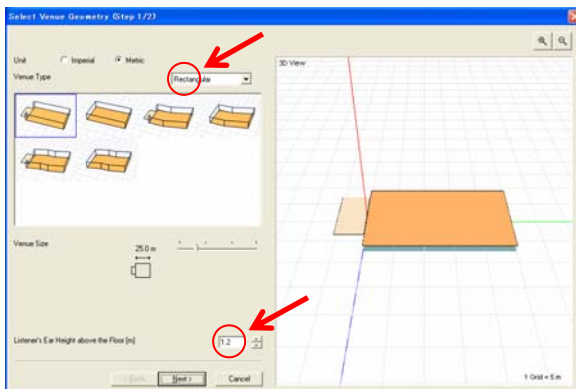
- **Startup**

Double-click the Y-S³ icon on the desktop or select [Programs] - [YAMAHA] - [Y-S3]. The program starts and the main window appears.

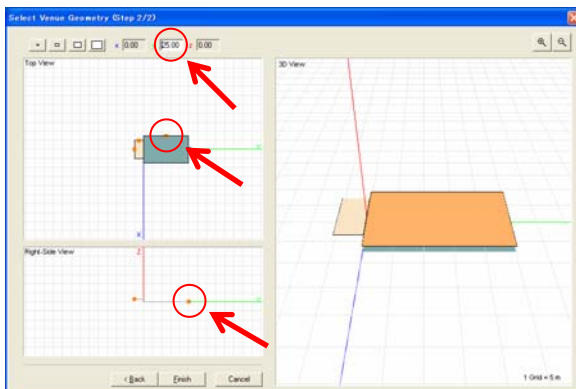
Click  in the main window to open a new project.



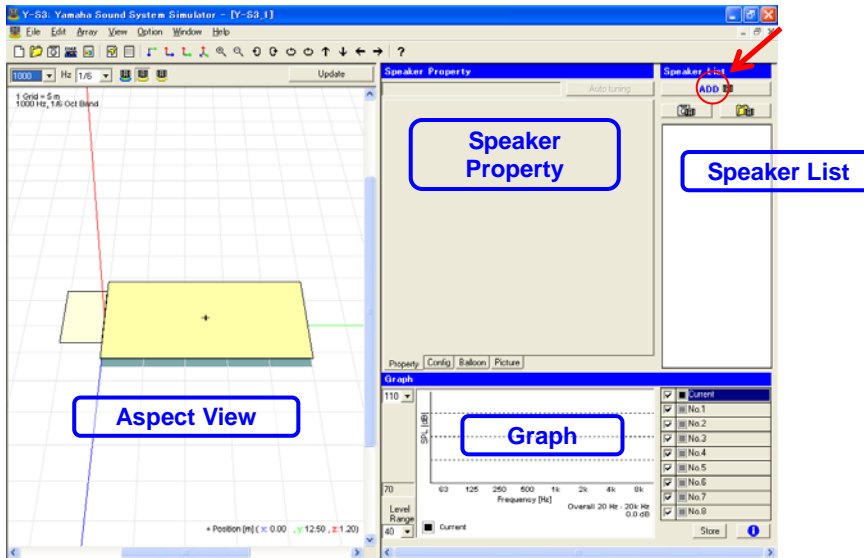
In Select Venue Geometry (Step 1/2), set "Venue Type" and the area of the receiving surface, etc. (See chapter 2)



In Select Venue Geometry (Step 2/2), use your mouse to select the orange points and adjust the room size, slope etc. (See chapter 2)

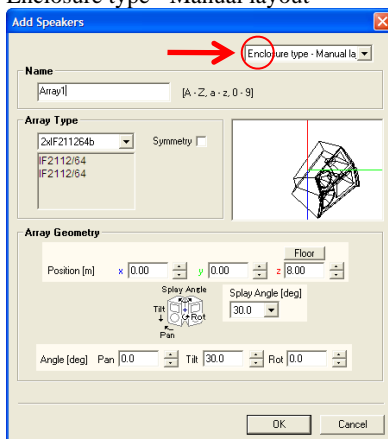


When you have completed configuration of the settings, the Aspect View, Speaker Property, Speaker List, and Graph appear, with the room you configured displayed in Aspect View. Click **ADD** in Speaker List to open the Add Speakers window and configure the speakers.
(See chapter 4)



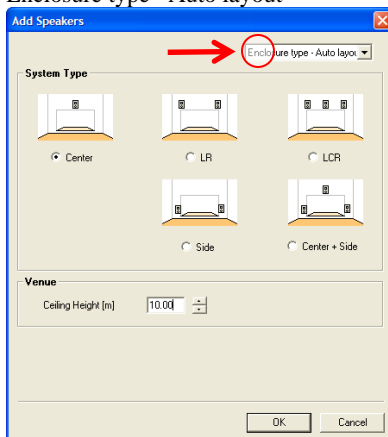
Use the Add Speakers list box to select one of the three installation types available (Enclosure type - Manual layout, Enclosure type - Auto layout, Distributed), and enter the installation parameters.
(See chapter 4)

Enclosure type - Manual layout



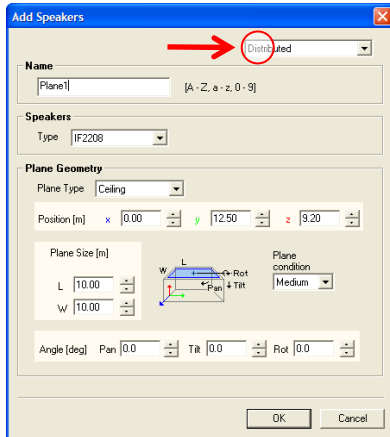
Select an array type, and enter the coordinates and angle of the speaker array. You can also place the speaker array symmetrically.

Enclosure type - Auto layout



Select a system type and Y-S³ will automatically calculate the optimum array type and coordinates for the size and shape of the room defined. Y-S³ cannot perform these calculations for rooms of unusual size or shape, or for circular rooms.

Distributed



Configure the parameters for the ceilings, walls, and other plane surfaces, and then set the speaker layout. There are two methods available: “Coverage”, where you set the coverage area of the receiving surface for each speaker and then layout the speakers automatically, and “Grid”, where you set the location for each speaker manually of a level plane.

When you have finished configuring settings, the parameters you have entered and the calculated results appear in Aspect View, Speaker Property, Speaker List, and Graph areas on the project window.

- **Project window: display of calculation results (Chapter 6)**

Tool Bar

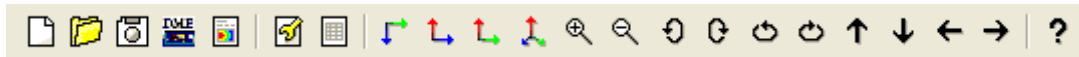













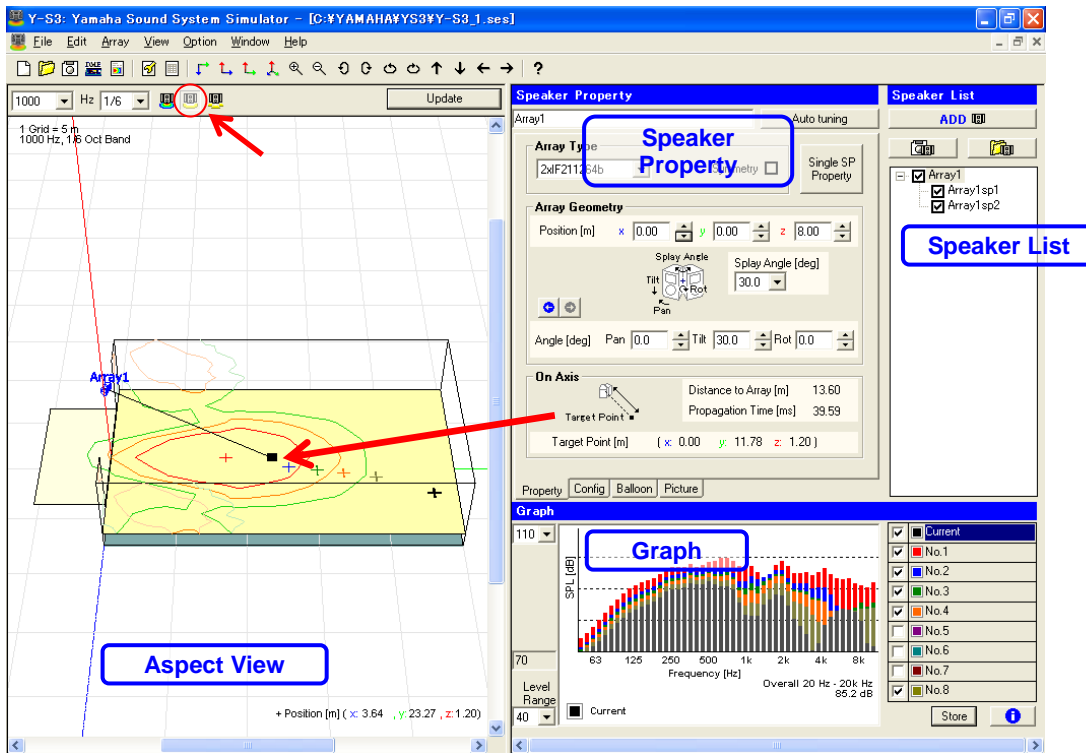


Table: The name and function of each button on the main toolbar

Button Type	Button Name	Button Function
	New	Create a new project (Chapter 2).
	Open Project	Load a previously saved project file (.ses) (Chapter 1).
	Save Project	Save a project file (.ses) (Chapter 1).
	Export DME Configuration	Save a DME configuration file (.daf) (Chapter 8).
	Export Project Report	Create and save a project report file (.html) (Chapter 7).
	Project Property	Open a Project Property window (Chapter 3).
	Product List	Open a Product List. You can save opened Product List in CSV (.csv) format (Chapter 7).
	Top View, Front View, Right-Side View, 3D View	Change viewpoints between Aspect View, Balloon view, and Picture view.
	Zoom In, Zoom Out	You can zoom in or out in Aspect View.
	Turn Down, Turn Up, Turn Right, Turn Left	Rotate the viewing angle. This is only available for Aspect View, Balloon view, and Picture view when in 3D View  .
	Move Up, Move Down, Move Left, Move Right	Moves the screen display when in Aspect View.
	Information	Link button to the Y-S ³ website.

To change the disposition of project windows when multiple projects are open, select [Cascade] or [Tile] from the [Window] menu.



Aspect View (Chapter 6)

Aspect View displays the layout of the speakers, along with a sound pressure distribution and contour figure based on calculation results. To update calculation results, select the center frequency and bandwidth from the list box in the upper section of Aspect View, then select the calculation mode icon. Change the calculation conditions and click Update to reflect the new calculation results.

Table: Names and functions of each Aspect View button.

Button Type	Button Name	Button Function
	Frequency, Band Width	Select the center frequency and the bandwidth (1/1, 1/3, 1/6, FFT) .Calculation results are reflected in Aspect View, Balloon view, and Graph.
	SPL Mode	Display a sound pressure distribution in Aspect View for all speakers selected in the Speaker List checkbox.
	Array Mode	Display a contour figure for speakers displaying target points. The contour figure is depicted in three layers, indicating -3 dB (red), -6 dB (orange) and -9 dB (green) drops in sound pressure from the target point. The contour figure is not available when speakers are mounted on the floor, or when the target point is not located on the receiving surface or in an enclosed space. Furthermore, you cannot select speaker arrays that have been automatically located using the symmetry function in “Enclosure type - Auto layout” and “Enclosure type - Manual layout” (these speakers are depicted in orange). Y-S ³ does not display target points and contour figures for these speaker.
	Single Mode	Display a contour figure for each speaker displaying target points. Since the contour figures for each speaker are calculated relative to the respective target points, the SPL for each speaker will be different even though for contour lines of the same color.



Speaker Property (Chapter 5)

You can use the Property and Config views to set installation conditions for speaker arrays and configure output parameters for items such as processors and amplifiers. The “Auto tuning” function calculates the optimum conditions for speaker arrays within the defined area automatically.

Speaker List (Chapter 5)

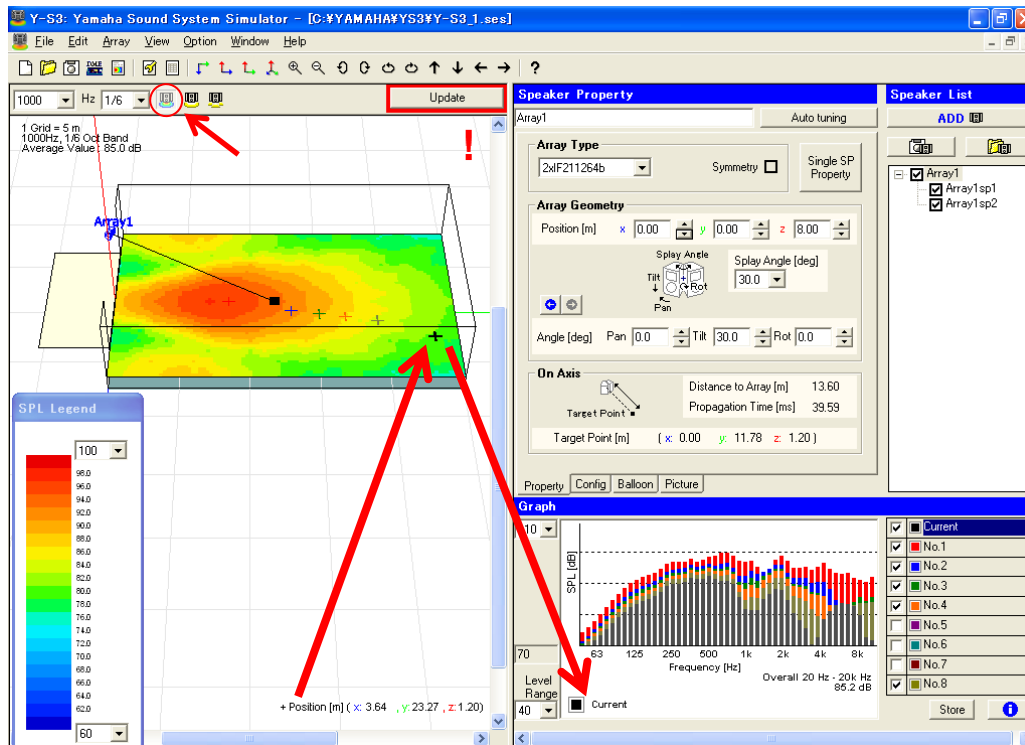
You can use the checkboxes to turn installed speakers on and off. Switching speakers on and off affects calculations, the results of which are reflected in Aspect View and Graph. You can also add or remove speakers, and change names.

Table: Names and functions of each Speaker List button.



Button Type	Button Name	Button Function
	Add Speakers	Click this button to open the Add Speakers window. You can add speakers using the “Enclosure type - Manual layout”, “Enclosure type - Auto layout”, or “Distributed” methods.
	Save Array, Load Array	You can save and load array files (.spa) for each speaker array installed. This is useful when, for example, you want to use the same speaker array you have been using in a different project. For large-scale projects, you can load the same speaker array file into a single project multiple times. Distributed speakers are treated as part of a surface, and cannot be saved or loaded.

Graph (Chapter 6)

The graph displays the current calculation results (Current) for a +Position on the receiving surface. Drag the +Position cursor with your mouse to see the calculation results for a given point on the receiving surface. At the desired receiving point, select a graph number (e.g. No.1), and click . The graph changes color and the current results (Current) are saved to the selected graph number. You can save calculation results for up to 8 points on the graph. Click to open an Information window displaying details on the graph number selected. In this window, you can also add a dry source to the response at the receiving points calculated and listen to the results.



Saving and Opening Projects


In order to save the whole project, click  icon on the tool bar or select [Save Project] or [Save Project As...] under the File menu. In order to open a project, click  icon or select [Open Project] under the File menu. You may edit and compare projects by opening multiple projects at once.

2. Constructing the Room Shape & Audience Area

- **Overview**


Construct the room shape and set the audience area for calculation.

- **Starting a new project**

Click  in the tool bar or select [New] from the [File] menu to open a new project. The Select Venue Geometry (Step 1/2) setting window opens.

- **Constructing the room shape and audience area**

Select Venue Geometry (Step1/2):

Select a room shape. The selected shape appears on the 3D view for verification. You can change the zoom, angle and position for the 3D view. Click  when you have selected a shape.

Unit

Select “Metric” (meters) or “Imperial” (feet) for units of measurement.



Venue Type

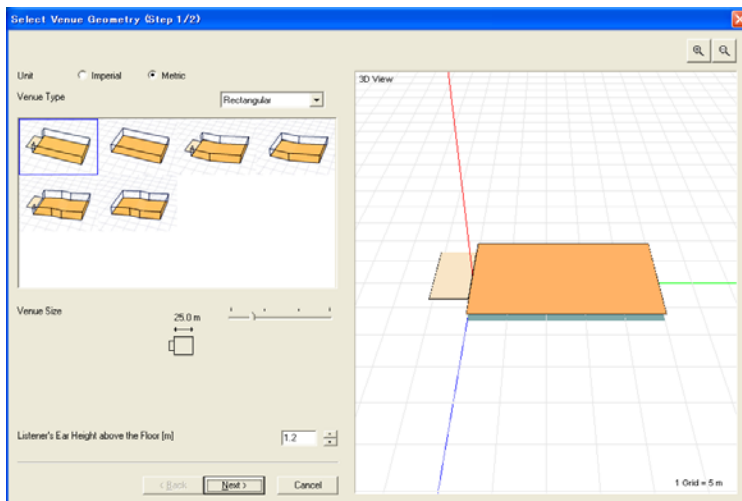
Select a venue type from the list box (Rectangular, Fan, Cross, Polygon, or Circle), then select the room shape that most closely matches the geometry of your project. You will see some shapes with and without a stage/performing area, which is shown in a lighter color. Y-S³ will not estimate the SPL on the stage, but shows a contour to check for unexpected coverage spilling over to the stage.

Venue Size


Set the size of the selected shape with the slider.

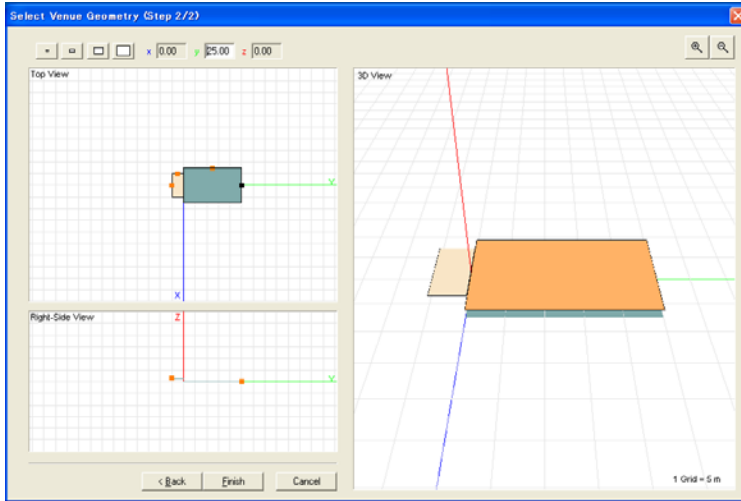
Listener's Ear Height above the Floor


Select a height from the list box. The height is the distance from the floor to the ear of the listener. This can be set from 0 to 2.1 m (0 to 7 ft) with a default setting of 1.2 m (4 ft). You can set the height of the receiving surface, depicted in orange in the 3D view. You can use   to zoom in and out in 3D View, or view the room from a specific angle by dragging with the mouse on-screen.

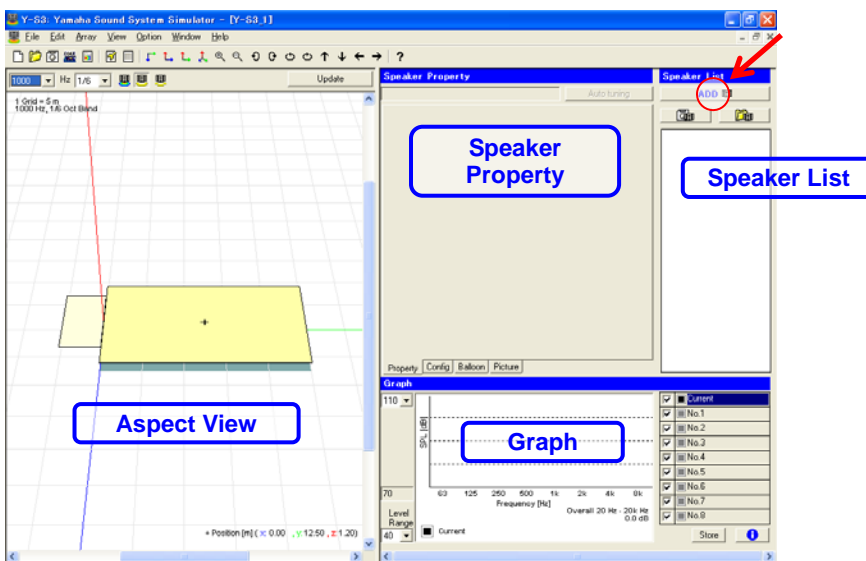


Select Venue Geometry (Step 2/2):

Edit the selected shape with the Top View and Right-Side View. Use your mouse to select an orange point on a view (selected point turns black), then drag the point to the desired position. You may also select a point, and enter the desired three-dimensional coordinates. The range for each dimension is as follows: $-45\text{ m} < x < 0\text{ m}$ ($-150\text{ ft} < x < 0\text{ ft}$), $-90\text{ m} < y < 90\text{ m}$ ($-300\text{ ft} < y < 300\text{ ft}$), $0\text{ m} < z < 45\text{ m}$ ($0\text{ ft} < z < 45\text{ ft}$) and $0\text{ m} < z < 2\text{ m}$ ($0\text{ ft} < z < 7\text{ ft}$). You can change the zoom for Top View and Right-Side View by clicking .






Click  when you have configured the parameters. The configured room shape appears on the project window. The project window includes Aspect View, Speaker Property, Speaker List, and Graph.



3. Editing Project Properties

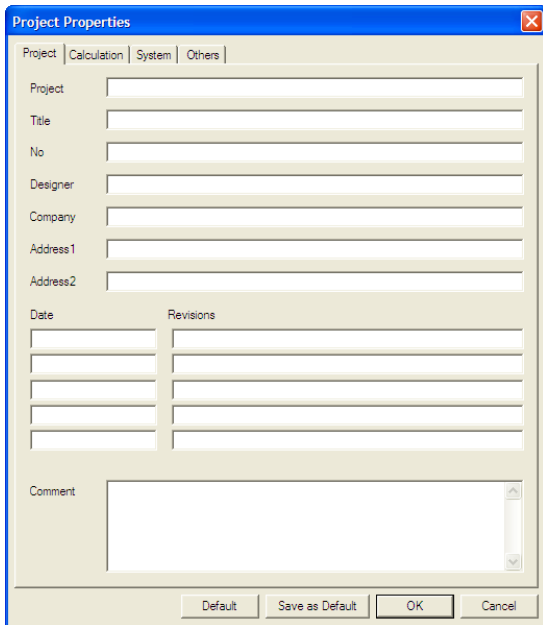
- **Overview**

You can edit parameters such as the environment and processor selection, amplifier voltage, and text in the Project Properties window. Click  in the tool bar or select [Project Properties] from the [File] menu, open the Project Properties window, and edit the contents of the Project, Calculation, System, and Others views. These parameters may be saved as a user default setting by clicking the  button. When you click the button, all parameters in every tab sheet within the Project Properties window are saved as the default setting. In order to apply the saved setting, click  icon. When you create a new project, the software default setting is applied.

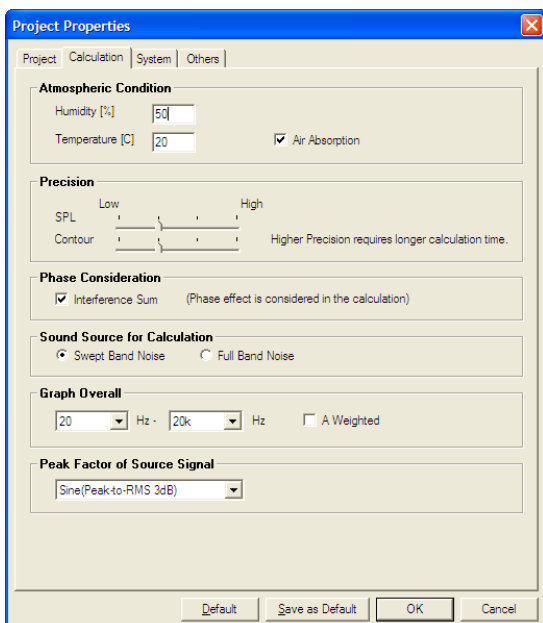
- **Project**

Enter the details of your project. Note that when exporting the results as a Project Report, the following characters are automatically replaced with “_” (underscore) in order to prevent false representation in HTML format.

Characters: < > & “



- **Calculation**



Atmospheric Condition

Enter “Humidity” and “Temperature”. These parameters affect the speed of sound and the air absorption coefficient. The default settings are 50% for humidity and 20°C for temperature. Check the “Air Absorption” checkbox to take attenuation of high frequency components due air absorption into account in calculations.

Precision

Select the degree of precision used in the SPL calculation and contour calculation respectively. When a lower precision is selected, Y-S3 uses an interpolation for faster processing. You may use a lower precision in the design stage for faster processing and the highest precision in the final stage for checking the detailed results.

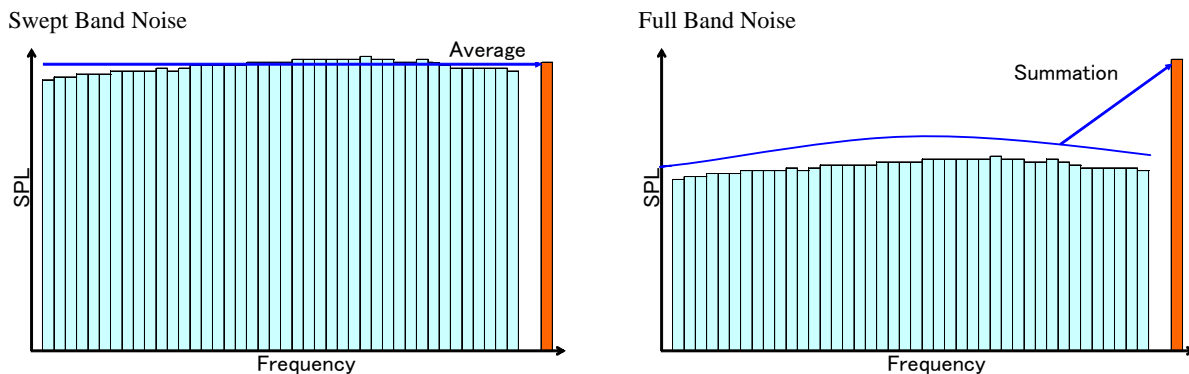
Phase Consideration

Check the “Interference Sum” checkbox to take phase interference into account when calculating the frequency characteristics and sound pressure distribution. Energy summing calculations are performed if you do NOT check this box.

Sound Source for Calculation

Select “Swept Band Noise” or “Full Band Noise” for use as the sound source in the calculation. When “Swept Band Noise” is selected, band pass noise assumed to be used. The bandwidth corresponds to the frequency selected in Aspect View. In this mode, the overall level in Graph is the average energy of each band response. When “Full Band Noise” is selected, full band noise is assumed to be used. The overall level in Graph is the summation of each band response. The “Swept Band Noise” mode is convenient when you want to see the frequency characteristic while referring to the required SPL. You may easily deduce the overall SPL by averaging the SPL results at several frequencies in this “Swept Band Noise” mode. The “Full Band Noise” mode is more reasonable for a comparison of the calculated SPL with the value measured by using full band pink noise and real time spectrum analysis.

Fig: Level difference between “Sound Source for Calculation” settings



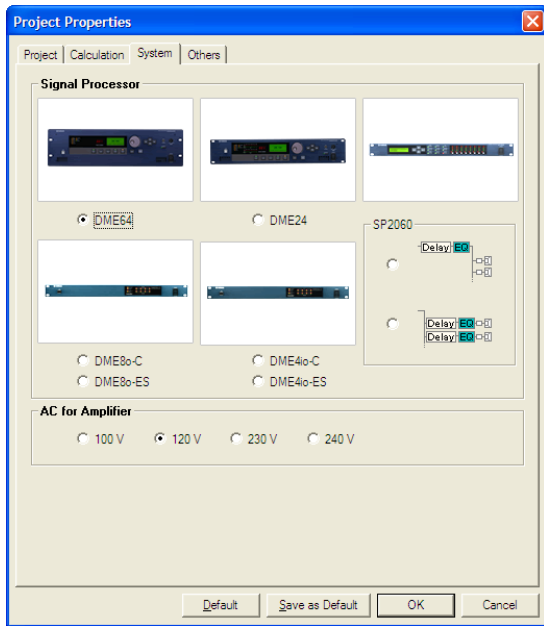
Graph Overall

Select the frequency range of overall level displayed in Graph. The default range is 20 Hz to 20 kHz. For “Swept Band Noise” (cf. previous section), the overall level denotes the average level of the response in the selected range. For “Full Band Noise”, the overall level equals the summation of the response in the selected range. Check “A Weighted” checkbox to process the sound in a similar manner to that of the human ear, using “A” characteristics. The Overall figures in Graph are displayed in dBA units.

Peak Factor of Source Signal

Select the source type from “Sine (Peak-to-RMS 3dB)”, “Pink (Peak-to-RMS 6dB)”, or “Music (Peak-to-RMS 10dB)”. “Sine” has a 3 dB difference between the peak signal and RMS, “Pink” has 6 dB and “Music” has 10 dB. In this list, you select a peak-to-RMS level in a practical sense. These levels are used by the clip level indicator and for auto tuning. “Output configuration settings (Speaker Property - Config)” and “Auto tuning” in chapter 5.

- **System**



Signal Processor

Select the output processor type. The selected processor is used in [Export DME Configuration] (selected from the [File] menu) and [Product List] (selected from the [Option] menu). Each processor has different processing powers and number of outputs. The specifications are available in <http://www.yamahaproaudio.com/>. If you select “SP2060”, you can then select a processor that sets EQ and Delay values for all outputs, or one which sets values for each amplifier. The configuration used in “SP2060” is shown in the following table.

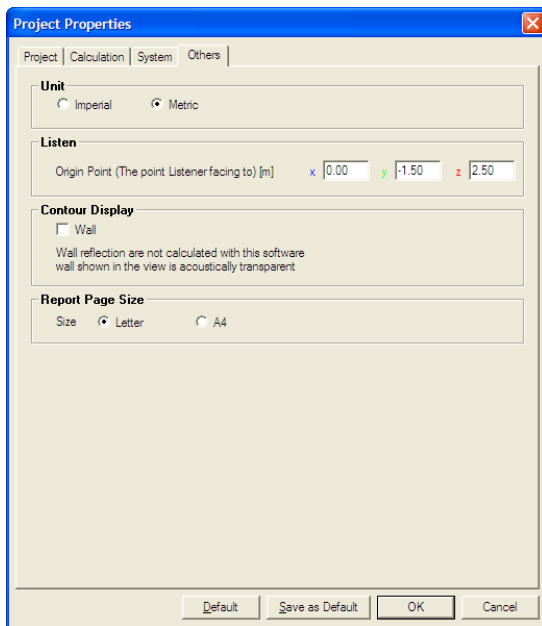
Table: Configurations applied to each speaker type in SP2060

Speaker Type	Configuration
Tri-amp (IF3115t)	2 x 3-way
Bi-amp (IF2112b, IF2115b, ...)	3 x 2-way
Passive (IF2112p, IF2115p, ...)	Multi Zone
Combination (IH2115 + IL1115)	2 x 2-way + 2 x Aux

AC for Amplifier

Select the amplifier voltage. This figure is used to determine how clipping is displayed. You can check on the specifications of each amplifier at <http://www.yamahaproaudio.com/>. The default setting is “120 V”.

- **Others**



Unit

Select “Imperial” (feet and Fahrenheit) or “Metric” (meter and Celsius) for units of length and temperature.

Listen

Enter the coordinates of the principal performer or person speaking. These figures should be absolute coordinates. You should take height into account if you are using the equipment on a stage. For example, using a sound source 1.5 m for the stage floor, when the height of the stage floor is 0.8 m from the ground gives a total height of 2.3 m. Y-S³ refers to the origin point when creating auralization data. The auralization data is calculated using head-related transfer functions (HRTF) by assuming that the listener is facing the Origin Point. See chapter 6 for how to create auralization data.

Contour Display

Check the “Wall” checkbox to show the walls in Aspect View. The height of the wall is fixed at 5 m. You may check any unnecessary radiation onto the walls by checking the contour shown on the walls. Note that Y-S³ does not calculate the reflections from the walls even if this option is selected.

Report Page Size


Set the size of the page to print. You can select letter size or A4 paper.

4. Placing Speakers

- **Overview**

Place the speakers in the room. You can add positions for each speaker array on a conventional proscenium or stage, and place speakers on flat surfaces within the room such as ceilings and walls.

- **Adding a new speaker (Add Speakers)**

Click  in Speaker List or select [Add New Array] from the [Array] menu to open the Add Speakers window. You can select the installation method (Enclosure type - Manual layout, Enclosure type - Auto layout, Distributed) from the list box. Place each speaker array for which you have entered details. Installed speakers will appear in Aspect View, and are available for selection in Speaker List. See chapter 6 for details on calculation results.

Array Speakers

This is a very flexible installation method compatible with all Installation series speakers. You can save installation data for each speaker array.

(See chapter 5)

Enclosure type - Manual layout:

The method allows a great deal of freedom in speaker layout, allowing the "Array Type" selection, mirroring, and direct entry of coordinates.

Enclosure type - Auto layout:

Y-S³ will select an appropriate speaker array for your room and arrange them automatically, based on your "System Type" selection.

Distributed Speakers

You can arrange speakers with a fixed spacing on a level surface (e.g. wall or ceiling). The compatible speakers for distributed designing are the following Installation series speakers: IF2108, IF2208, IF2205, and S5, S15, S55 speakers. Since the speakers will be treated as part of the flat surface, you cannot save this arrangement.

(See chapter 5)

Distributed:

Sets the parameters for the level surface in which speakers are placed, depending on your speaker and the "Plane Type" selections.

Coverage:

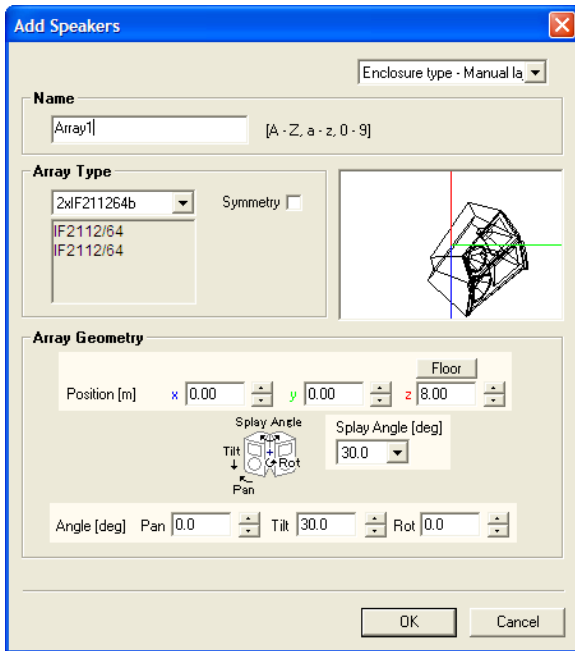
Y-S³ automatically places speakers in the coverage area on the receiving surface, depending on your selections for placement pattern and degree of consolidation of the receiving surface.

Grid:

You can place speakers at any intervals on a grid, based on your selections for placement pattern and the distance between speakers.

• **Placing the speakers manually (Enclosure type - Manual layout)**

Click **ADD** in Speaker List or select [Add New Array] from the [Array] menu to open the Add Speakers window. Select “Enclosure type - Manual layout” from the list box. Select a speaker array type and enter the coordinates and conditions for the area to calculate the results.



Name

Input a name for the new array (e.g. Center, Left, Right, Delays, etc). Y-S³ automatically assigns names for single speakers that compose the array like ***sp1, ***sp2 (***) is the array name). You can change these names also in Speaker List after placing the speaker array. To change them, select the speaker array or single speaker in Speaker List, right-click and select [Rename], then enter the new name.

Array Type

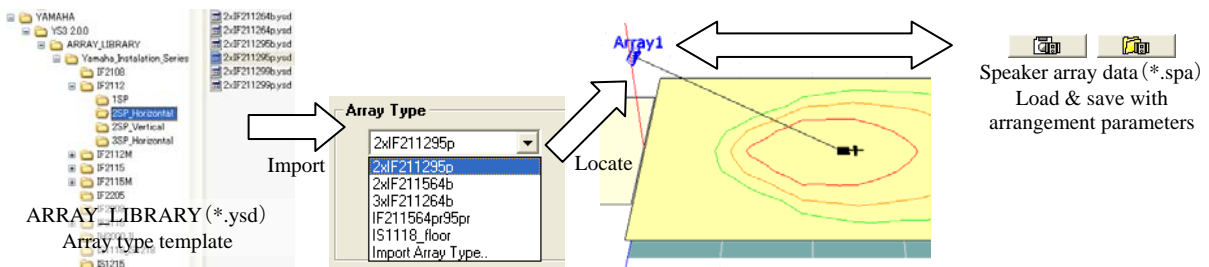
Select the speaker array type from the list box. When you would like to use an array type which is not shown in the list box, you need to import a speaker array template (“.ysd”) file from “ARRAY_LIBRARY” folder to the “Array Type” list. Select “Import Array Type” from the list box and Y-S³ imports the data to the “Array Type” list so that you may select the array type in the list box. The imported array type will remain on the list until you delete it, even after you restart the program. To delete the imported data from the list, delete the “.ysd” file from the “data_folder.\template_folder.SPA_DATA” folder in the program folder. Y-S³ requires at least one template to be present in the “Array Type” list. Placing an imported array template (.ysd) in the room will convert it to array data (.spa) containing the conditions for the speaker array, which you can save and load. (See chapter 5)

The suffixes in the speaker array template have the following meanings.

p: Passive, b: Bi-amp, t: Tri-amp, r: rotate (horn-rotated), floor: +3dB (adding reverberations from the floor)

You can check the specifications for each speaker on the website at <http://www.yamahaproaudio.com/>.

Fig: File types related to the speaker arrays used in Y-S³



Symmetry

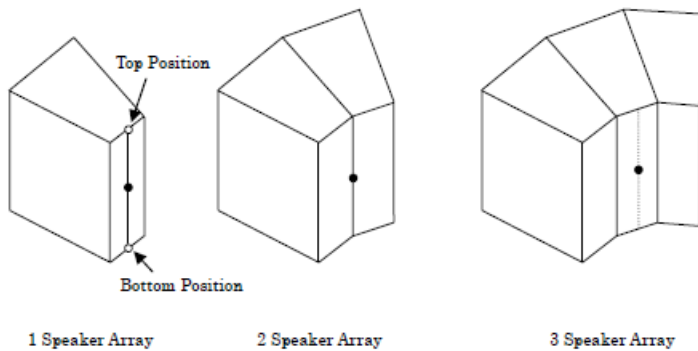
Check this checkbox to place a mirror image of the speaker array with respect to the y-z plane. For a stereo system, when the left side speaker is entered, the right side “mirrored” speaker will appear automatically. Speakers will overlap if Position x in “Array Geometry” is set to the default (0.00). Please enter an appropriate figure. Note that since speaker figures are also mirrored, the mirrored figure is different from the actual picture in some cases for some asymmetric models like IS2112AS or IF2115AS. This will not affect calculation results. An asterisk (*) appears beside the array names of mirrored speakers, to help distinguish them from the original speakers.

Array Geometry

Enter positional data for the speakers such as the splay, angle and coordinates of the speaker array. The contour diagram does not display if the target point is not located on the receiving surface in Aspect View after you have positioned the speaker. Further, the contour figure will not display if the target point is in an area obstructed by walls. In both cases, the sound pressure distribution that is displayed is based on calculations made for those areas that sound can travel to unobstructed. Placing a speaker array outside the receiving surface or stage excludes it from calculations, and its output does not appear on contour figure and sound pressure distribution.

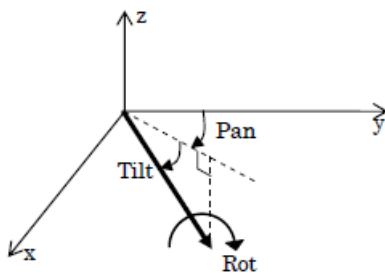
Position

Enter the position coordinates of the speaker array. Defaults (x, y, z) = (0.00, 0.00, 8.00), with height set to 8 meters. The coordinates are at the center rear point of the array. Click to place a speaker on the floor automatically. Enter the angle you want. Floor-mounted speakers not facing the receiving surface and speakers with the same z-coordinates as the height of the receiving surface will not have target points displayed on the receiving surface, and are thus not displayed in the contour figure.



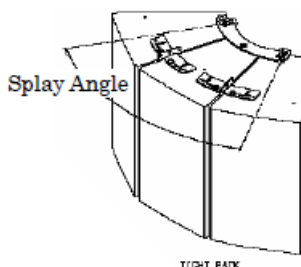
Angle

Enter the angle of the speaker. Enter the Pan (default: 00.0), Tilt (default: 30.0), Rot (default: 00.0) angles.



Splay Angle

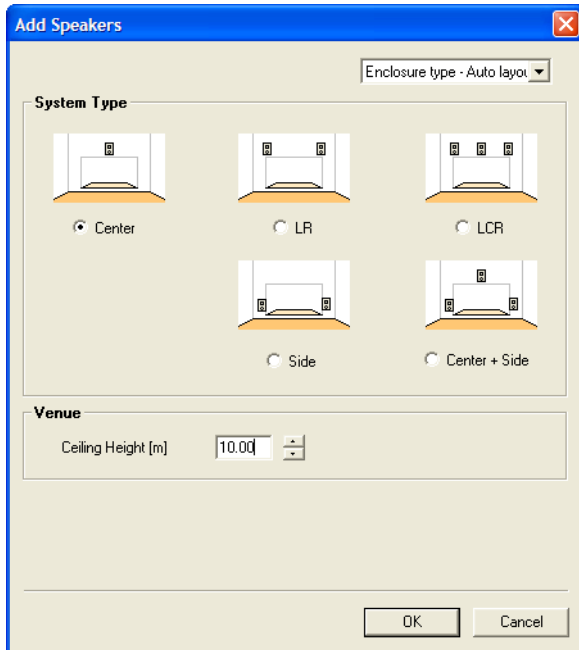
Select the splay angle of the speaker array from the list box.



• **Placing the speakers automatically (Enclosure type - Auto layout)**

Y-S³ can automatically place speakers in the room. The appropriate speaker types for the configuration of the room, such as the surface area of the audience area, and the ratio of its width and length, can be selected automatically. Click in Speaker List or select [Add New Array] from the [Array] menu to open the Add Speakers window. Select "Enclosure type - Auto layout" from the list box. Select "System Type" and ceiling height and click to begin calculations and configure the system composition. When calculations are complete, Y-S³ displays a message prompting you to carry out auto tuning. Click to begin auto tuning. Click to finish without auto tuning. See chapter 5 for details about auto tuning.

You cannot use "Auto layout" in "SPL Mode" when Y-S³ displaying a sound pressure distribution. Always switch to "Array Mode" or "Single Mode" before using this function. Additionally, "Auto layout" deletes any existing speaker arrays that have already been placed and places new speaker arrays. Speakers placed using the "Distributed" function are not deleted. This is useful in instances such as when you want to replace speakers on a stage or proscenium but retain speakers installed in the ceiling. The "Enclosure type - Auto layout" function does not execute for circular rooms or rooms that are too large, small, wide, or narrow. In such cases Y-S³ displays an error message. Please use the "Enclosure type - Manual layout" function to position speakers.



System Type

Select the speaker system type from the list box (Center, Center, LR, LCR, Side, Center + Side).


Ceiling Height

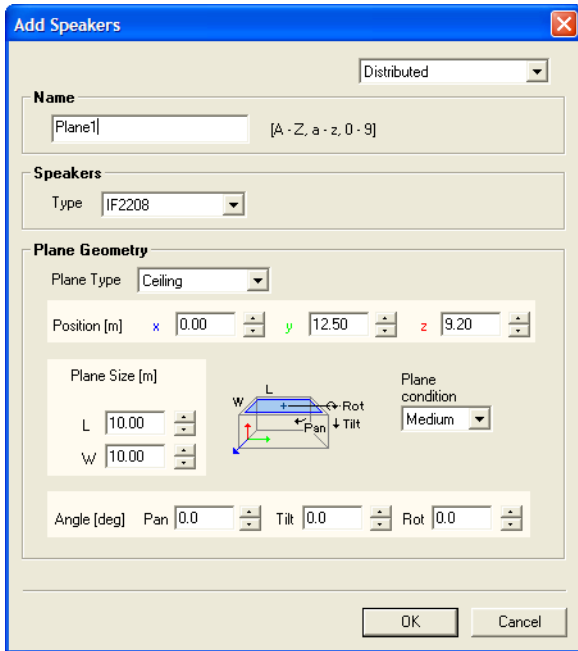
Enter the estimated ceiling height of the room. Y-S³ decides the array height referring to this parameter. The speaker arrays are always set below the ceiling height. Note that Y-S³ does not estimate the reflection from the ceiling in the calculation.

Setting methods

The "Auto layout" function selects speakers that are appropriate for the shape, floor area, and proportions of the room. It also takes the ceiling height you have entered into account when positioning speakers (Center, Center + Side, Side). The default angle settings are; Pan and Rot: 0°, Tilt: 30, Splay Angle: minimum.

• **Distributed**

You can arrange speakers with a fixed spacing on a level surface. Click  in Speaker List or select [Add New Array] from the [Array] menu to open the Add Speakers window. Select “Distributed” from the list box. Select speakers, ceiling, walls, and plane types from the list boxes, and enter the appropriate settings. You can select “Coverage”, which automatically calculates positioning based on the coverage area of the receiving surface, or “Grid”, which places speakers on a plane surface at any interval you wish.



Name

Enter the names you want to use for plane surfaces (e.g.: Ceiling, Front, Back, Wall etc). Names for the individual speakers that make up a plane are generated automatically (**sp1, **sp2 etc, where ** is the name of the plane). You can change these names in Speaker List. To change a name, select a flat surface or an individual speaker from Speaker List. Right-click the item you have selected, select [Rename] from the menu that appears, and enter the new name.

Speakers Type

Select the type of speaker you want to place from the list box. Note that the suffix ‘r’ on a type name indicates a horn-rotated speaker. S5, S15, and S55 speakers can be chosen from either High Impedance connection (shown as “_High”) or Low Impedance connection (shown as “_Low”).

Table: Connections of S5, S15, S55 speakers when Distributed

Name	Connection Type
Low Impedance Serial	Low Impedance Serial Connection
Low Impedance Parallel	Low Impedance Parallel Connection
Low Impedance Equal	Low Impedance Serial & Parallel Connection * ¹
High Impedance 70V	70V line High Impedance Connection
High Impedance 100V	100V line High Impedance Connection

*¹ 2 pairs of 2 serially connected speakers are parallel connected.
The total impedance becomes the same as 1 speaker.
Only up to 4 speakers can be connected per amplifier channel.

You can check the specifications for each speaker on the website at <http://www.yamahaproaudio.com/>.

Plane Geometry

Enter the defining parameters for the plane you want to place. Although you can set planes to be larger than the size of the room, be aware that speakers placed outside the room area will not be included in any calculations.

Plane Type

Select from the plane type from the list box (Ceiling, Front Wall, Back Wall, Side Wall 1, Side Wall 2).

Position

Enter the coordinates of the center of the plane. Default settings are x = 0.00, y = a figure determined by room shape, z =

receiving surface + 8.00.

Plane Size

Enter the size of the plane. Default settings are L = 10 m, W = 10 m.

Plane condition

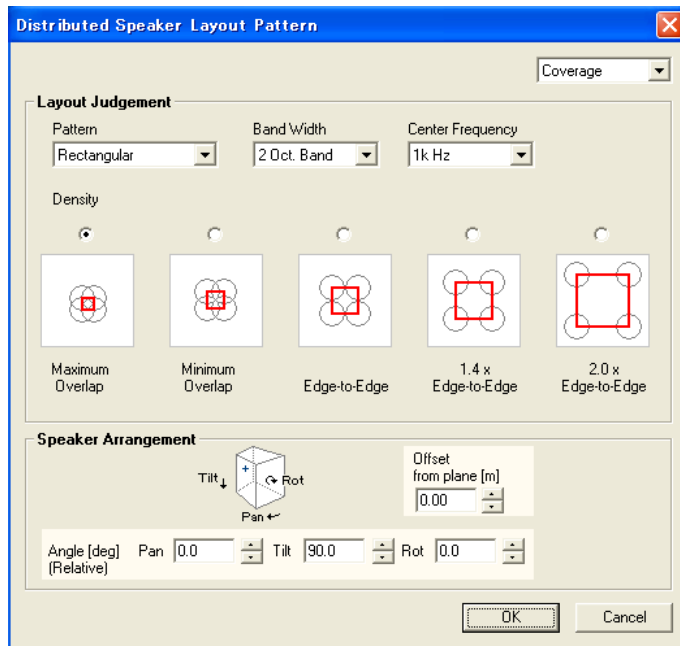
Select the reflectance of the wall surface (Hard: 100%, Medium: 50%, Transparent: 0%). You can set this parameter to “Hard” or “Medium” to take the effects of rising acoustic pressure into consideration when placing speakers close to a plane. However, this calculation will not take sound from speakers installed on this plane into effect.

Angle

Enter the angle of the plane. There are 3 types: Pan (default: depends on plane type), Tilt (default: depends on plane type) and Rot (default: 0.00).

Coverage (Distributed Speaker Layout Pattern)

Speakers are placed automatically based on the coverage area of the receiving surface. This function is useful when evaluating the speaker placement necessary to obtain direct distribution of sound.



Layout Judgment

Set the defining parameters for “Pattern”, “Bandwidth” and “Center Frequency” from the list boxes and choose a density.

Pattern:

Select either “Rectangular” or “Hexagonal” as a layout pattern for speakers on a flat surface.

Band Width, Center Frequency:

Set the bandwidth and frequency used to calculate the coverage area. Although the narrower bandwidths allow closer distributions to the desired frequencies, they are also subject to more extreme distribution changes caused by interference and other factors. The default setting is 2 Oct. Band, 1 kHz, which should cope with most vocal bandwidths

Density:

Set the density of the coverage area on the receiving surface. Take the distance between the receiving surface and the plane where the speakers are located (the height, for speakers installed in the ceiling) when setting this parameter. Generally, higher ceilings mean increased distances between speakers, so you should select high density to achieve sound pressure above a constant level.

Speaker Arrangement

Angle (Relative):

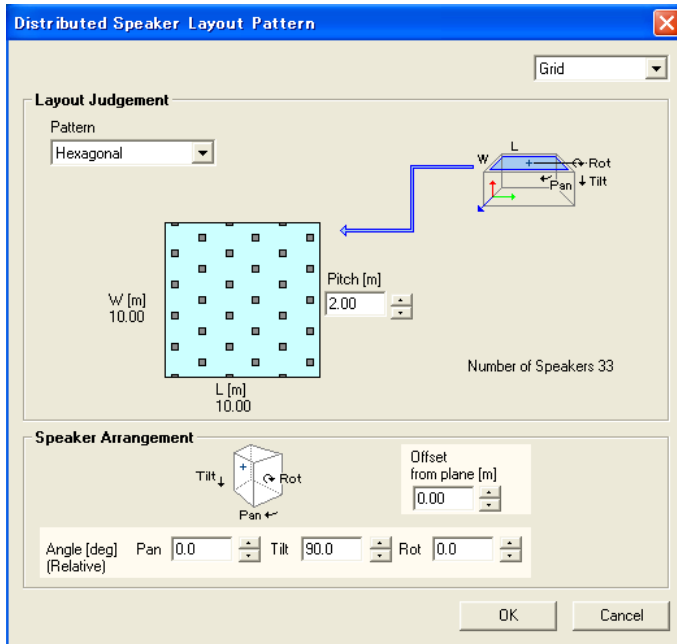
Set the angle of the speaker when seen from the plane. Default settings are Pan (0.0), Tilt (90.0), and Rot (0.0), indicating that the speaker’s rear is flat against the plane.

Offset from plane:

Set the offset of the speaker from the wall. The default setting is (0.00), indicating that the speaker’s rear is flat against the plane.

Grid (Distributed Speaker Layout Pattern)

You can place speakers at intervals on your choosing on a plane. This function is useful when evaluating the sound pressure distribution resulting from a particular placement.



Layout Judgment

Select a "Pattern" from the list box, and enter a "Pitch" (the interval between speakers).

Pattern:

Select either "Rectangular" or "Hexagonal" as a layout pattern for speakers on a plane.

Pitch:

Set the intervals at which you want to place speakers.

Speaker Arrangement

Angle (Relative):

Set the angle of the speaker when seen from the plane. Default settings are Pan (0.0), Tilt (90.0), and Rot (0.0).

Offset from plane:

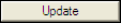
Set the offset of the speaker from the wall. The default setting is (0.00), indicating that the speaker's rear is flat against the plane.

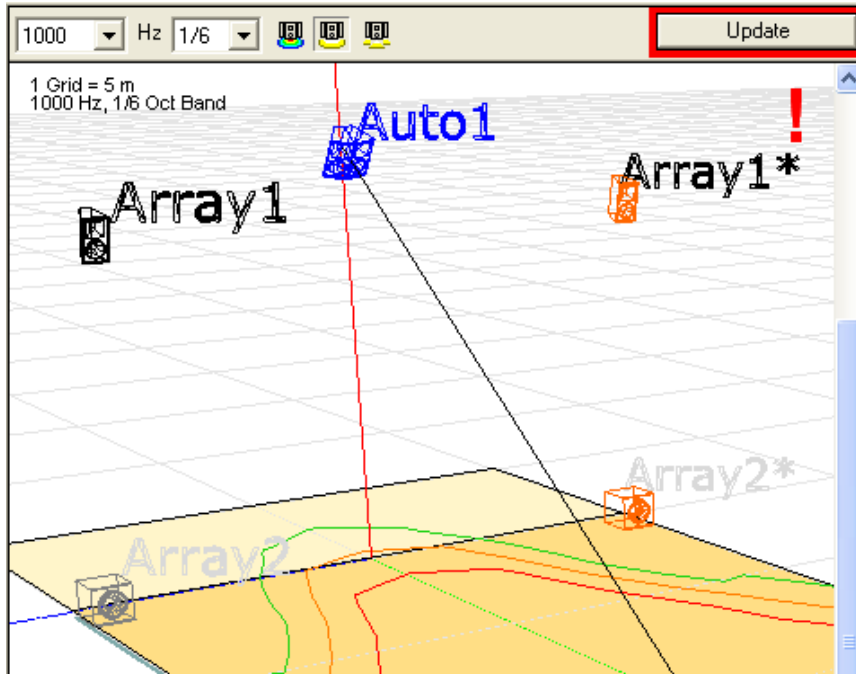
5. Adjusting Speaker Parameters

- **Overview**

Set all the parameters for the distributed and array speakers you have placed, and perform calculations.

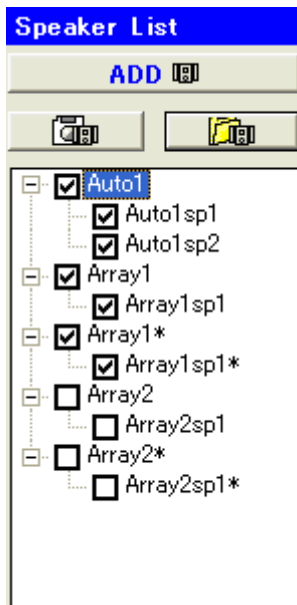
- **Update**

The periphery of  changes to red when you change any speaker parameters. Click this button to apply your settings.



5-1. Array Speakers

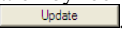
- **Speaker array selection, on/off, changing names/deletion, saving/loading (Speaker List)**



Speaker array selection

To display a speaker array, click a speaker array of a speaker name in Speaker List. The background of the array now changes to yellow, indicating that it has been selected. Speaker Property displays all the parameters for the speaker. The selected speaker arrays and array names are displayed in blue in Aspect View. You can also click speakers in Aspect View to select them. Mirrored speakers placed using the “Auto layout” or symmetrical layout functions appear in orange with an asterisk (*) beside their array names. You cannot select these speakers.

Speaker array on/off

Check the checkbox for a speaker array in Speaker List so that the checked speaker arrays are estimated in the calculation. Speaker arrays for which checkboxes have been set to “on” appear in black in Aspect View. Speaker arrays and array names for which checkboxes have been set to “off” appear in grey. However, the speakers you select always appear in blue regardless of their “on/off” status, while speakers placed using the symmetrical layout function will always appear in orange. Thus, you can always tell whether speakers are targeted for calculation by looking at the checkboxes in the Speaker list. To reflect the speaker array checkbox settings in calculation results, click .

Renaming and deleting the speaker array

To change the name of speaker arrays appearing in Speaker List, select a speaker array, right-click it, select [Rename] from the menu that appears, and enter the new name. To delete the placed speaker array, select the speaker array in Speaker List, then right-click and select [Delete] or select [Delete Array] from the [Array] menu.

Saving and loading the speaker array data

You may save the condition of the currently selected speaker array such as Array Name, Speaker Property, and Configuration. The data is saved in a dedicated format with the “.spa” extension. This function is useful, for example, when you want to place speaker arrays with the same condition in different project. When you load and place the same array data multiple times, Y-S³ creates multiple speaker arrays with identical array names in Speaker List. Change these names after you have finished loading the arrays.

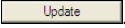


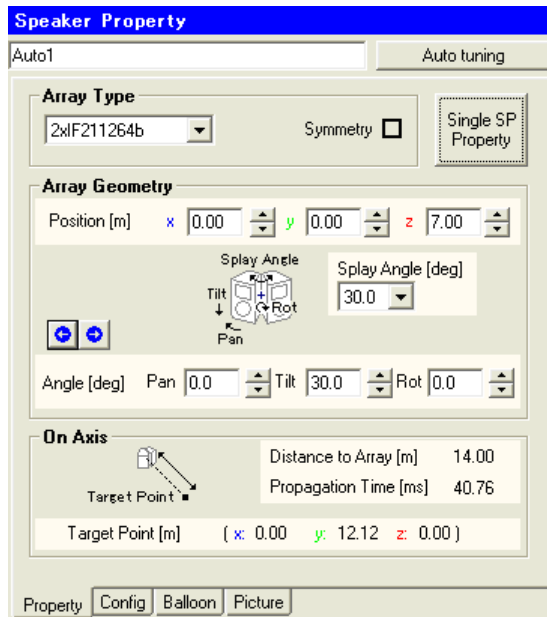
Click to save speaker array data (.spa) (or select [Save Array] from the [Array] menu).



Click to load saved speaker array data (.spa) (or select [Load Array] from the [Array] menu).

- **Adjusting speaker array parameters (Speaker Property - Property)**

Adjust the parameters for the currently selected speaker array. To reflect the settings in calculation results, click . You can change the "Array Name" text box at the top of Speaker Property.



Array Type

You may change the type of speaker array by selecting an array type in the list box. For arrays not displayed in the list box, select "Import Array Type" from the list box and import the necessary speaker array template (.ysd) from the "ARRAY_LIBRARY" folder. See chapter 4 for details.

Symmetry

When the selected speaker has a mirrored speaker array, this checkbox is checked. You cannot edit the symmetry condition here in the Property view, but only when editing the Add Speakers window. See chapter 4 for details.

Array Geometry

Enter speaker array positional parameters. You cannot create contour figures if the target points you enter coordinates for do not appear in the receiving surface of the room. The sound pressure levels are displayed.

Position

Enter the position coordinates of the speaker array. See chapter 4 for details.


Angle

Enter the angle of the speaker. See chapter 4 for details.

Splay Angle

Select the splay angle of the speaker array from the list box. See chapter 4 for details.

Previous/Next Array Geometry

Click  or select [Previous Array Geometry] or [Next Array Geometry] from the [Edit] menu to undo/redo the adjusting of the "Array Geometry" parameters (Position, Angle, Spray Angle) up to 20 times. However depending on the conditions you have set, you may not be able to return the software to its previous settings.

On Axis

Displays the positional axes and the position in relation to target points. Y-S³ does not display figures for target points outside the receiving surface.

Target Point

Displays the intersection coordinates of the axis of the speaker array and the audience area. The target point is displayed as a black square on the audience area. You may move the target point using the mouse by dragging the target point on the Aspect View. Target points for each speaker appear in black when viewed in "Single Mode", and cannot be moved. The target point is not displayed when the axis of the speaker array does not hit the audience area. This may be due to the speaker not facing the receiving surface, or being placed so that its z-coordinates are the same as those of the receiving surface.

Distance to Array

Displays the distance between the speaker array position and the target point.

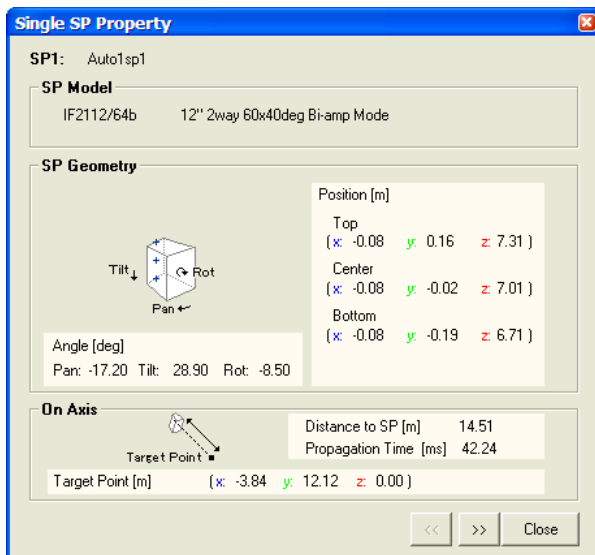
Propagation Time

This parameter denotes the propagation time from the speaker array position to the target point. You can refer to this information when deciding the delay time for each speaker.

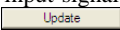
Single SP Property

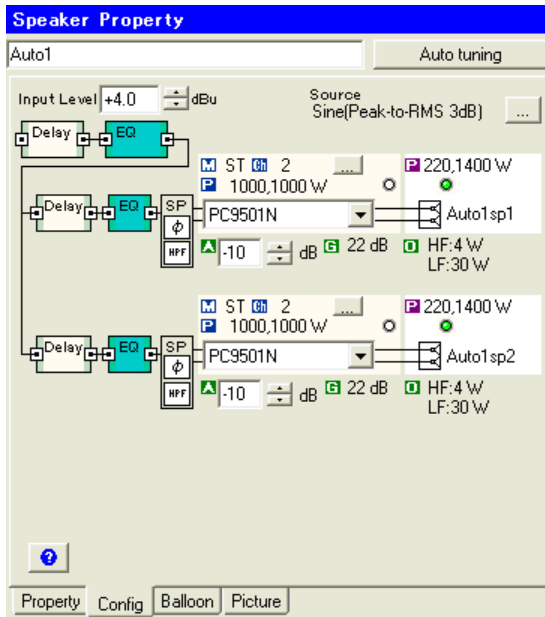


This parameter denotes the properties of the single speakers which construct a speaker array. You can check each individual speaker's information such as model number, location, angle, target point coordinates, distance between target point and speaker, etc.



- **Output configuration settings (Speaker Property - Config)**


Y-S³ automatically generates the output system configuration to suit each speaker array type and displays them in the Config view in Speaker Property. You may adjust the input signal level, source type, delay, EQ, speaker processor and amp model. To reflect the settings in calculation results, click .




Input Level

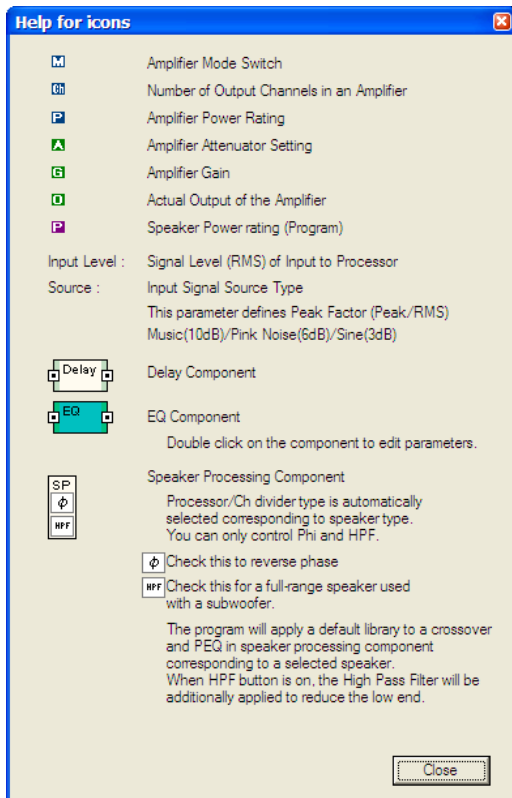
Input the input signal level in dBu. This level denotes the signal level at the input of the processor. The maximum is 24 dBu and the minimum is -10 dBu.

Source


Display the type of sound source used. You can select “Sine (Peak-to-RMS 3dB)”, “Pink (Peak-to-RMS 6dB)”, or “Music (Peak-to-RMS 10dB)”. To change your selection, click  to open the Project Properties window, then select a type from the “Peak Factor of Source Signal” list box. “Sine” has a 3 dB difference between the peak signal and RMS, “Pink” has 6 dB and “Music” has 10 dB. Select the peak-to-RMS level setting you want to use in your design. These levels are used by the clip level indicator and for auto tuning. See “Clip indicator” and “Auto tuning” in this chapter.

Help for icons


Click  to open the Help for icons window, which explains the meanings of the buttons in the Config view.



Delay Component


Double-click  to display the delay setting window. Refer to the end of this chapter for information on the delay setting window.


EQ Component

Double-click  to display the EQ setting window. Refer to the end of this chapter for information on the EQ setting window.

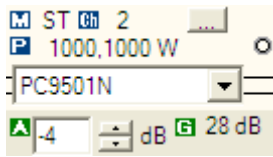
Speaker Processing Component









Click  to turn phase-rotation on/off.

Click  to turn the 90 Hz cut-off frequency high-pass filter on/off. Use this when combining full-range speakers with subwoofers.


Power Amplifier

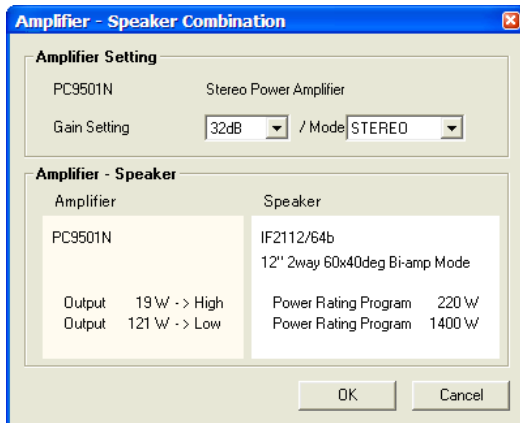


Select a power amplifier from the list box. The specifications of compatible types appear, as follows.

-  Mode display: Stereo and bridge details for the selected amplifier are displayed.
-  Output channels
-  The value shows the maximum output power of the amplifier. The value is under the conditions of 120 V and 1% distortion for a 20 Hz to 20 kHz input. This value is used by the clip level indicator. SPL distribution or frequency response does not depend on the power voltage. The specifications of amplifiers are available at <http://www.yamahaproaudio.com/>. The level at which the clip indicator lights depends on the power voltage of the amplifier. You can set the power voltage under System in the Project Properties window.
-  Clip indicator (circle above power amplifier list box): The indicator turns red when the peak output signal exceeds the maximum output power of the amplifier. When "Sine" is selected in the "Source" list box, the peak output signal is 3 dB (two times) higher than the actual output value. When "Pink" is selected, the peak is 6 dB (four times) higher. The peak output capacity of the amplifier is 3 dB (two times) higher than the actual power value. Comparing these values, the indicator shows whether the output signal is within the capacity.
-  Input an attenuation level for the power amplifier in dB. Maximum is 0 dB and the minimum is -60 dB.
-  The value shows the gain of the selected amplifier with the entered attenuation value.

Amplifier - Speaker Combination

Click  to open the Amplifier - Speaker Combination window.



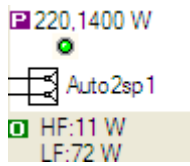
Amplifier Setting




The amplifier gain settings appear, and you can change between stereo and bridge connection modes.

Amplifier - Speaker

Display RMS values and speaker specifications for the amplifier.

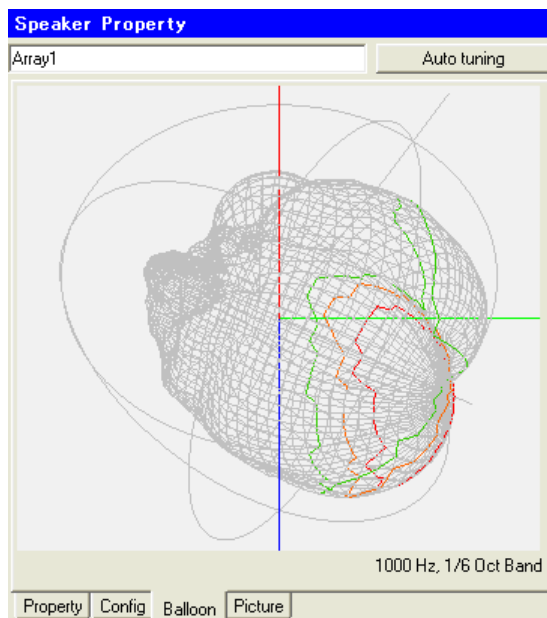
Speaker



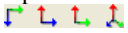

-  The value shows the maximum input power of the speaker with the program signal.
-  The value shows the current output power of the amplifier (HF/LF). This power is fed to the speaker.
-  Speaker clip indicator: The indicator turns yellow when the peak current output power exceeds the maximum input power of the speaker. When "Sine" is selected in the "Source" list box, the peak current output power is 3 dB (two times) higher than the actual output value. When "Pink" is selected, the peak is 6 dB (four times) higher and the peak is 10 dB (ten times) higher for "Music". The peak input capacity of the speaker is 3 dB (two times) higher than the power rating program value. Comparing these values, the indicator shows whether the current output power is within the capacity of the speaker.

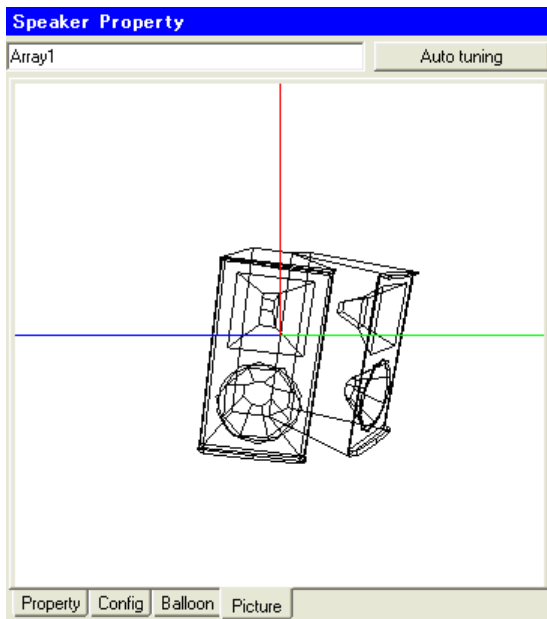
- **Directivity of speaker array (Speaker Property - Balloon)**

You may check the directional pattern (balloon data) of the speaker array selected in Speaker List for each of the frequencies selected. The data is displayed in the Balloon view in Speaker Property. These figures are normalized to the on-axis response. Each of the contour figures for -3 dB, -6 dB and -9 dB for on-axis characteristics are displayed in red, yellow and green respectively. The view angle of the Balloon view is synchronized with Aspect View.




- **Picture of speaker array (Speaker Property - Picture)**

You may check the 3D diagram of the speaker array selected in the Speaker List in the current settings. When you open the Picture view, the view angle is synchronized with Aspect View. Click  and  in Aspect View to check speaker placement visually.

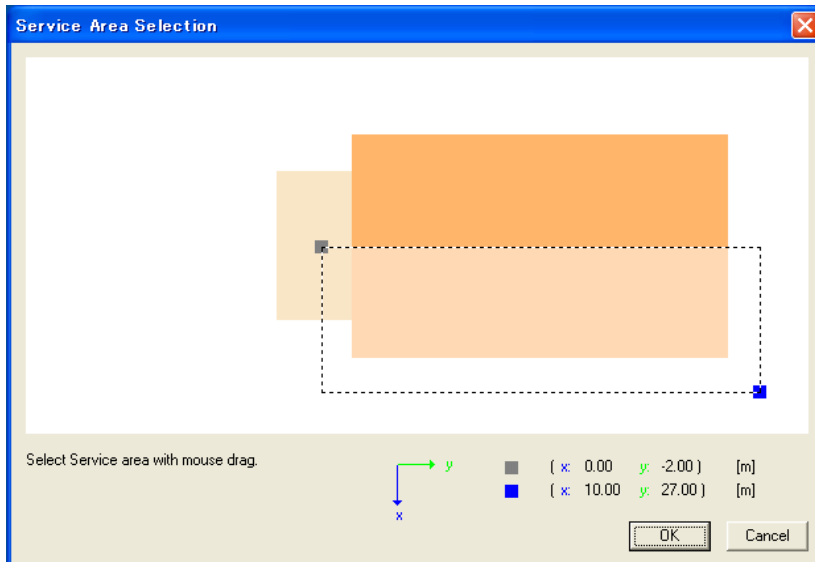



- **Auto tuning**

Set the service area on the receiving surface for each installed speaker array, and to automatically adjust the angle, splay angle, EQ, and other figures you have entered, while leaving the speaker arrays in the position you assigned them. This is applied to those speakers that are selected in Speaker List and appear in Speaker Property. Although you cannot select mirrored speaker arrays, they will be moved and their EQ settings changed to match those of their mirror originals.

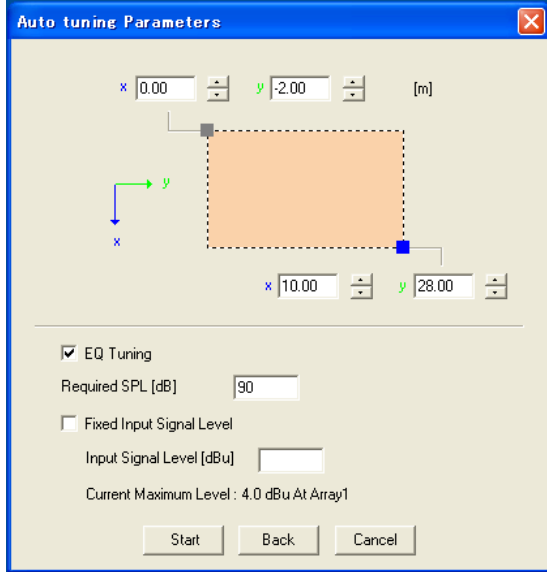
Click  in Speaker Property to open the Service Area Selection window.

Service Area Selection



Select the area to be served by the currently selected speaker array by dragging on the audience area with the mouse. The selected area turns to a lighter color even when outside of the audience area is selected, but only the area within the audience area will be used for the calculation. Stage, wall or outside of the floor will not be used. This diagram shows an example of a configuration which has been made taking account of the service area of mirrored speaker arrays installed in the y-z plane. Click  to open the Auto Tuning Parameters window.

Auto Tuning Parameters



You can enter the coordinates of the area you want to service. An error message appears if the area you designate is too small or does not match the conditions of the speaker array.

Required SPL

Enter the overall sound pressure level necessary at the target point of each single speaker. Where the sound pressure required is too large for the system, you may not be able to meet the required sound pressure levels.

EQ Tuning

Check this checkbox to adjust EQ.

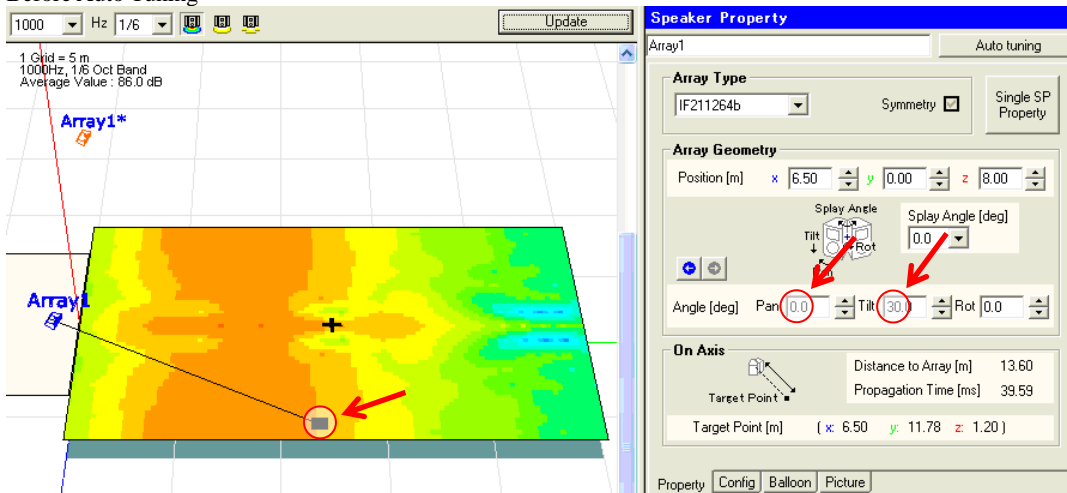
Fixed Input Signal Level

Place a check in this checkbox to lock the input level for the selected speaker array outputs (Input Levels in the Config view), and input a setting.

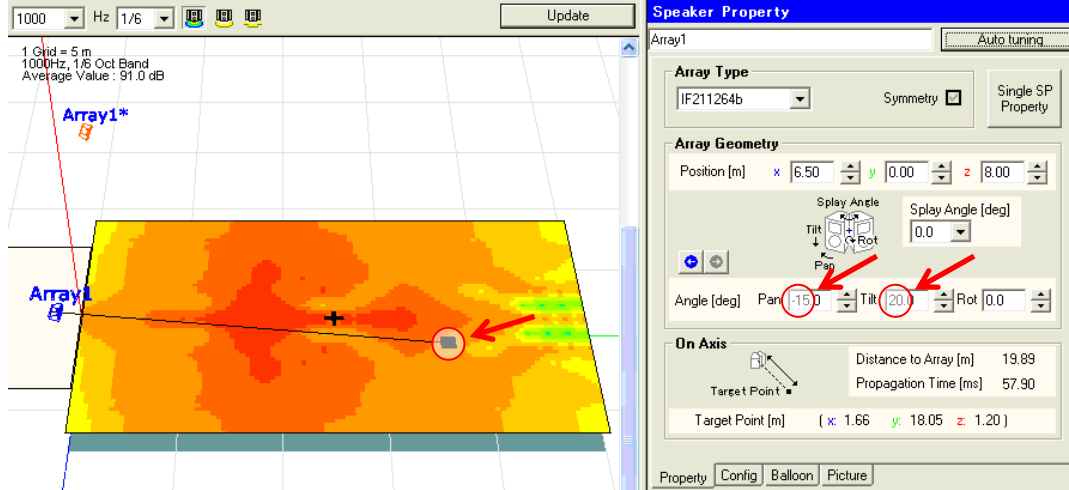
Enter the calculation conditions, and press **Start** to calculate the results and update the Property and Config views in Speaker Property.

The following diagrams depict the differences before and after auto-tuning speaker arrays (included mirrored speaker arrays) in area setting above.

Before Auto Tuning



After Auto Tuning



Setting methods

- Y-S³ sets speaker parameters for each speaker array.
- Y-S³ decides the speaker angles (Pan, Tilt and Splay Angle) to minimize the standard deviation of the sound pressure level within the area that is selected by the user as the coverage of the speaker array.
- When computing angles, the proper setting is selected from among the conditions in which all of the target points of the speaker composing the speaker array are within the selected cover area.
- Y-S³ decides the EQ and gain for each speaker so that the frequency responses are flat and their levels match the required SPL set by the user at the target points of each speaker that composes the speaker array. (Note 1: In auto tuning, since sound pressure level calculations at axis points are computed based on the summing of energy, peaks/dips from interference are not corrected. Note 2: Delay is not tuned automatically. All the delays are set to 0 ms after auto tuning.)
- In the level adjusting, Y-S³ first decides the necessary output power for each speaker referring to the required SPL. Then, Y-S³ decides the attenuation level to adjust the necessary power difference between the speakers in one speaker array. Finally, Y-S³ decides the input signal level from the necessary output power and amplifier gain.

5-2. Distributed Speakers

- **Distributed speakers on/off, changing names/deletion, adding speakers to an installation plane**

Distributed speakers on/off

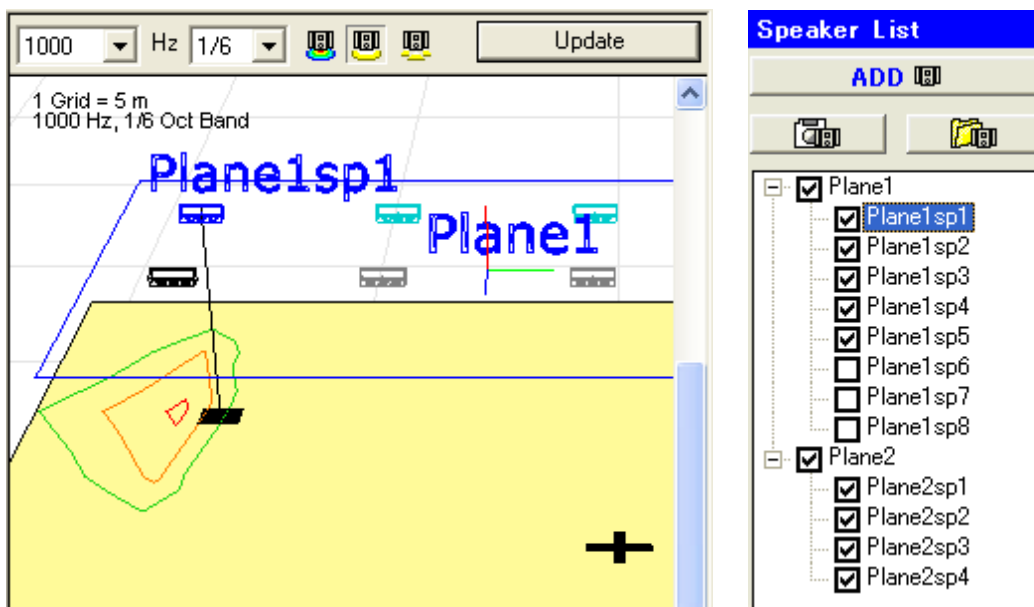
Click the name of a plane in Speaker List to select it. The background of the name changes to color to blue. Speakers assigned to this speaker group on the selected plane are displayed. Planes selected in Aspect View are displayed in blue. Additionally, the properties are displayed in Speaker Property. To designate all speakers on each plane, or individual speakers as targets for calculation, select the desired plans in Speaker List, or select each speaker individually, place a check in the appropriate checkbox, and turn them on. All selected speakers appear in blue regardless of the on/off status of their checkboxes. Speakers in the same output series appear in light blue. Speaker arrays with checkboxes set to “on” appear in black in Aspect View. Speaker arrays with checkboxes set to “off” appear in grey, and are not targeted for calculation. Click to apply your settings.

Additionally, you can also select click individual speakers, or the central coordinates of planes in Aspect View, to select them.

Changing names/deletion, adding speakers to installation planes

Right-click a plane. This menu allows you to change names plane names (Rename), delete planes (Delete), and add speakers to planes (Add Speaker). Alternatively, right-click on each speaker to open a menu. You can use this menu to rename or delete speakers. You can also select [Change Amp] to open the Amplifier - Speaker Combination window. For more information, refer to “Adjusting distributed speakers property (Speaker Property - Property)” in this chapter.

Distributed speakers located on a plane are treated as part of a plane, and cannot be saved in the manner of array speakers.

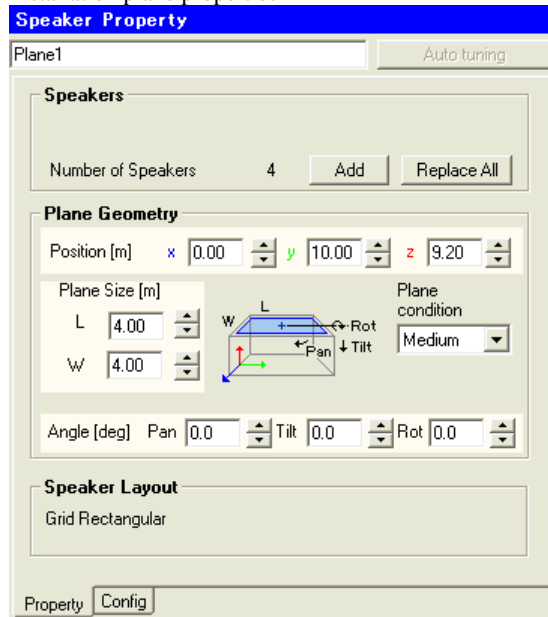


- **Adjusting distributed speaker parameters (Speaker Property - Property)**

Adjust the parameters for the currently selected distributed speaker. To reflect the settings in calculation results, click .

You can change the name of the installation plane in the "Speaker Name" text box in the upper area of Speaker Property.

Installation plane properties



Speakers

Click to add a speaker at the center of a plane. Enter the coordinates and other parameters as necessary.

Click to display the Add Speakers window and replace all speakers and planes.

Plane Geometry

Enter the defining parameters for the plane you want to place.

Position

Enter the coordinates of the center of the plane. Default settings are $x = 0.00$, $y =$ a figure determined by room shape, $z =$ receiving surface + 8.00.

Plane Size

Enter the size of the plane. Default settings are $L = 10$ m, $W = 10$ m.

Plane condition

Select the reflectance of the wall surface (Hard: 100%, Medium: 50%, Transparent: 0%). You can set this parameter to "Hard" or "Medium" to take the effects of rising acoustic pressure into consideration when placing speakers close to a plane. However, this calculation will not take sound from speakers installed on this plane into effect.

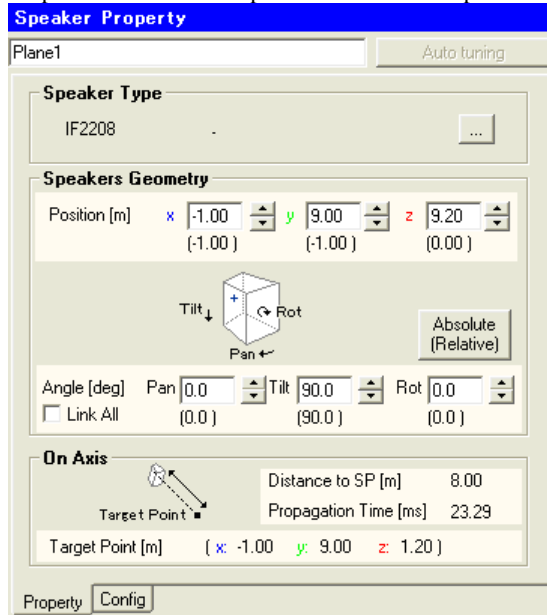
Angle

Enter the angle of the plane. You can set Pan, Tilt and Rot.

Speaker Layout

Displays the speaker installation method and layout.


Properties of individual speakers installed on a plane



Speaker Type

Displays the type of speaker installed.

Amplifier - Speaker Combination

Click  to open the Amplifier - Speaker Combination window. For details please see the next section in this chapter, “Output Configuration Settings (Speaker Property - Config)”.

Speakers Geometry

Enter data related to speaker positioning, such as speaker coordinates.

Position

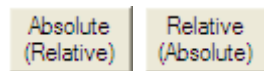
Adjust the coordinates of the speaker array. See chapter 4 for details.

Angle

Enter the angle at which the speaker is installed. See chapter 4 for details.

You can select “Link All” to link all selected speakers with all speakers on the installation plane, and change the installation angle of all speakers simultaneously. This function is not available in Aspect View when moving target points with the mouse and changing angles

Absolute/Relative



Click the [Absolute] button to display absolute coordinates, or the [Relative] button to display coordinates relative to the installation plane.

Absolute:

The absolute location and angle of the speaker

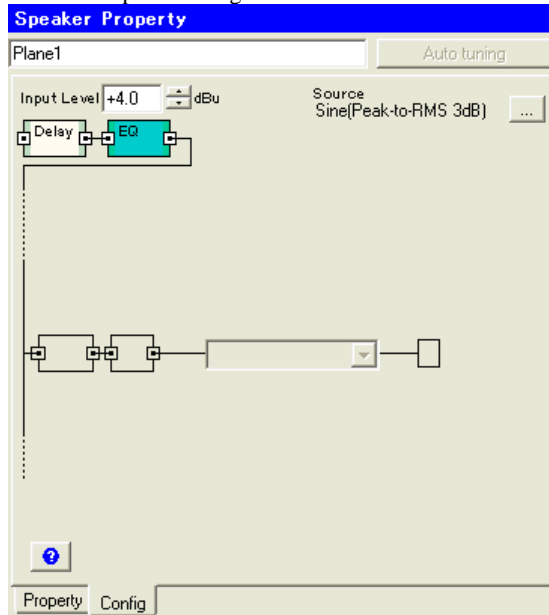
Relative:

The location and angle of the speaker relative to the installation plane

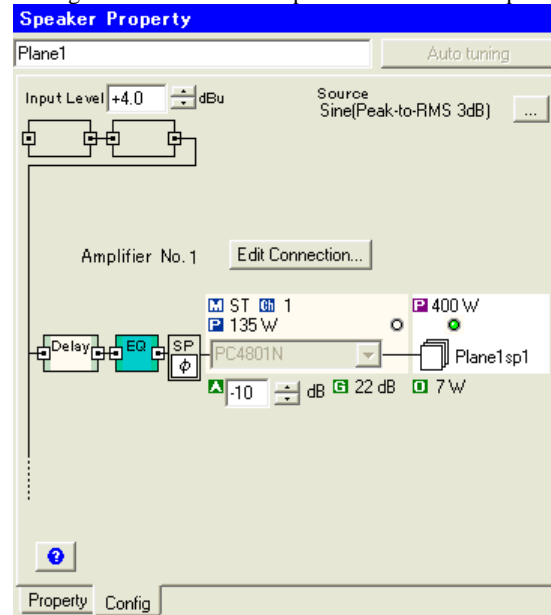
• **Output configuration settings (Speaker Property - Config)**

Y-S³ automatically generates the output system configuration to suit each speaker array type and displays them in the Config view in Speaker Property. You may adjust the input signal level, source type, delay, EQ, speaker processor and amp model. To reflect the settings in calculation results, click . For details, see “Output configuration settings (Speaker Property - Config)” in the “5-1. Array Speakers” section.

Installation plane configuration

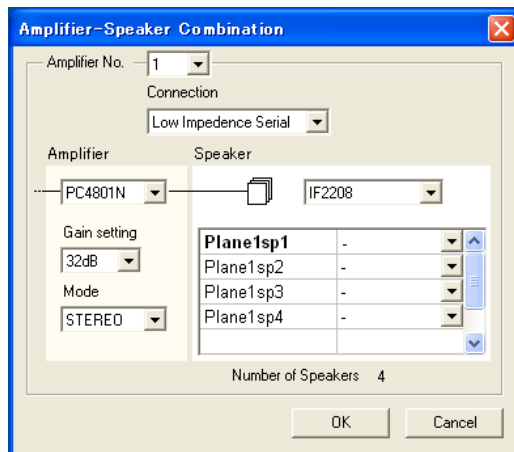


Configuration of individual speakers installed on a plane



Amplifier - Speaker Combination

Click to open the Amplifier - Speaker Combination window. You can use the list boxes to select and change amplifier type and gain, mode settings, connection method, and speakers. You can also select the amplifier number of a selected speaker to combine it with a particular amplifier. To prevent erroneous connections, when you press , Y-S³ checks that speakers and amplifiers are connected appropriately. If Y-S³ deems a configuration incorrect, it displays a warning dialog.



Chapter 5 closing material: Speaker Config

Delay Component

Drag the dial or type in a number to specify the necessary delay time (ms). The delay parameter in this window is used in the calculation. Click **Update** at the top right of the delay setting window to reflect the settings in calculation results.



EQ Component

Drag the dial or type in a number to specify the necessary Q value, frequency and gain. You can select EQ types for two of the eight settings. The EQ parameter in this window is used in the calculation. Click **Update** at the top right of the EQ setting window to reflect the settings in calculation results.



6. Displaying Calculation Results

- **Overview**

Y-S³ calculates responses on the audience area considering the arrangement of each speaker array, EQ, delay, system attenuation and other related parameters. The results are displayed in Aspect View or Graph.

Aspect View

Aspect View displays the layout of the speakers, along with sound pressure distributions and contour figures based on calculation results. To update calculation results, select the center frequency and bandwidth (1/1, 1/3, 1/6, FFT) from the list box in the upper section of Aspect View, then select the calculation mode icon. If you set bandwidth to "FFT", you must enter the bandwidth you want in the list box. Clicking after changing calculation conditions applies the new conditions to the calculation results and updates Aspect View, Balloon view and Graph.

- **Contour figure**

Y-S³ displays the contour figure for -3 dB, -6 dB and -9 dB for the target point of the speaker array or component speaker currently selected in Aspect View. The contour figure displays three lines indicating -3 dB (red), -6 dB (orange) and -9 dB (green) drops in sound pressure from the target point. You can turn the display for each line on and off in from the [View] menu. These figures are the bandwidth and center frequency figures selected in the list boxes in the upper area of Aspect View. When speakers are mounted on the floor, the contour figure is not available when the target point is not located on the receiving surface or in an enclosed space. Additionally, Y-S³ does not display target points or contours of speaker arrays placed using the "Symmetry" function in "Enclosure type - Auto layout" and "Enclosure type - Manual layout". To display contour figures for walls, open the Project Properties window from the [File] menu, and place a check in the "Contour Display" checkbox in Others. Y-S³ does not display a sound pressure distribution for walls. This wall is used for display the contour figure only, and is treated as being acoustically transparent. Thus calculations to do take reflections from this wall into account.

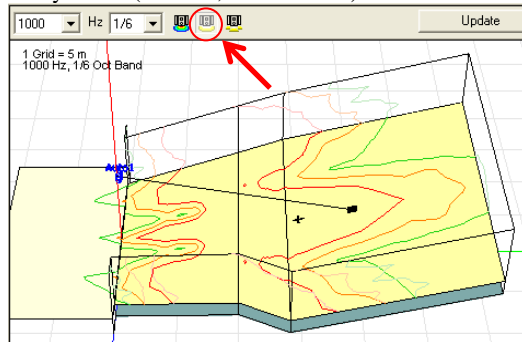
Array Mode

Displays a contour figure for speakers displaying target points. A speaker array made up of a single speaker will have the same display as "Single Mode". Speakers distributed on a plane are treated as individual speakers, and thus have the same display as "Single Mode".

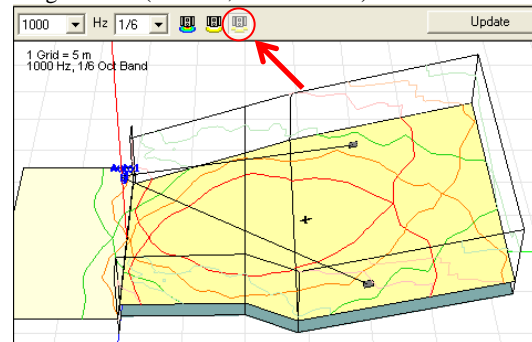
Single Mode

Displays a contour figure for each speaker displaying target points. When you have placed multiple speakers, you can use the checkboxes in Speaker List to turn each speaker on/off. Since the contour figures for each speaker are calculated relative to the respective target points, the SPL for each speaker will be different even for contour lines of the same color.

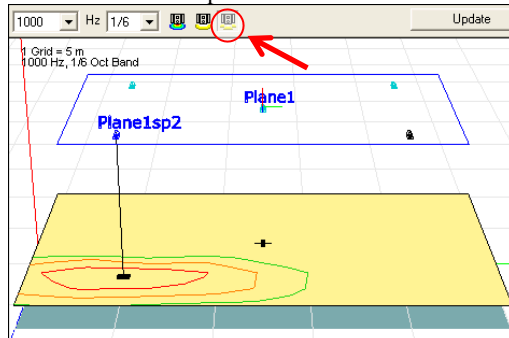
Array Mode (1000Hz, 1/6Oct Band)



Single Mode (1000Hz, 1/6Oct Band)



For installation on a plane



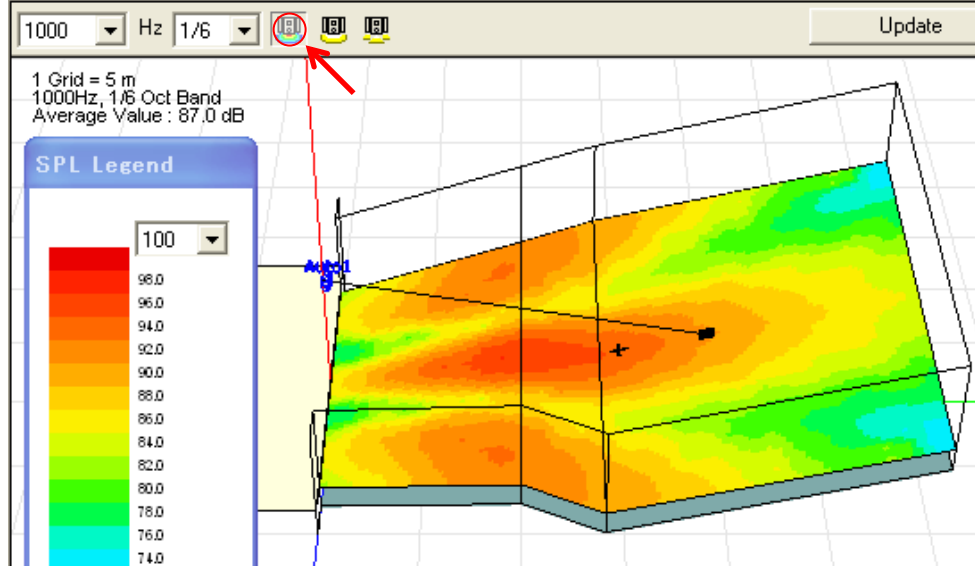
• **Sound pressure distribution**

Displays sound pressure distribution for receiving surfaces with speaker arrays selected from the checkboxes in Speaker List, and displays the range (dynamic range) using a Sound Pressure Level (SPL) legend. The display range for the SPL legend is automatically applied through calculation. After display, you can select the minimum and maximum figures in the display range from the list boxes. The average SPL (speaker pressure level) for the receiving surface is displayed at the top left of the Aspect View.

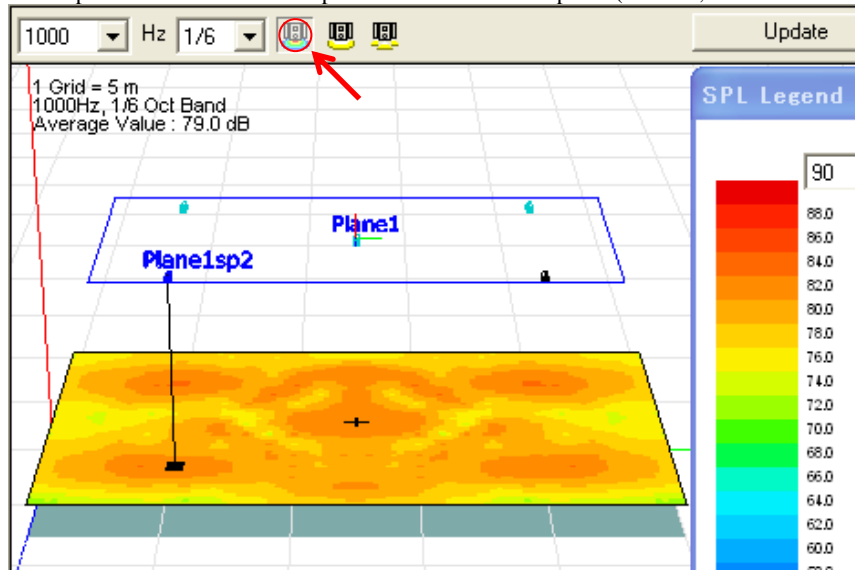
 **SPL Mode**

Displays a sound pressure distribution in Aspect View for all speakers selected in the Speaker List checkbox.

Sound pressure distribution for a speaker array (1000Hz, 1/6 Oct Band, Average Value: 87.0dB)

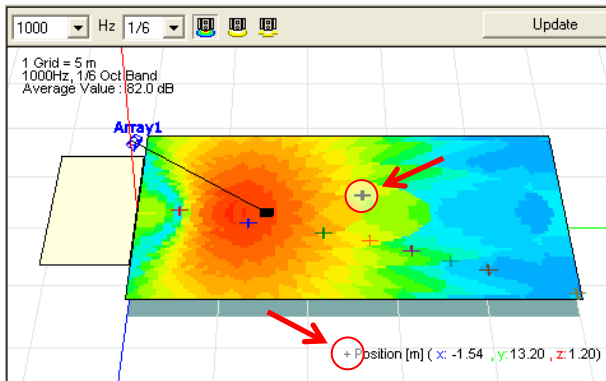


Sound pressure distribution for speakers distributed on a plane (1000Hz, 1/6 Oct Band, Average Value: 79.0dB)

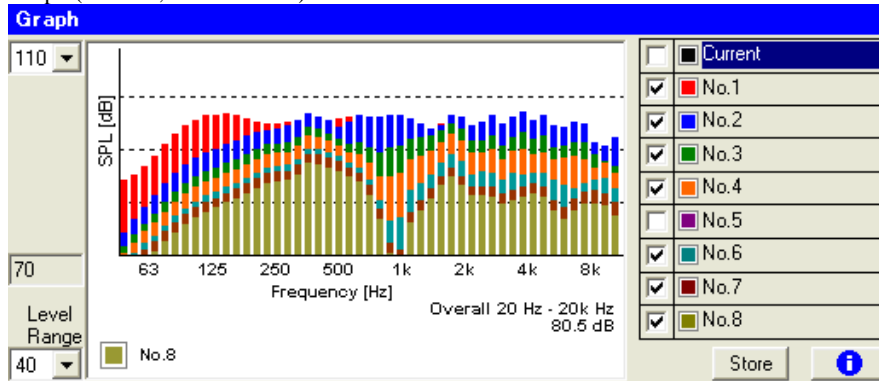


• **Frequency characteristics**

The graph displays the current calculation results (Current) for a +Position on receiving surface. You can use the list box to change the bandwidth of the graph displayed. In “Array Mode” and “Single Mode”, the Graph displays only the response of the speaker selected in Speaker List. However, the “on/off” staff of the speaker (based on the “on/off” status of the checkbox) is also displayed. In “SPL Mode”, the graph displays combined responses of all speakers set to on. To move the cursor, drag the +Position cursor in Aspect View using the mouse. The current position of the +Position cursor is displayed at the bottom right of Aspect View. Click the right-mouse button to open an Information window with detailed information related to the current position of the cursor.

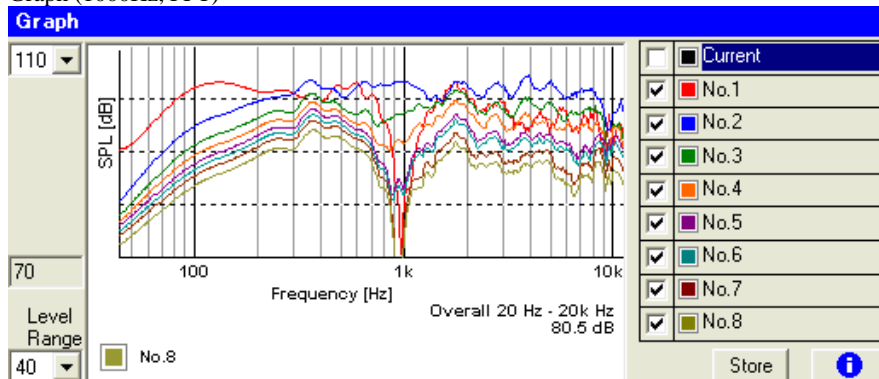



Graph (1000Hz, 1/6 Oct Band)

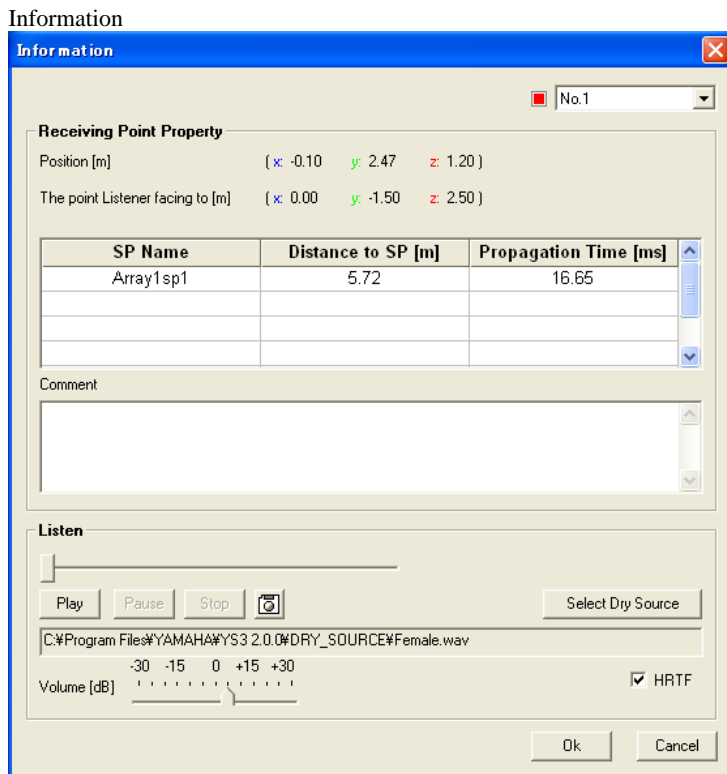


The graph displays the current calculation results (Current) for a +Position on the receiving surface. Drag the +Position cursor with your mouse to see the calculation results for a given point on the receiving surface. At the desired receiving point, select a graph number (e.g. No.1), and click . The graph changes color and the current results (Current) are saved to the selected graph number. You can save calculation results for up to 8 points on the graph. Right clicking a graph number opens a menu from which you can change names, save and delete data, and display and information window. Select a graph number to display the appropriate graph in Graph. You can also use the on/off checkboxes to hide or display each graph. You can use the list boxes to select the maximum display figure and range and change the display range of the graph.

Graph (1000Hz, FFT)



Click  to open an Information window displaying details on the graph number selected.



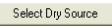
Click a graph number in the list box to change the graph number for which information is being displayed. You cannot select graph numbers for which no data has been saved.




Receiving Point Property


The distance display displays the distance between the location of the targeted speaker and the console. You can enter comments in the “Comment” box.

Listen

You can test-listen to how a dry source would sound when heard at the receiving point, based on the results of your calculations.

Click  to select the dry audio source to be convolved with the calculated response. The dry source must be in 44.1 kHz, 16-bit WAV (PCM) and stereo format. The maximum data size is 5 minutes (about 50 MB) in this format.

Click  to play the calculated audio sound. Click  to stop playing,  to pause playing. You can also set the playback volume with the slider. You can adjust a level difference when comparing responses from different calculation conditions.

Click  to save the sound as heard at the receiving point. Y-S³ stores audio data in 44.1 kHz, 16-bit WAV (PCM) and stereo format.

You can set the “HRTF” checkbox to “on” to listen to the sound with HRTF (head-related transfer functions) applied. You can apply a directional effect so that the sound appears to be coming from a predefined direction.

7. Simulation Results Report

- **Overview**


Y-S³ can save calculation results as reports and data for use as reference material. Select [Export] from the [File] menu. You can save data in a variety of formats. Select [Product List] from the [Option] menu to save a list of the equipment used in the project.

- **Project report**

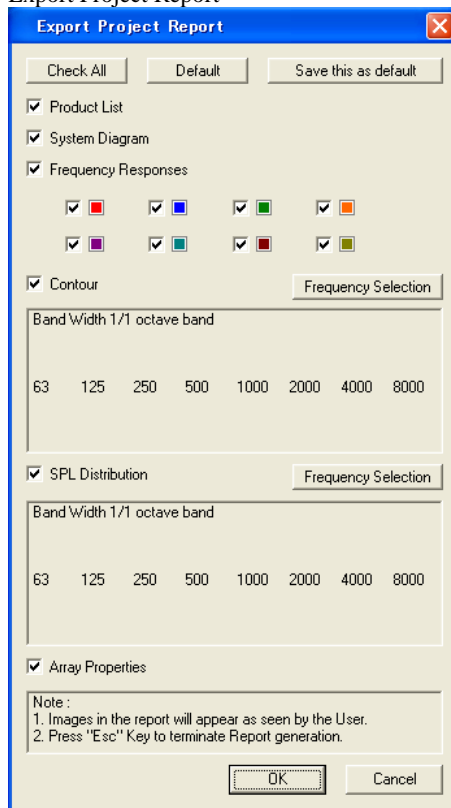
You can save a project report which outputs a variety of data (including the following), in HTML format.

- Project Summary: An overview of the project
- Project Geometry: Room type and size
- Product List: A list of equipment used
- System Diagram: Signal processor, amplifiers, and speaker composition
- Frequency Responses: Coordinates for each receiving point and frequency response graphs
- Contour Map: A contour figure for the specified frequencies
- SPL Color Map: A sound pressure layer map for the specified frequencies
- Array Properties: The properties of installed speaker arrays and distributed speaker

- **Generating and saving project reports**

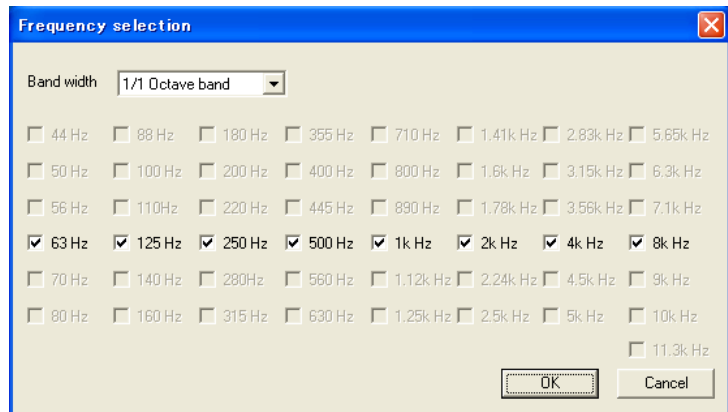
Click  in the tool bar to generate and save a project report file in HTML format. Select [Export] from the [File] menu, these select [Project Report] to open the Export Project Report window.

Export Project Report



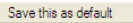

The 'Export Project Report' dialog box contains the following sections:

- Buttons: Check All, Default, Save this as default
- Product List: Product List
- System Diagram: System Diagram
- Frequency Responses: (with 8 color-coded checkboxes)
- Contour: Contour (with a Frequency Selection button)
- SPL Distribution: SPL Distribution (with a Frequency Selection button)
- Array Properties: Array Properties
- Note:
 1. Images in the report will appear as seen by the User.
 2. Press "Esc" Key to terminate Report generation.
- Buttons: OK, Cancel



The 'Frequency selection' dialog box contains the following sections:

- Band width: 1/1 Octave band (dropdown menu)
- Frequency grid: A grid of checkboxes for frequencies from 44 Hz to 11.3k Hz.
- Buttons: OK, Cancel

Place a check in the checkboxes of those fields you want to export. Use the Frequency Selection window to change the frequencies and bandwidths of the contour and sound pressure distributions if desired. You can click  to save these as the default settings for exporting project reports. Click  and enter a file name to initiate generation and saving of the project file report. Push the Esc key to cancel creation of the report.

Note that the following characters and "space" cannot be used for file names.

; / ? : @ & = + \$, < > # % " } | ¥ ^ [] ` *`

- **Saving text data**

You may save speaker conditions and calculation results as text data in CSV format. CSV format can be imported into spreadsheet applications such as Microsoft Excel®.

SPA Property

You may save all the information for the speaker arrays as text data (in CSV format). Select [SPA Property] from [Export] in the [File] menu to save SPA property.

SPL Data

You may save currently displayed sound pressure distribution results in Aspect View as text data (in CSV format). Select [SPL Data] from [Export] in the [File] menu to save the data.

Graph Data

You may save current and stored frequency characteristic results in Graph as text data (in CSV format). Select [Graph Data] from [Export] in the [File] menu to save the data.

- **Saving images**

You may save results of calculations displayed in Aspect View and Graph as image data (in JPEG format).




Image of Aspect View

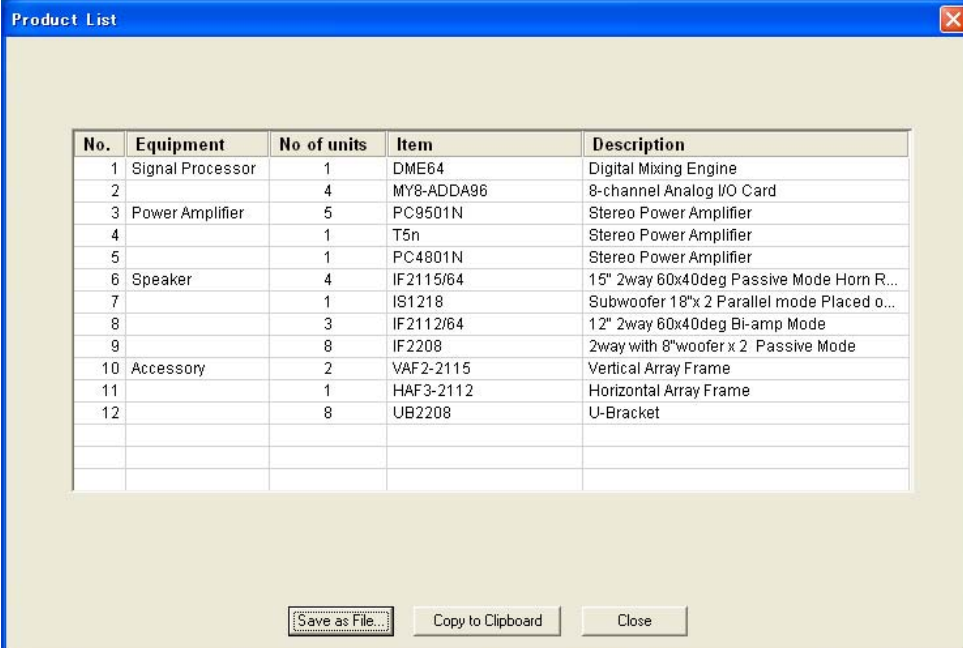
You may save the currently displayed sound pressure distribution or contour figure in Aspect View as image data in JPEG format. Select [Image of Aspect View] from [Export] in the [File] menu to save the data.

Image of Graph View

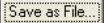
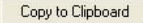
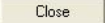
You may save the currently displayed frequency characteristic in Graph as image data in JPEG format. Select [Image of Graph View] from [Export] in the [File] menu to save the data.

- **Saving product list**


Y-S³ creates a product list including all placed speaker arrays and accompanying devices such as amplifiers, DME and array frames. Click  in the tool bar or select [Product List] from the [Option] menu to display the product list. You may also save the contents of this list as text data (in CSV format). To save the file, click  in the "Product List" window and enter a file name. To copy the text of the product list to the clipboard, click .

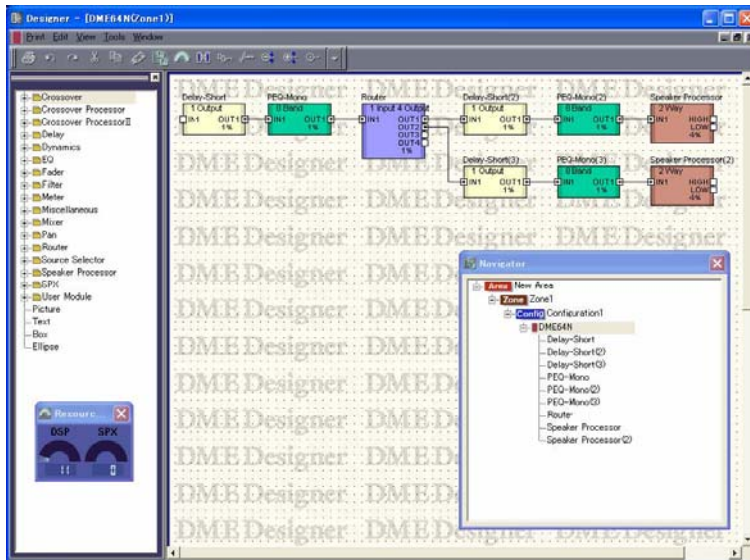


No.	Equipment	No of units	Item	Description
1	Signal Processor	1	DME64	Digital Mixing Engine
2		4	MY8-ADDA96	8-channel Analog I/O Card
3	Power Amplifier	5	PC9501N	Stereo Power Amplifier
4		1	T5n	Stereo Power Amplifier
5		1	PC4801N	Stereo Power Amplifier
6	Speaker	4	IF2115/64	15" 2way 60x40deg Passive Mode Horn R...
7		1	IS1218	Subwoofer 18"x 2 Parallel mode Placed o...
8		3	IF2112/64	12" 2way 60x40deg Bi-amp Mode
9		8	IF2208	2way with 8"woofer x 2 Passive Mode
10	Accessory	2	VAF2-2115	Vertical Array Frame
11		1	HAF3-2112	Horizontal Array Frame
12		8	UB2208	U-Bracket

Buttons:   

8. Exporting Configurations in DME Designer Format

Y-S³ can automatically generate an output system configuration for all placed speaker arrays and save them in DME Designer Project format. Click  in the tool bar or select [DME Configuration... (*.daf)] from [Export] in the [File] menu and enter a file name; the configuration is saved in DME Designer Project format (.daf). You may open the .daf file from DME designer software. The .daf file includes the necessary number of processors and configurations for the placed speaker arrays. You may also export the configuration as Device Configuration file. Select [DME Configuration... (*.ddf)] from [Export] in the [File] menu and enter a file name; the configuration is saved in Device configuration file format (*.ddf). To load the file into DME Designer software, start DME Designer, select [Create New Group] from [Import Device Configuration] in the [File] menu on the main screen, and load the saved file. You may also import the configuration to the matched DME in your system configuration made in DME designer. In DME Designer, select the processor from [Import Device Configuration] in the [File] menu on the main screen, and load the saved file. You may download DME Designer from <http://www.yamahaproaudio.com/>.



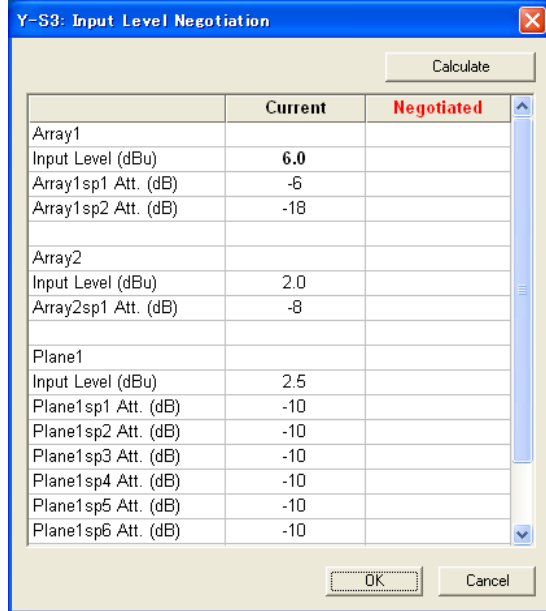
9. Other Functions

- **Input Level Negotiation**

Adjust input levels (Speaker Property - Config - Input Level) from all installed speaker arrays to a fixed level.

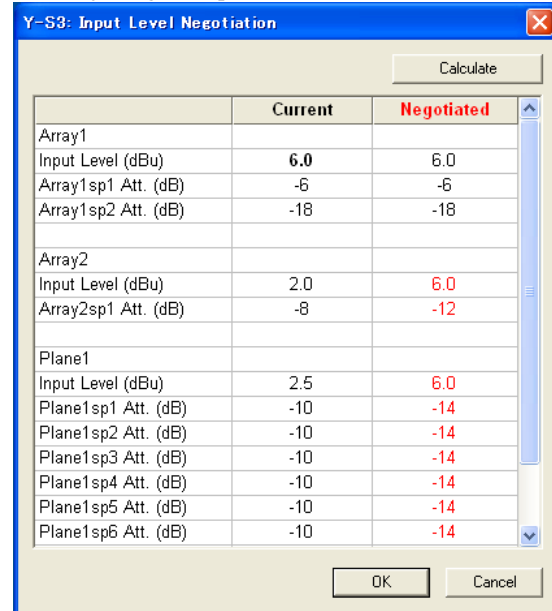
Select [Input Level Negotiation] from the [Option] menu to open the Y-S³: Input Level Negotiation window. The current input level (Input Level (dBU)) for each array and the attenuator settings for each amplifier connected to the speakers in the array are displayed in the Current column. The highest level of those displayed appears in bold. Click to standardize all related figures to this level. Y-S³ adjusts the amplifier attenuators at the same time so that the output to all speakers remains the same. This is useful when working with smaller mixers that are not equipped with multiple output busses.

Before adjusting the input level



	Current	Negotiated
Array1		
Input Level (dBU)	6.0	
Array1sp1 Att. (dB)	-6	
Array1sp2 Att. (dB)	-18	
Array2		
Input Level (dBU)	2.0	
Array2sp1 Att. (dB)	-8	
Plane1		
Input Level (dBU)	2.5	
Plane1sp1 Att. (dB)	-10	
Plane1sp2 Att. (dB)	-10	
Plane1sp3 Att. (dB)	-10	
Plane1sp4 Att. (dB)	-10	
Plane1sp5 Att. (dB)	-10	
Plane1sp6 Att. (dB)	-10	

After adjusting the input level



	Current	Negotiated
Array1		
Input Level (dBU)	6.0	6.0
Array1sp1 Att. (dB)	-6	-6
Array1sp2 Att. (dB)	-18	-18
Array2		
Input Level (dBU)	2.0	6.0
Array2sp1 Att. (dB)	-8	-12
Plane1		
Input Level (dBU)	2.5	6.0
Plane1sp1 Att. (dB)	-10	-14
Plane1sp2 Att. (dB)	-10	-14
Plane1sp3 Att. (dB)	-10	-14
Plane1sp4 Att. (dB)	-10	-14
Plane1sp5 Att. (dB)	-10	-14
Plane1sp6 Att. (dB)	-10	-14

10. General Theory

General calculation methods

- Y-S³ computes the speaker array response at the receiving point or audience area.
- The responses are computed by combining the responses from each speaker based on a geometrical simulation.
- Each speaker response is computed using measured directional impulse responses. First by selecting the impulse response for the corresponding direction based on the relationship between the receiver point and the speaker position, and then considering the effects of attenuation by distance, air absorption, amplifier type, system attenuation, and processor settings (EQ, delay).
- There are two methods of combining responses: a method that considers the interference and a method that is based on the summing of energy and not taking the interference into account.
- The response is limited to direct sound. Calculations are performed as for a free sound field without any reflections.
- The sound pressure level is calculated assuming sine wave or pink noise input to the system.
- There are two types of pink noise: band-pass filtered noise for the “Swept Band Noise” option or overall noise for the “Full Band Noise” option.
- The response for the two channels used in auralization is computed by first convolving the head-related transfer function (HRTF) of the directions corresponding to each speaker's response, and then combining these responses.

Auto setting methods

- There are two auto setting functions. “Auto layout” selects the appropriate speakers for the current room configuration, and “Auto tuning” determines the parameters (Angle, EQ, Amp type, Input Level and Attenuation) for each speaker.
 - The results for each function are only rough estimates, and adjustments or modifications will be necessary for either method. Calculations are made based on the following theory.
1. Auto layout
 - Y-S³ selects the speaker type that is appropriate for the configuration of the room, its area, and the dimensions of the floor.
 - Speaker positioning is conducted in accordance with the speaker arrangement methods (Center, Center + Side, Side) while considering the ceiling height of the room.
 - Angles are set to default: Pan and Rot = 0 degrees, Tilt = 30 degrees and Splay Angle = minimum.
 2. Auto tuning
 - Y-S³ sets speaker parameters for each speaker array.
 - Y-S³ decides the speaker angles (Pan, Tilt and Splay Angle) to minimize the standard deviation of the sound pressure level within the area that is selected by the user as the coverage of the speaker array.
 - When computing angles, the proper setting is selected from among the conditions in which all of the target points of the speaker composing the speaker array are within the selected cover area.
 - Y-S³ decides the EQ and gain for each speaker so that the frequency responses are flat and their levels match the required SPL set by the user at the target points of each speaker that composes the speaker array. (Note 1: In auto tuning, since sound pressure level calculations at axis points are computed based on the summing of energy, peaks/dips from interference are not corrected. Note 2: Delay is not tuned automatically. All the delays are set to 0 ms after auto tuning.)
 - In the level adjusting, Y-S³ first decides the necessary output power for each speaker referring to the required SPL. Then, Y-S³ decides the attenuation level to adjust the necessary power difference between the speakers in one speaker array. Finally, Y-S³ decides the input signal level from the necessary output power and amplifier gain.