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Panaray MSA12X
Modular Steerable Array Loudspeaker

Design Guide

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Is the MSA12X the Right Choice for the Application?

When considering the Panaray MSA12X modular steerable array loudspeaker vs. the passive Panaray MA12EX modular line array loudspeaker, the MSA12X would be a good choice in the following scenarios:

Rooms that need a columnar loudspeaker installed **vertically and tight-to-the wall** for improved aesthetics, allowing the loudspeaker to visually blend into the room. Panaray MSA12X arrays do not need mechanical aiming, or pitch. They can also be mounted high on the wall, using digital steering to focus sound down to audience areas.

Difficult rooms with **high reverberation times** that need the radiation pattern control offered by digital beam steering. MSA12X arrays allow more precise targeting of audience areas, so you can decide where you want to place (and not place) the acoustic energy. This level of control leads to better direct-to-reverberant sound ratios and speech intelligibility in difficult rooms.

Rooms that require **two audience zones** to be covered by a single-column array.

Rooms that need a columnar loudspeaker **recessed into surfaces**.

Rooms with structural or design constraints that require the loudspeaker to be **installed in non-ideal locations**.

Rooms that **do not have an amplifier rack** and can benefit from using a powered loudspeaker.

Rooms that already use, or are planning to use **Dante® digital audio and control** over Ethernet-based networks.

Choosing Between 1, 2 or 3 Modules

When choosing the number of modules of an array, there are many elements to consider.

Max SPL, Throw Distance and Beam Control of Low-Frequency Content

The longer the array, the higher the maximum SPL and the longer the throw distance. Also, longer arrays can vertically and digitally steer audio content down to a lower frequency, as indicated by Beam Control Limit.

The table below is a guide for these items:

Modules	Typical Usable Throw Distance[1]	Max SPL[2]			Beam Control LF Limit
		10 m	20 m	30 m	
1	10 m (33 ft)	97 dB	91 dB	88 dB	500 Hz
2	25 m (82 ft)	100 dB	96 dB	94 dB	250 Hz
3	35 m (115 ft)	101 dB	97 dB	95 dB	160 Hz

[1] Typical Maximum Usable Throw Distance includes considerations for reverberation and speech intelligibility.

[2] Max SPL calculated based on free-field (no boundary loading gain) sensitivity, exclusive of power compression, and without beam steering, spreading or smoothing functions applied.

All calculations based on typical conditions with complex acoustic summation by Bose Modeler software; many competitor specifications based on less accurate, distance-loss approximations.

For applications that exceed the general guidelines listed above, use Bose Modeler to predict SPL for a specific acoustic environment, or contact your Bose Professional representative.

Conference rooms with lower ceilings and smaller steering angles may not have the same reverberation concerns and can mainly consider Max SPL as a guiding factor for choosing between 1, 2 and 3 array modules.

Array Location (Height)

If you mount the array high on the wall and utilize a more significant steering angle closer to –20° and a wide spreading angle to cover the front rows, a 2- or 3-module MSA12X configuration is highly recommended.

Dual Beam Mode

When using Dual Beam mode, it is recommended to use a 2- or 3-module MSA12X array for better pattern control due to the longer array.

Reverberant Spaces

Generally, the primary use of columnar arrays is for speech reproduction. Also, most of these columnar arrays tend to be highly used in reverberant spaces for the vertical pattern control.

The rule for these venues is, as reverberation time increases, stack more modules.

|	RT60* for Medium to Large Venues
1 module	1.5 sec
2 module	3.0 sec

* These recommendations apply to "typical" medium sized venues with some reverberation concerns. In cases where your application exceeds the guidelines, design tools such as Modeler software, should be used to determine system performance.

Choosing Beam Patterns

There are three beam pattern options for the Panaray MSA12X. You can choose the beam type depending on the location of the array and shape of the coverage area.
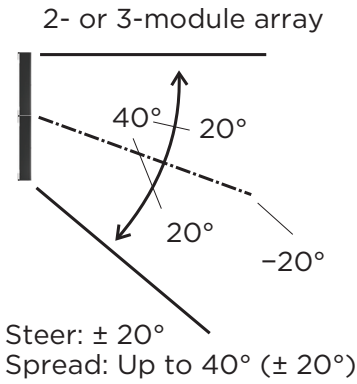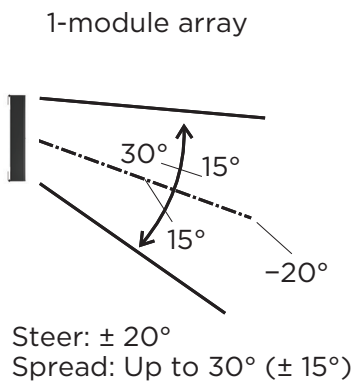
Basic Steer/Spread

Basic Steer/Spread is the most basic beam pattern. First, steer the axis of the beam vertically, then spread the beam from that axis. Steering and Spreading are independent from each other. If spreading is applied, the beam is spread symmetrically from the steer axis. When the Steer angle = 0 and the Spread angle = 0, the radiation pattern of the array is the same as that of a (passive) non-steerable columnar array, such as the Panaray MA12EX loudspeaker. Steer/Spread works for the vertical plane only; horizontal steering/spreading is not supported.
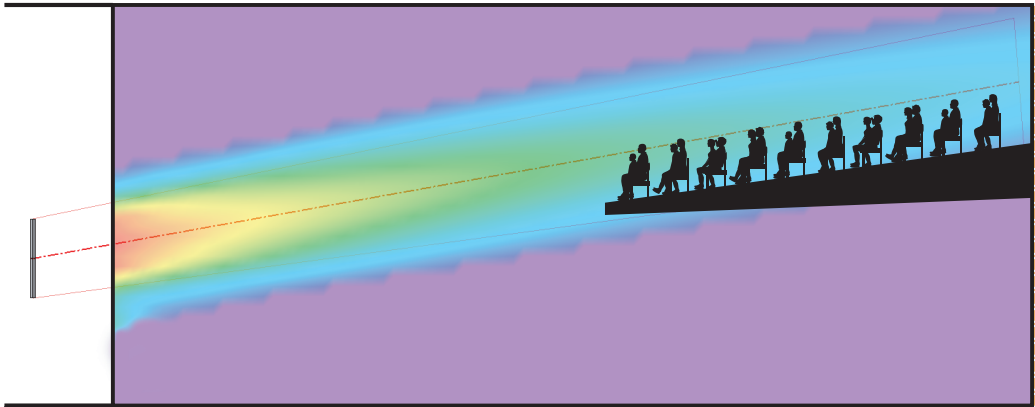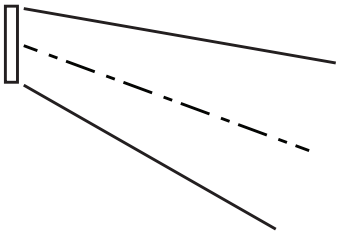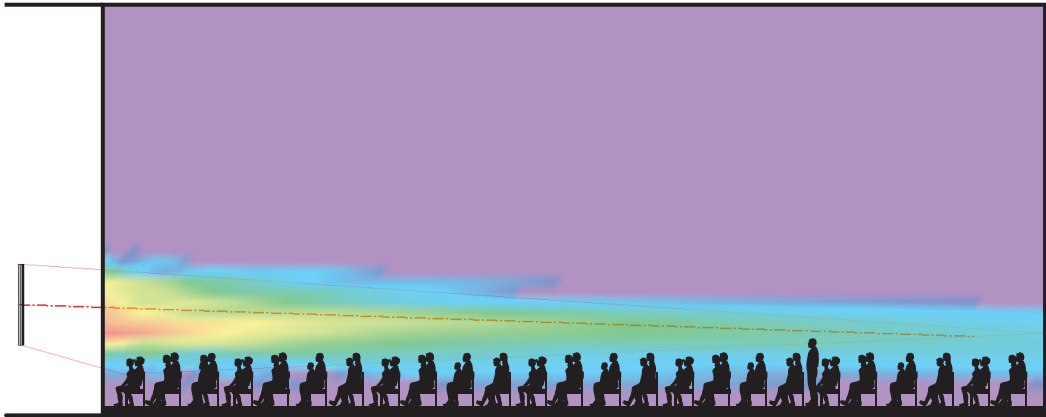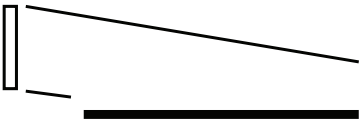
Vocal Range Smoothing Option

Basic Steer/Spread has an option called Vocal Range Smoothing. With this option enabled (ON), the tonal balance inside of the coverage becomes more consistent, and the sidelobes from the beam are suppressed. The beam shape also becomes smoother, specifically around the vocal range. The trade-off of using this option is that you lose a few dB of headroom.

Angular Limits

1-module array

30° 15°
15° −20°

Steer: ± 20°
Spread: Up to 30° (± 15°)

2- or 3-module array

40° 20°
20° −20°

Steer: ± 20°
Spread: Up to 40° (± 20°)

Flat-Floor Optimized

As the name suggests, **Flat-Floor Optimized** is a beam pattern that is optimized for flat floors. With this beam type, you can only steer the beam. Spreading is not available in this pattern. This beam type achieves consistent coverage from the front row to the back row of the room, specifically around the vocal range. Keep in mind that this beam pattern works best when the array is mounted at a certain height: The bottom plate of the array should be mounted 0.3 to 0.8 m (1 to 2.5 feet) above the ear height of the audience. If the array is mounted higher than this, or the floor is raked, choose a different beam type.

Vocal Range Smoothing Option

The Flat-Floor Optimized beam pattern also has an option called Vocal Range Smoothing. With this option enabled, the tonal balance from front to back of the room becomes consistent around the vocal range, and the sidelobes from the beam are suppressed. Again, the trade-off of this option is that you lose a few dB of headroom. This feature is ON by default and recommended for this beam type.

Raked-Floor Optimized

As the name suggests, **Raked-Floor Optimized** is a beam pattern that is optimized for raked floors. The Raked-Floor Optimized beam type achieves a vertically-asymmetrical beam radiation, which is suitable for covering a raked floor, or covering a flat floor from a relatively high array position, such as when the bottom plate of the array is more than 1 m (3.3 feet) above the ear height of the audience.

This pattern does not offer the Vocal Range Smoothing option.
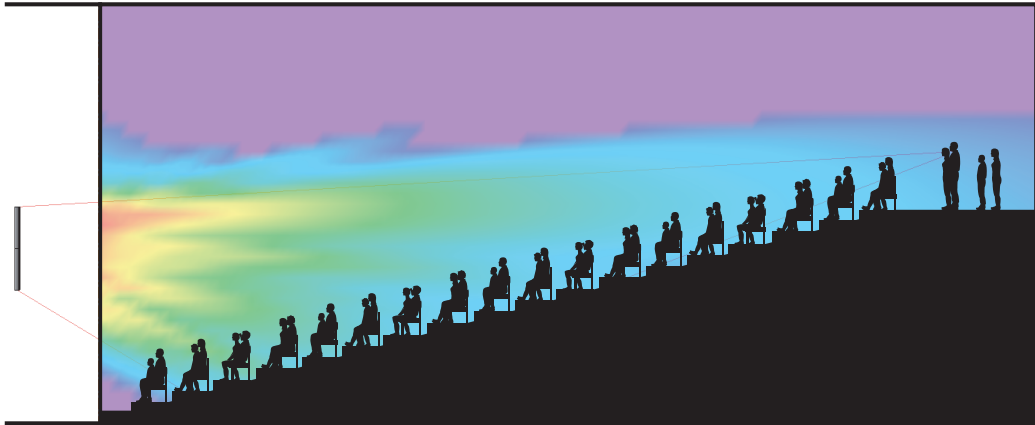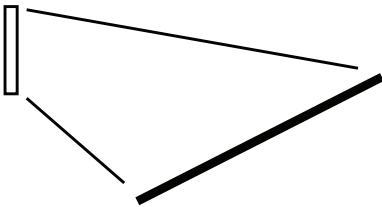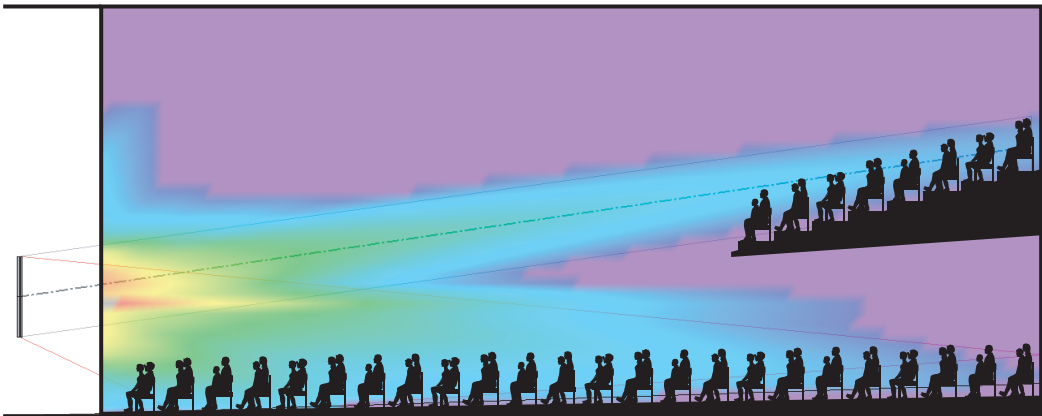

Dual Beam Mode

Up to two beams can be radiated from an MSA12X array built from 1, 2 or 3 modules, with any beam pattern selected independently for each beam. You also apply individual gain and Room EQ* for each beam.

Note: *Dual Beam Mode is only available when using Dante® input.*

Dual beams for the MSA12X is achieved by utilizing all the drivers of the array for both beams simultaneously. By utilizing all the available drivers, better low-frequency directivity control for both beams can be achieved. Other manufacturers may split their array into 2 smaller arrays (one on top of the other) to achieve dual beams, but at the cost of performance.

* Supported Bose ControlSpace processor with Dante card required to apply individual room EQ for each beam

Dual Beam Mode, using Basic Steer/Spread and Raked-Floor Optimized

Selecting Beam Steering Software Tool

There are three options of methods to steer the vertical coverage of MSA12X. This will help you choose the right software tool for your job.

1. Beam Steering in CSD

Choose this option when Basic/Steer is needed, and you do not need to see the coverage in the room.

Note: *Vocal range smoothing is not available with this method.*

2. Beam Steering in Bose Array Tool (Recommended)

Choose this option to quickly model an acoustic space and determine the loudspeaker array configuration using all three beam pattern types and beam options.

Note: *Windows OS version must be used to push array configuration to Control Space Designer to update array.*

3. Beam Steering in Modeler

Choose this option to create a detailed model of an acoustic space and determine the loudspeaker array configuration using all three beam pattern types and options. Modeler is recommended for complex or difficult spaces and includes computationally intensive predictions, including the full Speech Transmission Index (STI).

Note: *Both Bose Array Tool and Modeler allow system design without speaker present*

How to use the Bose Array Tool (BAT) with MSA12X

1. Download the Bose Array Tool (BAT) for free from our website. bosepro.link/bat

2. *Create your design in the BAT*

3. *When you are ready to update your array with the new beam pattern, click "Send to CSD".*

For additional details, including CSD actions, see "Send beam settings from Bose Array Tool" or "Modeler" section of this guide.
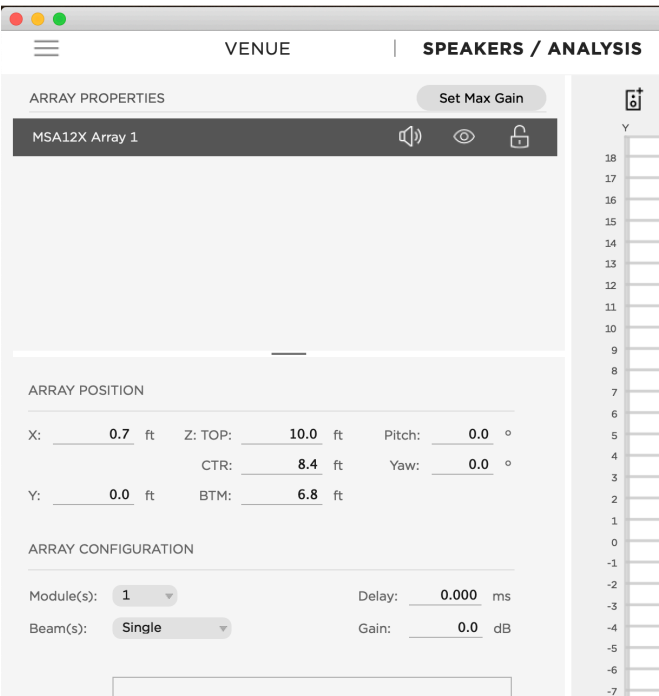
4. For additional help using the BAT, launch "Help" from within the BAT software.

Modeler Properties and Operation

In Modeler, you can look at the coverage both on the horizontal plane and the vertical plane in real time, and adjust the beam shape to match the room. You can also specify parameters for the Basic Steer/Spread beam type within ControlSpace Designer software (CSD) directly, without needing Modeler. Refer to the "Setting Up MSA12X Basic Beam Steering and Spreading" topic in the CSD help system for more information.

Note: Room modeling using Modeler software is not covered in this document. For room modeling, refer to Modeler help materials.

Place Array

Select 'Place MSA Array' Tool.
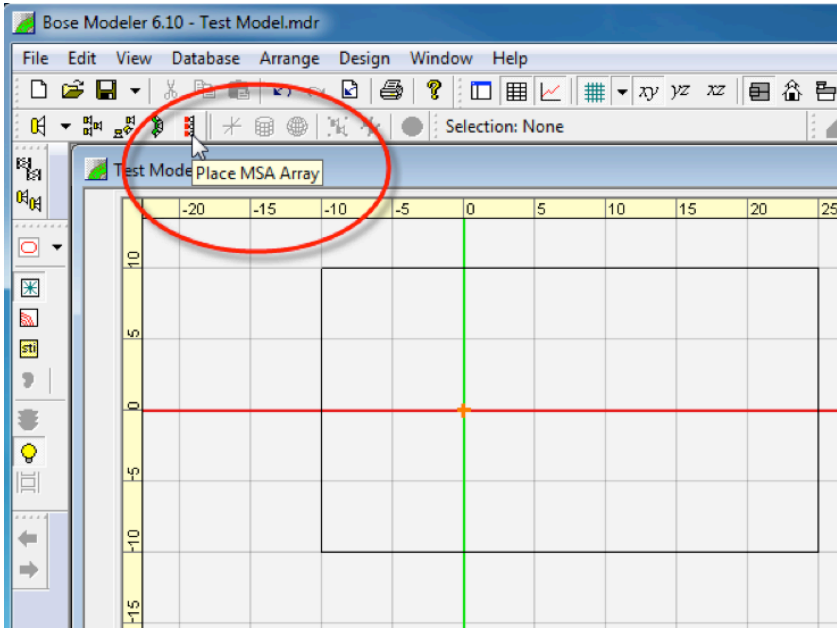
Click the surface in the Plan view and place an array.
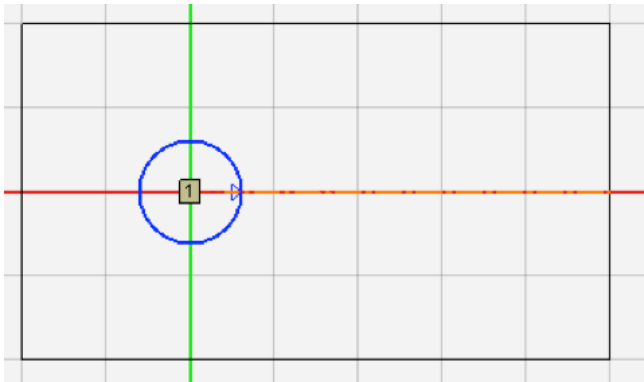
Yaw the array if necessary. Select the blue arrow of the array aiming tool and move.
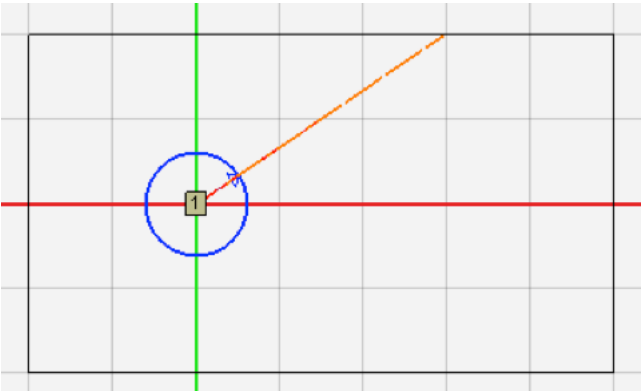
Click and select the array. Go to the Properties tab in the Detail View.
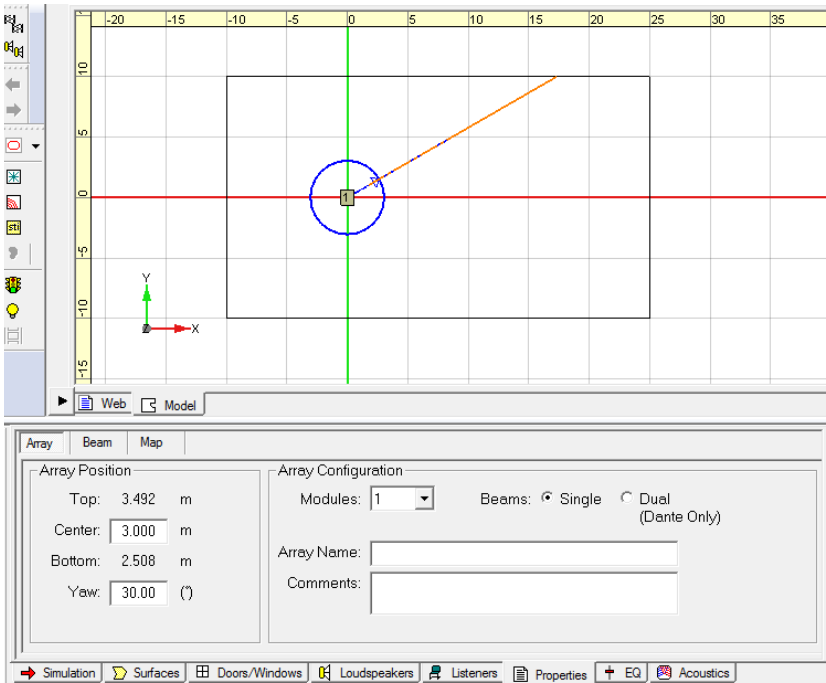
Change the array mounting position (height) in the Array Position frame. Center is the Z-coordinate of the array center; Top is the MSA12X top plate; Bottom is MSA12X bottom plate.

Array Tab

Basic properties of the array are set In the Array tab.

Array Position

Top/Center/Bottom: Set the Z-coordinate of the array. Center is for the array center; Top/Bottom are for top/bottom plate of the array. Top/Bottom are linked to the Center. You can use the Top/Bottom coordinate to specify the mounting height on site. Note that this is the Z-coordinate of the model, which may not necessarily be the distance from floor (when the Z-coordinate of the floor is 0, they match).

Yaw: Set the yaw of the array.

Array Configuration

Modules: Specify the number of the modules in an array. Select from 1, 2 or 3.

Beams: Specify the number of the beams radiated from the array. Either Single beam or Dual beams. *Note: For the actual system, Dual beams are possible only using the Dante® input.*

Array Name: You can name the array, such as 'Main Left'. This name is used to manage the link between Modeler and CSD later in the workflow.

Comments: This field can be used to describe the beam pattern (e.g. 'Weekday, covering main floor only', 'Sunday, covering main floor + balcony'). The comments chosen in this field are indicated in CSD later in the workflow. This can be useful when comparing multiple beam patterns for an array rather than looking at parameter values (e.g. Steer -10°, Spread +10°).

Beam Tab

In the Beam tab, you can specify the beam type and beam parameters.

Main/2nd: Selection for Main beam or Secondary beam. '2nd' beam tab appears only when 'Dual beam' is selected in the Array tab.

Main Gain/2nd Gain: Beam gain for main beam and second beam. '2nd Gain' is grayed out when 'Single beam' is selected in the Array tab.
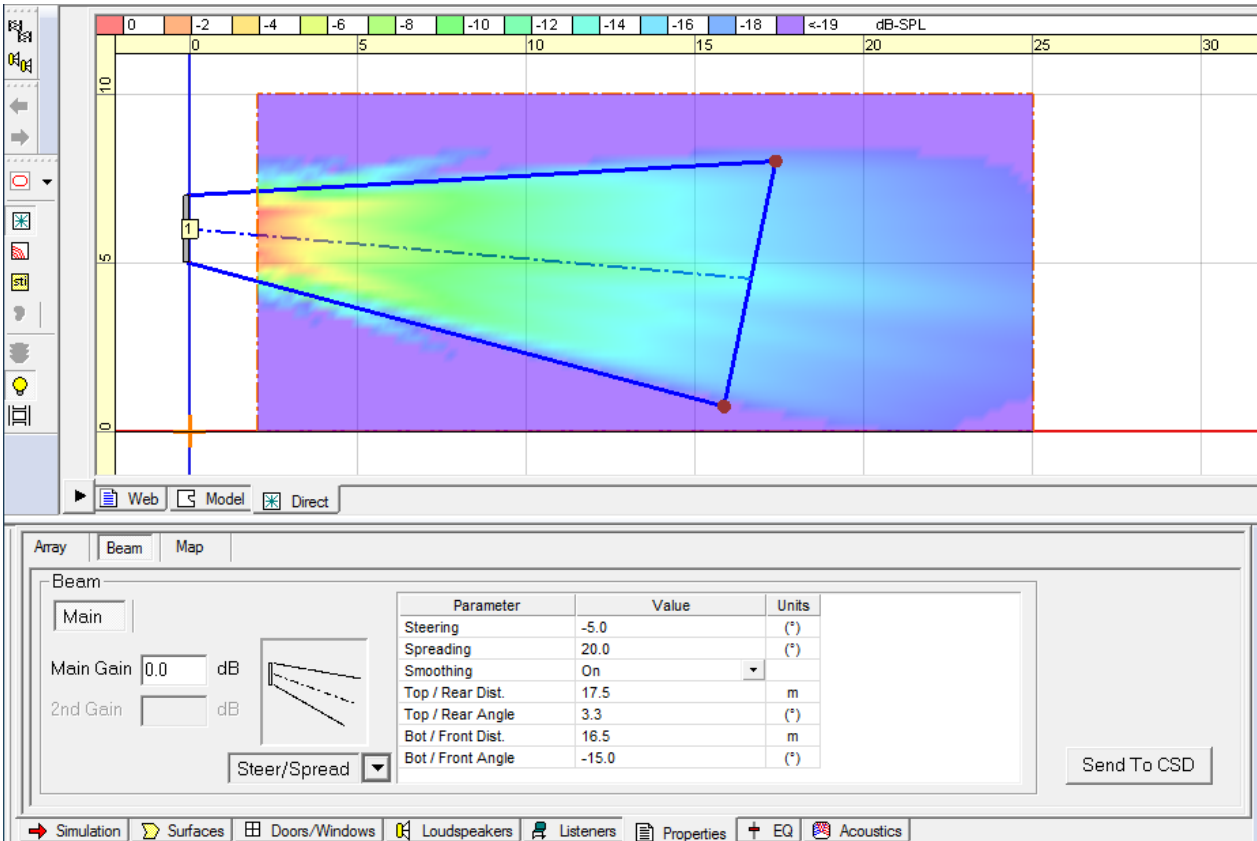
Beam type selector: Select beam type from the drop-down box.

Beam parameters: Parameters to specify the beam shape.

Send to CSD: A button to export the computed beam coefficients to CSD.

User Interface for Beam Shaping

Basic Steer/Spread

Select **Steer/Spread** from the beam type drop-down selector. With this beam type, the beam axis can be steered vertically, and the beam can be spread symmetrically from that axis. You can adjust the beam shape with one of the following:

A: Enter Steering/Spreading angle values in the cell (Positive steering angle aims the beam upward).

B: Select and move the edges of Top (Rear) throw line and Bottom (Front) throw line on the Vertical Coverage Map.

C: Enter the distance and angle values of the above throw lines in the cell.

A, B and C are linked and are automatically updated when the beam shape is changed.

When you move the edges on the Vertical map, select the Top (Rear) throw line edge and move to the target point of far throw. Remember to take the ear height of the far-end listener into account. Repeat the same for the Bottom (Front) throw.

Note: A sum of Top/Rear Angle and Bottom/Front Angle may not necessarily be the same as the Spreading angle. This is because Modeler is adjusting the Steer/Spread angle to effectively cover the far throw target point.

Each Beam type has its own limitation for the Beam Parameters. For example, you cannot spread the beam too wide with Basic Steer/Spread. When you drag the edge, observe the color of the circle of the line edge; if it is green, the edge is within the limitation. When it turns red, it is outside the limitation and the edge snaps back to the original position.

Within the limitation (green)	Outside of the limitation (red)
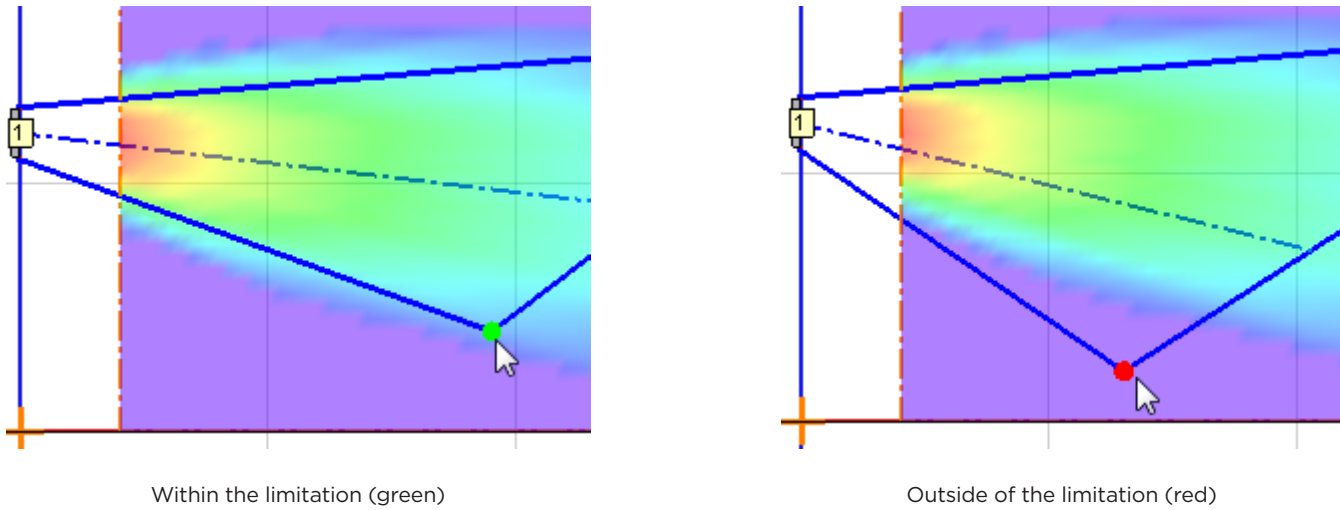
Vocal Range Smoothing Option: Select either ON or OFF. With this option ON, the tonal balance inside the coverage becomes more consistent and the sidelobes from the beam are suppressed and the beam shape becomes smoother, specifically around voice range. The trade-off of this option is that you lose a few dB of headroom. By default, Vocal Range Smoothing is OFF with Basic Steer/Spread.

Flat-Floor Optimized
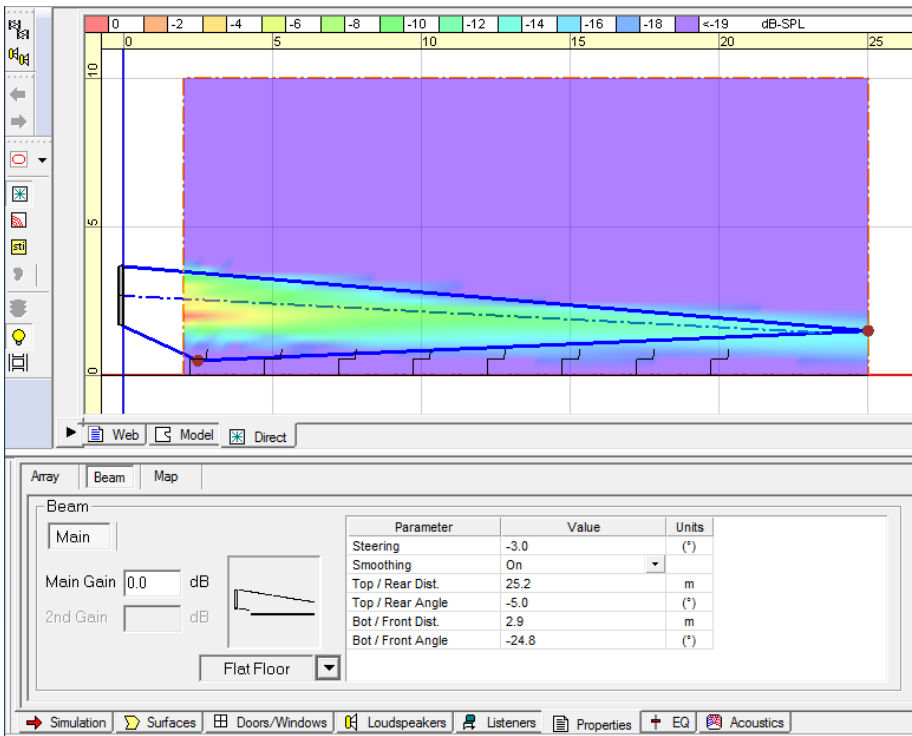
Select **Flat Floor** from the beam type drop-down selector. This beam type is optimized for a flat-floor seating arrangement. With this beam pattern, you can only steer the beam vertically, without any spreading. This beam type can deliver consistent coverage from front to back specifically around the vocal range when the array location (height) is appropriate, but if the array is located too high, you may not be able to achieve the coverage you expect. Make sure the Bottom plate of the array is located 0.3 to 0.8 m (1 to 2.5 feet) above the ear height of the audience.

Ear Height

Max Recommended
0.3-0.8 m
(1'-2.5')
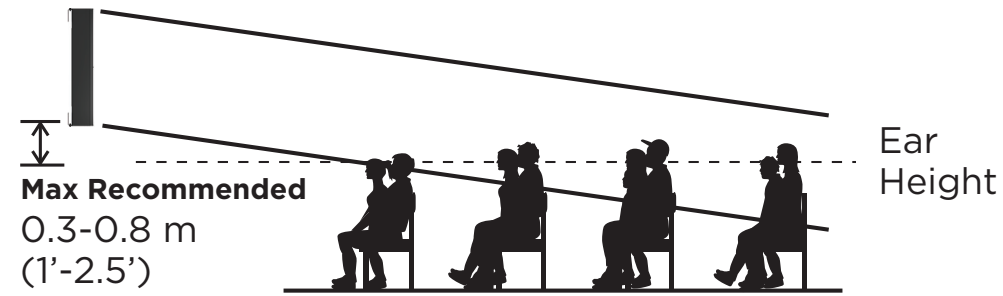
The beam shape can be adjusted with one of the following:

A: Enter Steering angle value in the cell (Positive steering angle aims the beam upward).

B: Select and move the edges of Top (Rear) throw line and Bottom (Front) throw line on the Vertical Coverage Map.

C: Enter the distance and angle values of the above throw lines in the cell.

A, B and C are linked and are automatically updated when the beam shape is changed.

When you move the edges on the Vertical map, select the Top (Rear) throw line edge and move to the target point of far throw. Remember to take the ear height of the far-end listener into account. You can move the Bottom (Front) throw line edge but it does not affect the beam shape.

Note: *The Top/Rear Angle and Steering Angle may not necessarily be the same. This is because Modeler is adjusting the Steer angle to effectively cover the far throw target point.*

Each Beam type has its own limitation for the Beam Parameters. When you drag the edge, observe the color of the circle of the line edge; if it is green, the edge is within the limitation. When it turns red, it is outside the limitation and the edge snaps back to the original position.

Vocal Range Smoothing Option: Select either ON or OFF. With this option ON, the tonal balance inside the coverage becomes more consistent, and the sidelobes from the beam are suppressed and the beam shape becomes smoother, specifically around voice range. The trade-off of this option is that you lose a few dB of headroom. By default, Vocal Range Smoothing is ON with Flat-Floor Optimized.

Raked-Floor Optimized
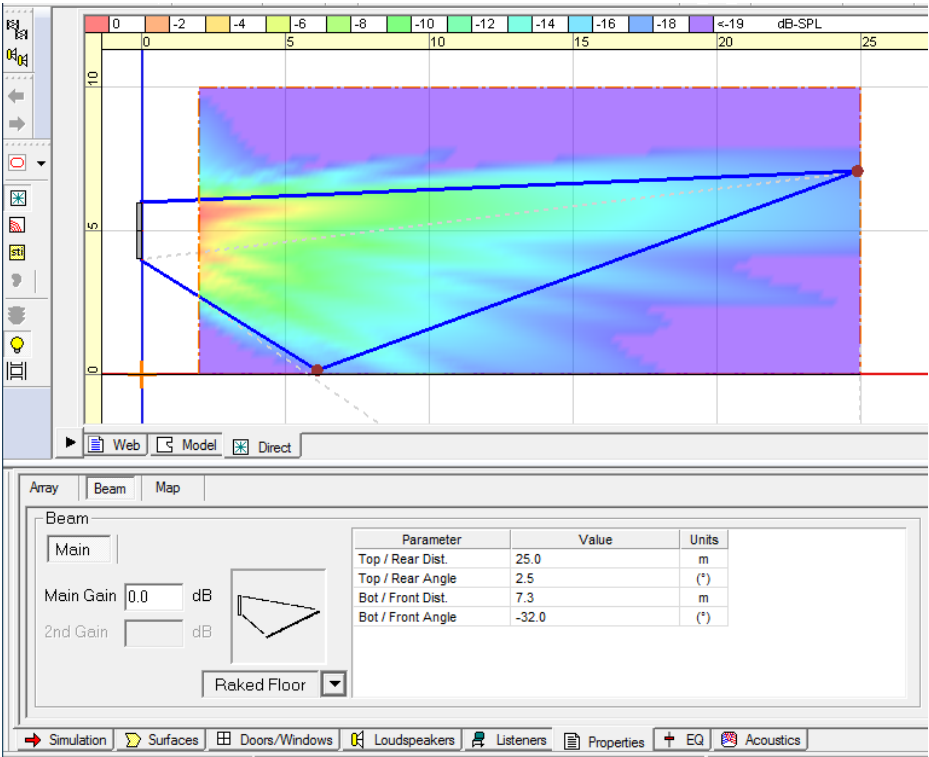
Select **Raked Floor** from the beam type selection. This beam type achieves a vertically asymmetrical beam radiation, which is suitable for covering a raked floor, or covering a flat floor from a relatively high array position.

The beam shape can be adjusted with one of the following:

A: Select and move the edges of Top (Rear) throw line and Bottom (Front) throw line on the Vertical Coverage Map.

B: Enter the distance and angle values of the above throw lines in the cell.

A and B are linked and are automatically updated when the beam shape is changed.

Each Beam type has its own limitation for the Beam Parameters. For example, you cannot spread the beam too much with Raked-Floor Optimized. When you drag the edge, observe the color of the circle of the line edge; if it is green, the edge is within limitation. When it turns red, it is outside the limitation and the edge snaps back to the original position.

Within the limitation (green)

Outside of the limitation (red)
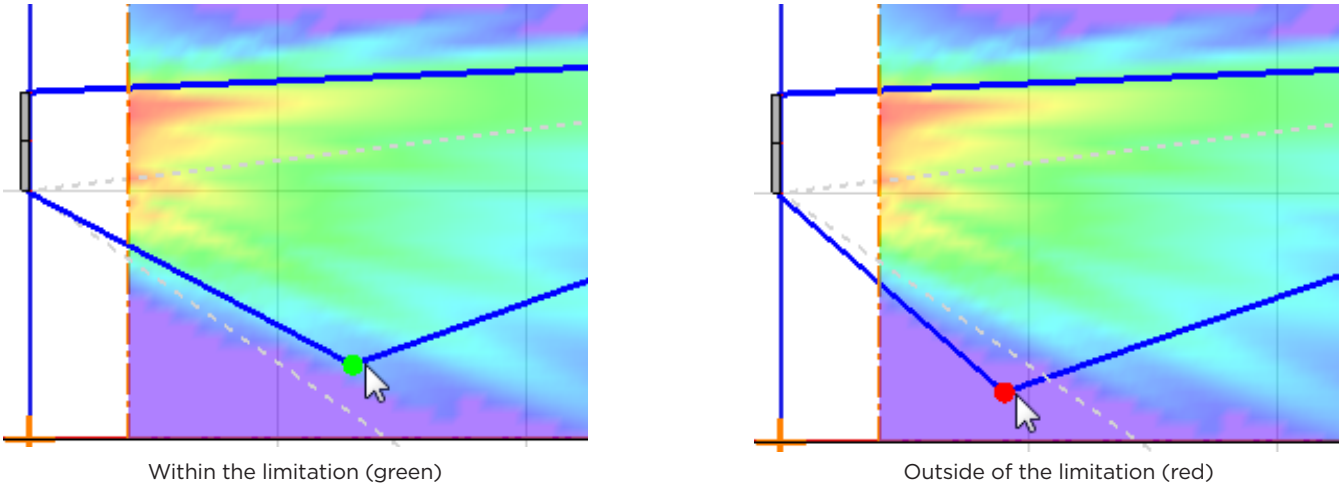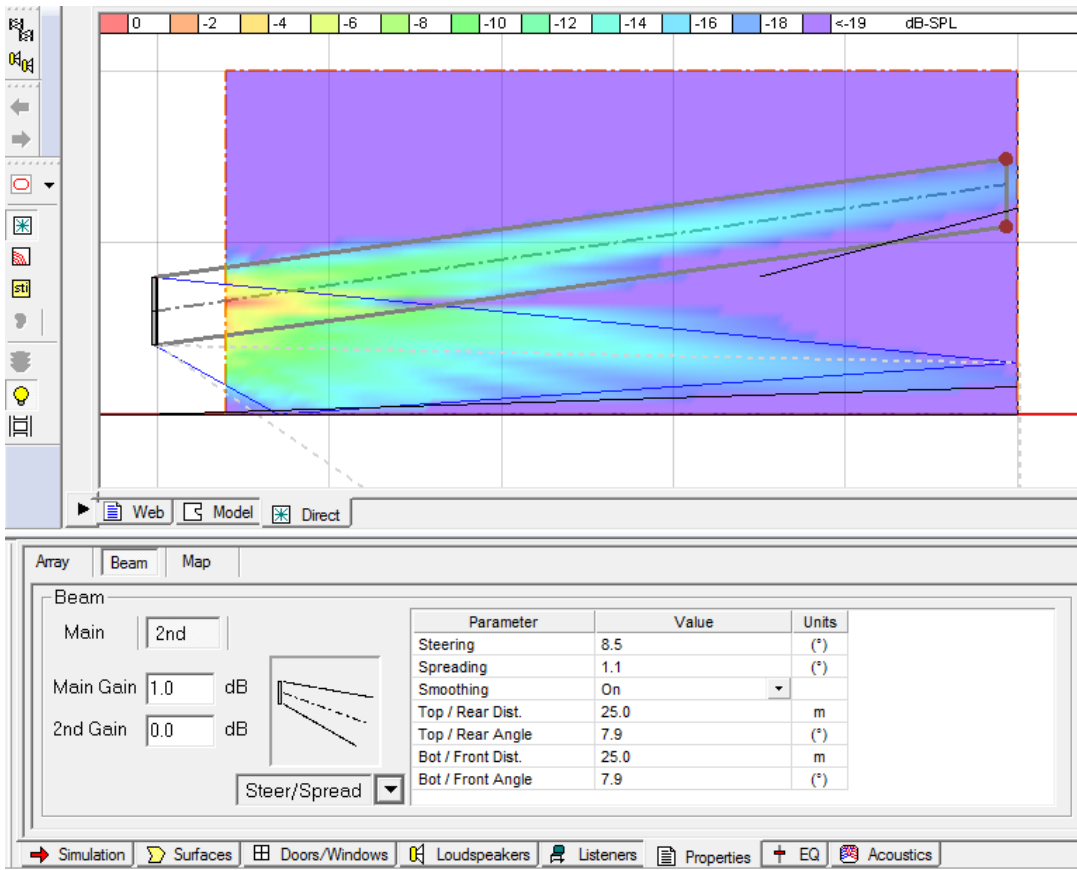
Dual Beam Mode

Dual Beam mode radiates two beams from a MSA12X array. When you have selected **Dual** in the Array tab (see page 11), a 2nd tab appears for the secondary beam. You can choose any of the three beam types for each beam (Main beam and Secondary beam) independently. You can also apply beam gains for each beam to balance the level at the seating area.

By selecting the 'Main' and '2nd' tab, the beam type selection and corresponding parameters displayed are switched.

Note: Dual beam is only possible by using the Dante® input with the actual system (Modeler does not have property to set the input type). When saving Modeler steering in CSD with Dual Beams, ensure Dante input is selected before saving.

Map Tab

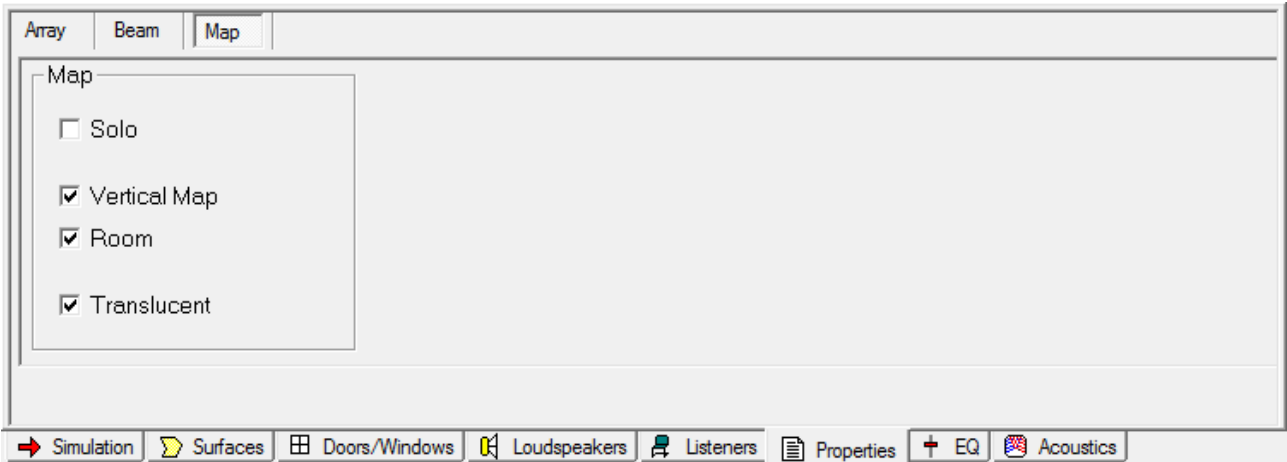The Map tab is used for changing the properties for SPL mapping.

Solo: Mutes/Unmutes the array and loudspeakers in the model.

Vertical Map: Activate/Deactivate the Vertical Map.

Room: Activate/Deactivate the SPL map for the room surfaces specified in the Simulation tab.

Translucent: Activate/Deactivate the Translucent option for the SPL map.

Send to CSD
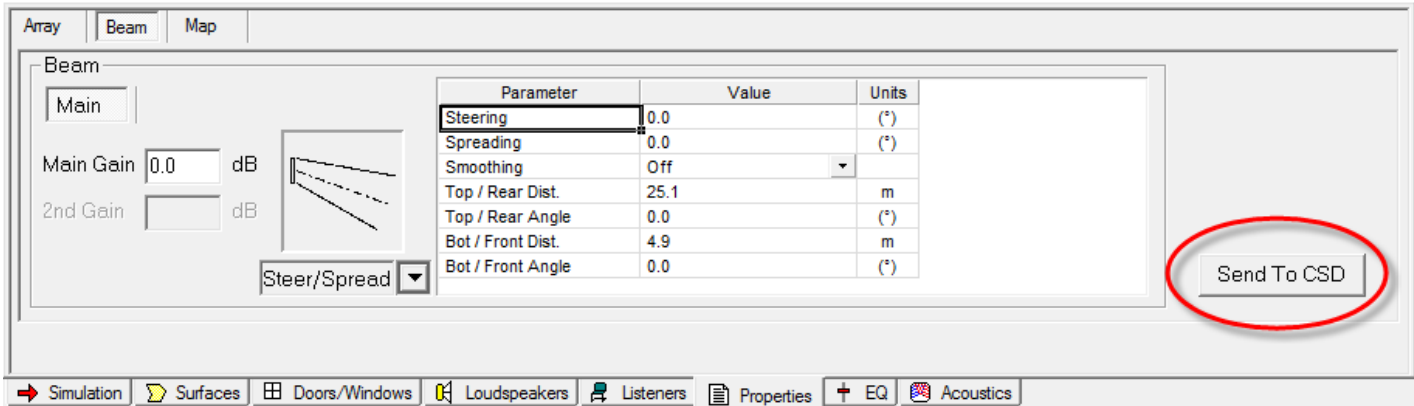
When you finish the beam shape design in Modeler, and save the file, the next step is to transfer the data that Modeler computes based on your setting into ControlSpace Designer software (CSD).

Launch CSD. Return to Modeler and select the Beam tab again. Then, click the 'Send to CSD' button on the far right.

Note: CSD must be open and running on the same machine as Modeler for the data transfer to work. Ensure you have CSD 5.0 or later.

Manage Multiple Beam Patterns

If you have a select Bose ControlSpace processor in your system (see table below), you can set multiple beam patterns in an array and set up end user recall of these settings.

Below is the process to keep each beam pattern in a Modeler .mdr file:

1. Name the Array Name (e.g. 'Main Left') in the Array tab.

2. Design the beam shape (pattern A) and add short description of the beam in the 'Comments' field (e.g. "Weekday, covering main floor only").

3. Save the .mdr file with an appropriate name (e.g. 'Weekday.mdr').

4. Duplicate the .mdr file and rename (e.g. 'Sunday.mdr').

5. Design the beam shape (pattern B) for the same array and change the short description in the 'Comments' field (e.g. "Sunday, covering main floor and balcony).
   Note: *At this point, the Array Name and number of modules of the array should be the same as before.*

6. Save the .mdr file.

Later in the workflow, we link the array in Modeler and the actual array through ControlSpace Designer software, and as long as the array name and number of modules are the same, we can maintain that link for different beam patterns stored in multiple .mdr files.

Supported ControlSpace Processor Models
EX-1280C
ESP-880A
ESP-880AD
ESP-1240A
ESP-1240AD
ESP-880A (discontinued)
ESP-1240 (discontinued)
ESP-4120 (discontinued)
ESP-1600 (discontinued)

Array Setup

Wiring

When you mount a MSA12X, you can choose the orientation: Control from Bottom or Control from Top. Once you mount the array, you have to specify the orientation in ControlSpace Designer software (CSD), otherwise the beam could point toward the ceiling!

Control from Bottom   **Control from Top**

(Default Orientation)
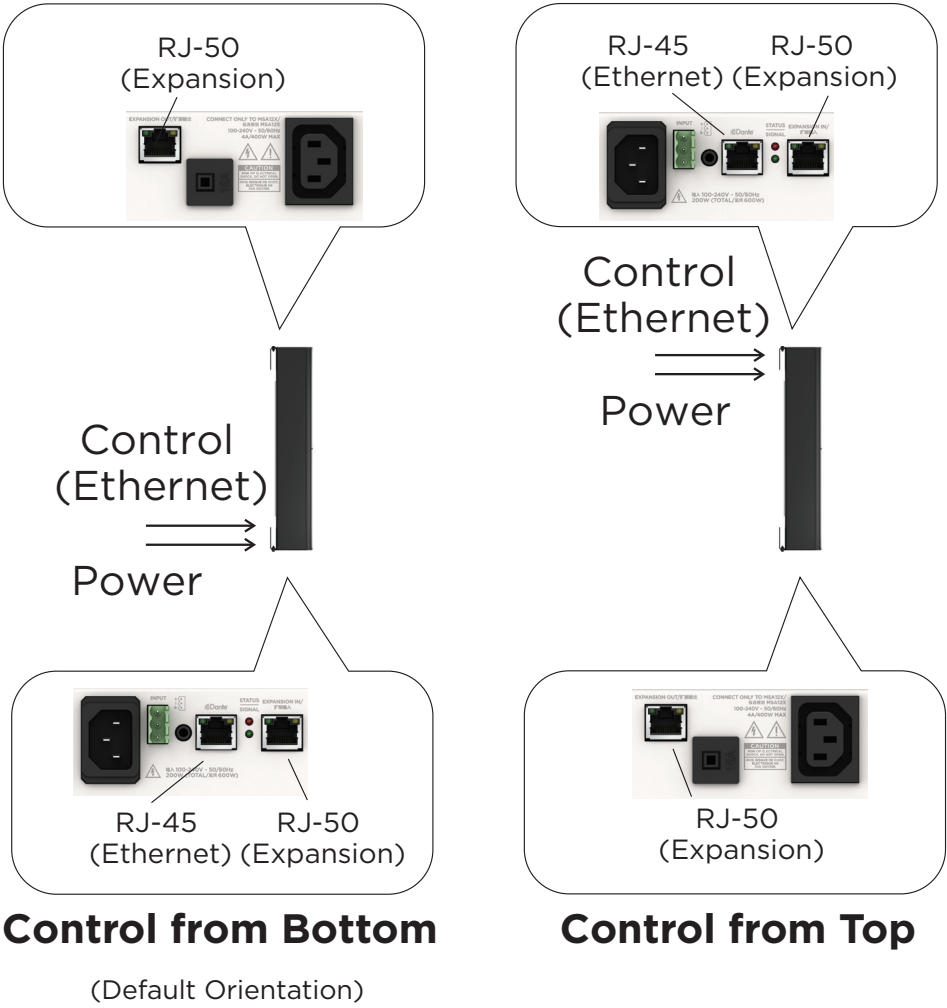
You can configure a longer array by stacking multiple modules and connect the modules by an expansion cable. Up to a 3-module array is supported. The end connectors of an expansion cable are RJ-50 (cable supplied), which is different from the RJ-45 for Control/Dante® (Ethernet), although they look similar. Take notice when setting up a multi-module array.

For a multi-module array, the Ethernet cable has to be inserted to the receptacle located at the end of the array, and the module in which the Ethernet cable is inserted becomes the Master module of the array automatically. Audio signal and control signal are passed to the slave module(s) via the RJ-50 expansion cable between the modules. You cannot insert the Ethernet cable into the modules other than the one mentioned above. The array does not work when you insert the Ethernet cable into the wrong modules.
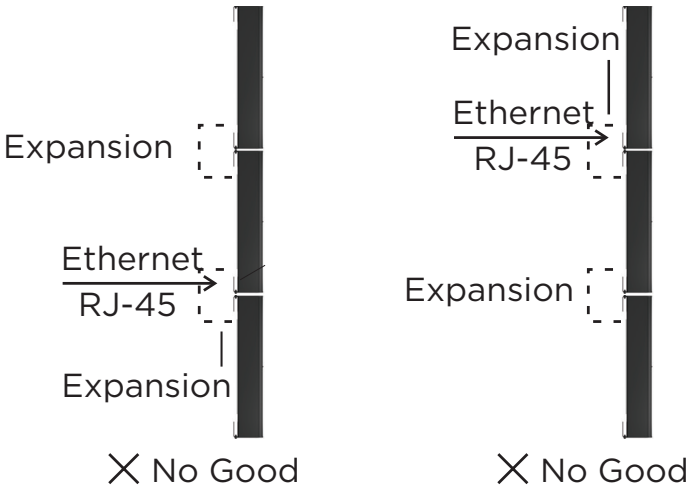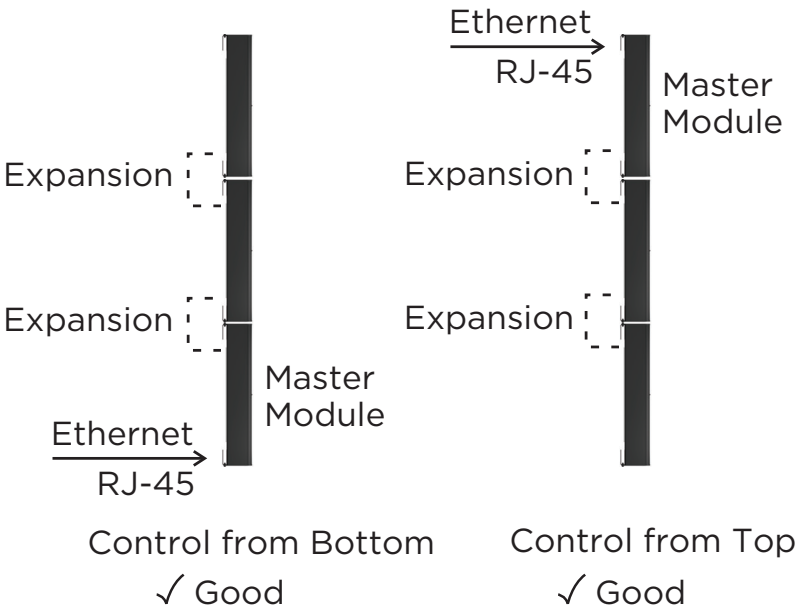
The master module represents the entire array; the IP address of the master module applies to the entire array. i.e. a multi-module array can be seen as a single device; it is just a long array with more drivers than a single-module array.

Mounting

Refer to the MSA12X Installation Guide available on **PRO.BOSE.COM**.

CSD Properties and Operation

ControlSpace Designer software (CSD) is used to transfer the beam pattern and mode (single or dual beam) configuration to MSA12X loudspeakers.

MSA12X Device Block in Project View
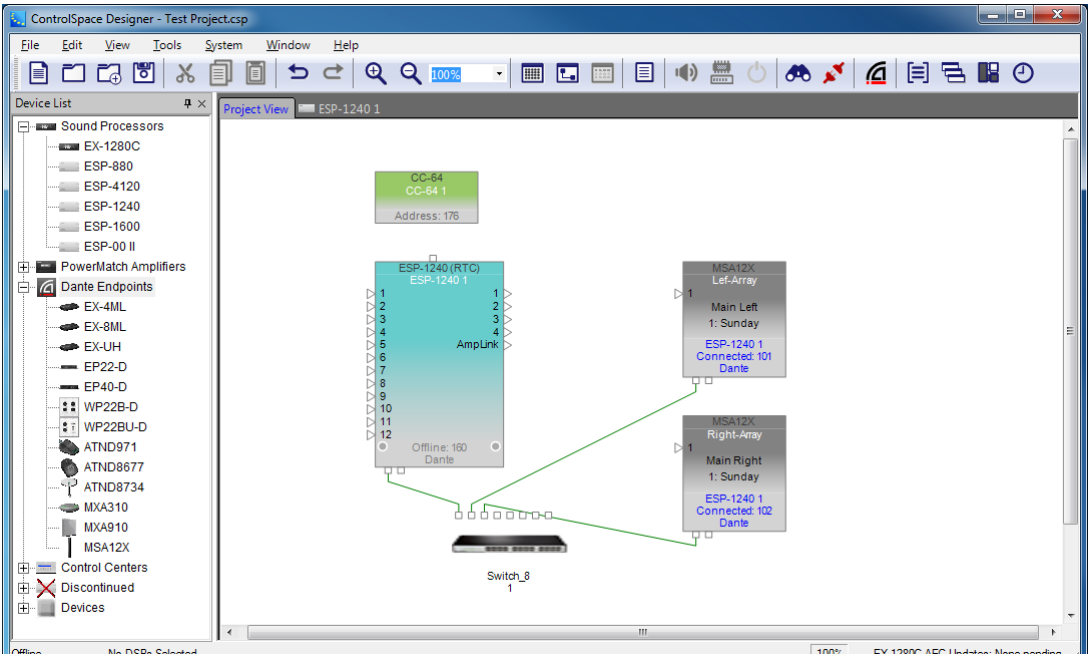
When you add a MSA12X to a CSD Project, the device block appears in the Project view. There are a few ways to add a MSA12X to a CSD Project.

On the device block, the following can be seen:

1. Device Name
2. Array Name in design (blank if not set)
3. Current Beam Preset
4. Device name of signal processor that the array is associated with (blank if not associated)
5. Connection status between CSD and the device
6. Last octet of IP address
7. Input type (Dante® or Analog)
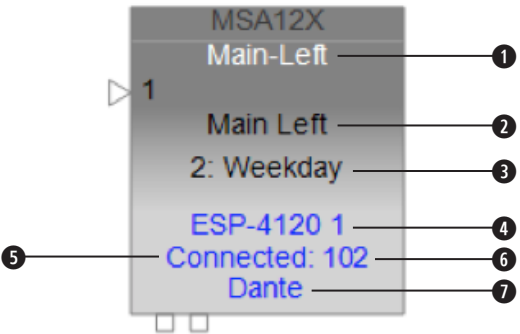
You can rename the Device Name by right-clicking (or press F2 key).

MSA12X Control Panel

By double-clicking the device block in the Project View, the MSA12X control panel appears.

Array Name in Design

The name of the array specified in Modeler. By default, this is blank.

Input & Speaker EQ

Input: Select from Dante® or Analog, followed by the input gain. The input gain is independent between Dante and Analog.

Speaker EQ: Select from Music or Voice.

Beam

Set Beam from CSD: You can set the beam steering and spreading without needing Modeler.
Note: This is limited to the Basic Steer/Spread.

Beam Preset

You can store/recall the beam pattern and Power On State here.

Basic beam description: Shows beam mode and comments details as entered in Modeler.

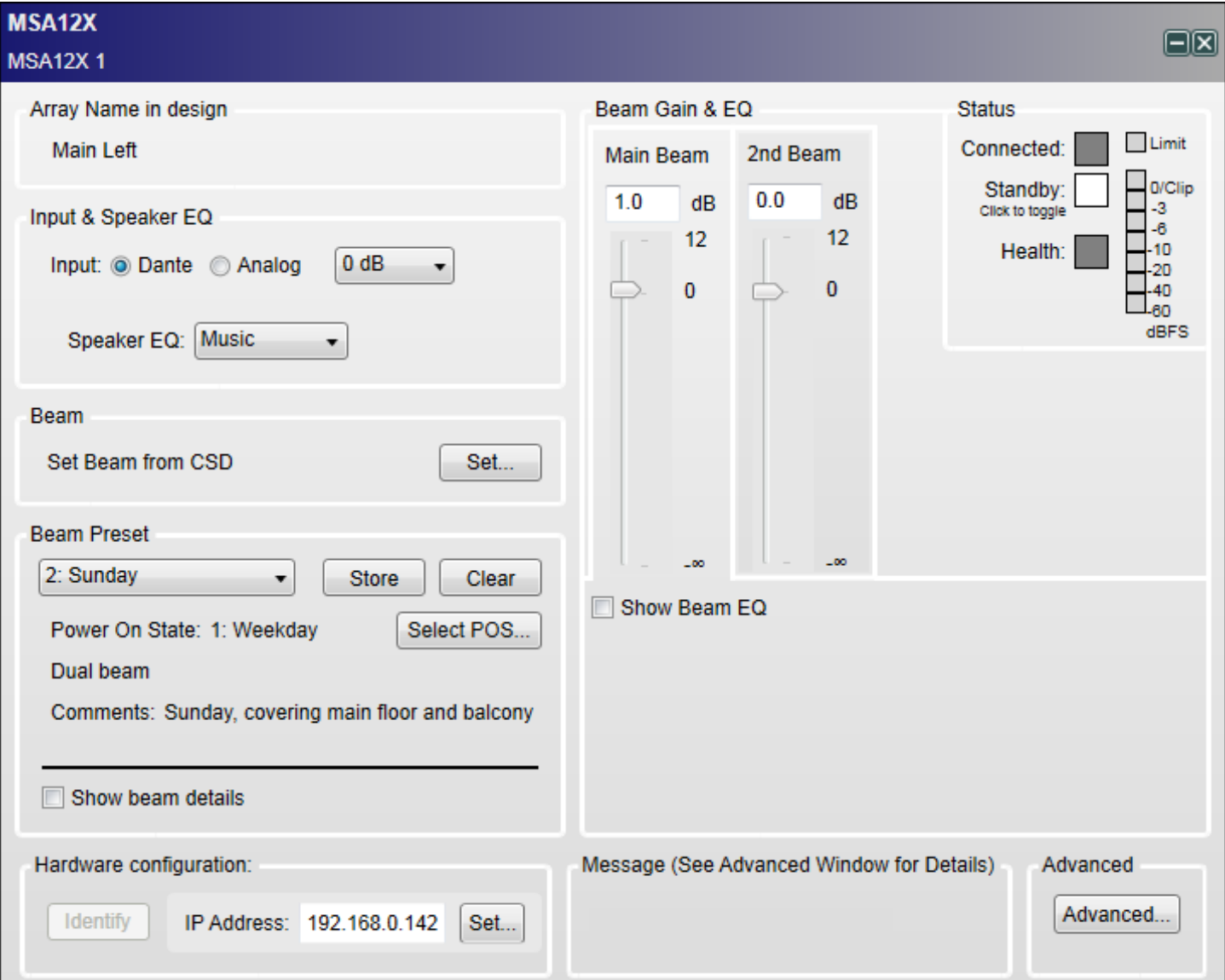Show beam details: Indicates the detailed beam parameters specified in Modeler.

Beam Gain & EQ

Beam Gain: Gain for each beam.

Show Beam EQ: Indicates the Beam EQ. A Beam EQ is a filter that compensates the tonal balance of each beam corresponding to the beam shape. The filter curve is automatically computed and updated every time the beam pattern is sent from Modeler. You can change the curve shape manually and store to a Beam Preset.

Freq: Center frequency.

Slope: Slope of the curve.

Gain: Hi-boost gain.

Restore Defaults: Return to the setting that was originally suggested from Modeler for that beam pattern.

Bypass: Bypass the beam EQ filter.

Status

Connected: Blue, when the connection between the array and CSD is active.

Standby: Red, when the array is in Standby. You can toggle the standby status by clicking the icon.

Health: Yellow, if there is a temperature warning. Red if there is a temperature fault or a driver fault. Green otherwise.

Limit: Yellow, when output limiter is active for the array.

Level Meter: Level of input signal after the input Gain.

Hardware Configuration

Identify: When Dante® is enabled and the device is online, clicking this button triggers a flashing LED on the back of the array.

IP Address: IP address of the MSA12X array. 'Set…' opens the Dante Properties window when Dante connection is enabled.

Advanced…: Opens the Advanced Window.

Beam Shaping in CSD

You can set the Beam Shaping within CSD for Basic Steer/Spread without needing Modeler on your PC. This is helpful when you set the beam in a room that requires only basic steering and spreading without the visual guide from the Vertical SPL map of Modeler.

1. Click 'Set…' button under Beam.

1. Beam Control window appears. Set the Steer angle and Spread angle for each beam. A red wire frame corresponds to the Main Beam; a blue wire frame corresponds to the Secondary Beam. 'Vocal Smoothing Option' is not available for this tool. Press 'Set' when you finish.

Note: The beam wireframes may look different from those in Modeler, even when the steering (and/or spreading angle) is the same. This is because in Modeler, a user can specify the Distance (length) of the beam lines, which does not affect the beam of this beam type. As long as the steering (spreading) angle is identical, the radiated beam pattern is identical.

2. Now the beam pattern is transferred to the array, and you will be able to hear the change of the beam pattern. If you like this pattern, store it to a Beam Preset (see page 35).

This function is available when either

The MSA12X device in CSD is already associated to a Physical array.

The MSA12X device in CSD has already received a beam pattern sent from Modeler.

Otherwise, the 'Set…' button is grayed out.

Template Files

Template files will be available on **PRO.BOSE.COM** to get you started using CSD and Modeler with MSA12X. These will include arrays for typical systems, including a 2-module Left-Right system with a single beam and a 2-module Left-Right system with dual beams. If you are new to CSD or Modeler, it is recommended to use these template files to start your projects.

Advanced Window
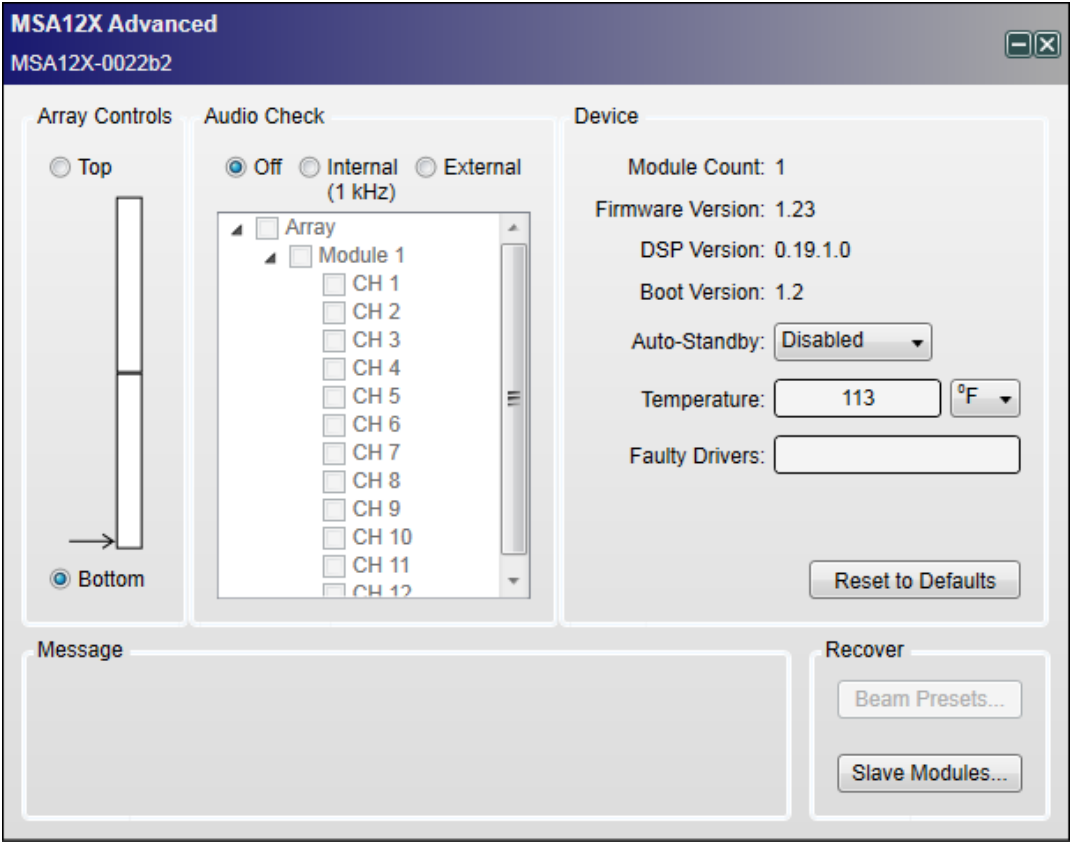
Array Controls

When you mount an MSA12X array on the wall, you can choose the orientation of the module(s) by specifying the array end that has the RJ-45 and power input panel. This defaults to Bottom, and in this situation, your RJ-45 and power cables enter the master module at the bottom. In some installations, installers prefer to send the RJ-45 and power into the top of the array. In those situations, you should select Top from this menu; you should physically invert the array so the RJ-45 and power inputs are at the top (and don't forget to rotate the Bose logo on the front grille). This software setting orients the software so it knows if the master module is on the top or bottom, which way the arrays are oriented, and can plan the beam types and steering correctly.

Audio Check

You can check each array/module/driver with either an internal or external audio signal. With Internal option, an internal signal generator feeds 1 kHz sine wave to the device. This is useful to identify the array even before subscribing Dante® routing.

Device

Module Count: Number of modules of the array.

Firmware Version

DSP Version

Boot Version

Auto-Standby: You can specify the signal absence time before the array goes to Standby mode. The array recovers from Standby mode when the input signal is present for 6-10 seconds.

Temperature: Indicates the temperature of internal amplifier.

Faulty Drivers: Indicates the number of faulty drivers and/or amplifier channels that are shorted or with excessive high current beyond the design's capability.

Reset to Defaults: Clears all the stored beam presets and sets the array to factory default.

CSD Workflow

There are many different ways to configure a MSA12X system. In this document we describe an on-site setup process. The assumption in this document is that you have an ESP with a Dante® card in the system, and the IP address of the devices are already set. For guidance for IP setup, see Appendix.

Initial Configuration in Project View

1. Connect the PC to the network and launch CSD. A blank Project appears.
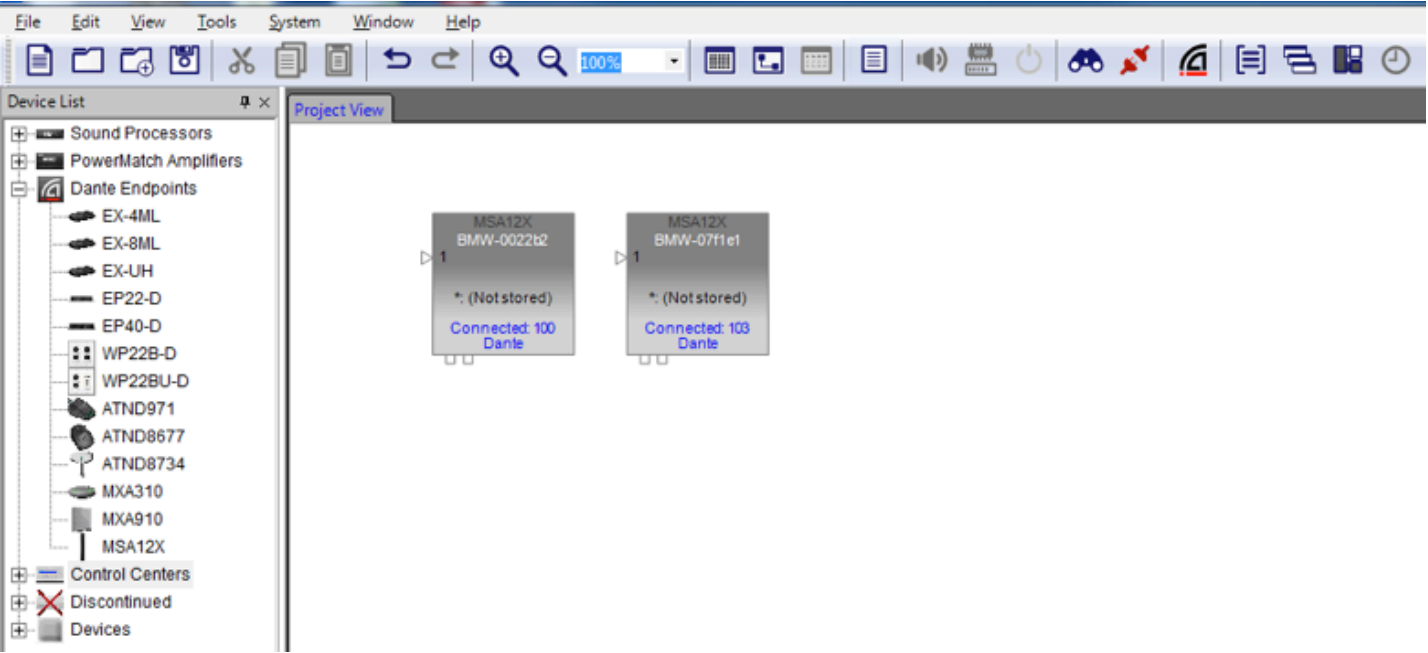
After 5-10 seconds (depending on the network status), MSA12X device blocks appear on the Project View.

*Note: This is not related to the ControlSpace Scan.*

MSA12X is a Dante device, and it is recognized and controlled by CSD even without the CSD Network Scan or CSD Go Online. If an MSA12X device block does not appear,

Go to System > Enable Dante Control.

Make sure the PC and MSA12X array(s) are both connected to the network.

Make sure the IP address for both the PC and the MSA12X array(s) are set properly. For details, see Appendix.

2. It is highly recommended to enable **Endpoint Control** prior to the following operations. When Endpoint Control is disabled, Dante endpoints (including MSA12X) are under the control of the firmware of ESP or EX-1280C, and you cannot program MSA12X controls from CSD. If Endpoint Control is disabled, many of the controls of the MSA12X control panel will be grayed out and a warning message will be indicated. Endpoint Control is disabled by default.
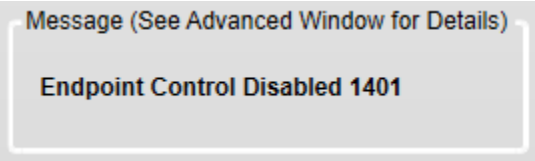
To enable Endpoint Control, go to System > Enable Endpoint Control.

3. The next step is to identify which MSA12X device block represents which physical array on the network. To do this, double-click the device block and open the MSA12X control panel, and press the 'Identify' button at the bottom. An LED at the back of the physical array flushes and you can identify the device block.
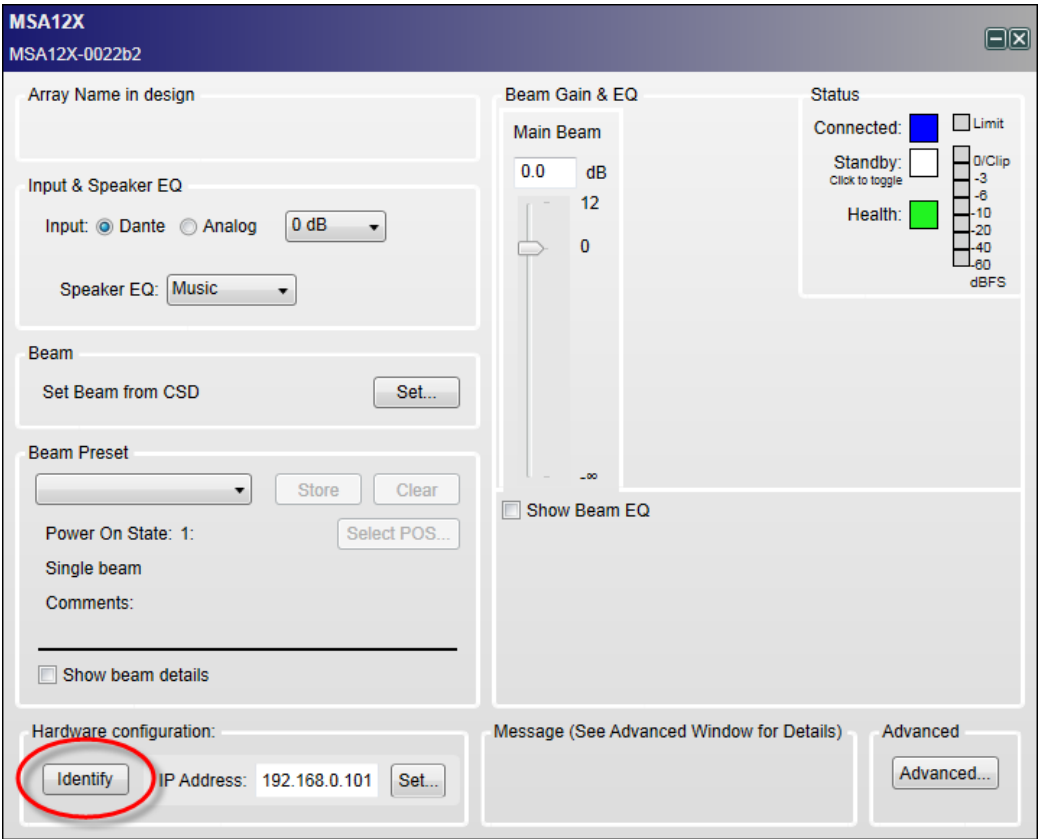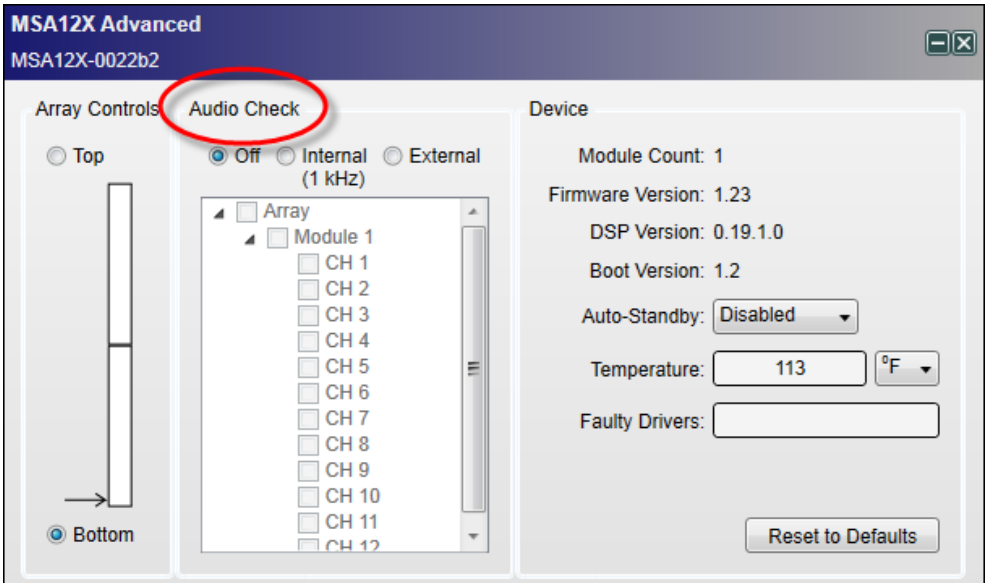

If you cannot access the back of the array to see the LED, another option is to push 'Advanced...' button and use the Audio Check mode.

With the 'Internal' option, an internal signal generator feeds a 1 kHz signal to the array and the array can be identified by that sound.

4. Once you identify the array, rename the device, such as 'Left-Array, 'Right-Array. This is the device name used for Dante® routing later. The device name can be the same as the Array name already defined in Modeler, but they can be different.
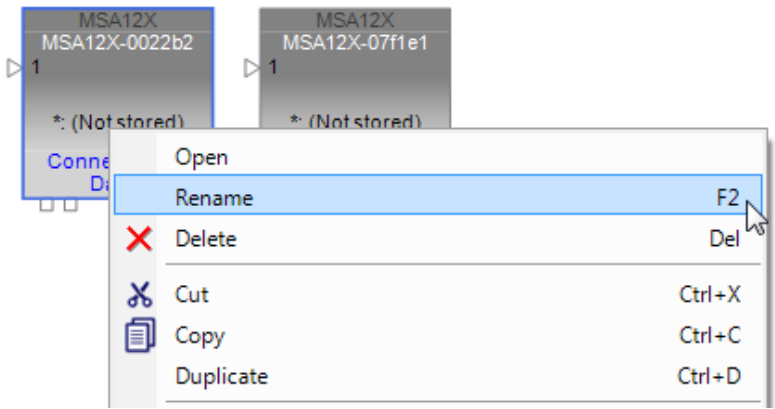
You can rename the device by right-clicking the device icon in the Project View.

Note: *The device name should follow the rule for Dante device labeling: Legal characters are A-Z, a-z, 0-9, and '-' (dash or hyphen). Device labels must begin with A-Z (or a-z).*

Associate ESP and MSA12X

In order to set multiple beam patterns for an MSA12X array and invoke changes from external devices, such as a Bose CC-64 controller, you need a supported Bose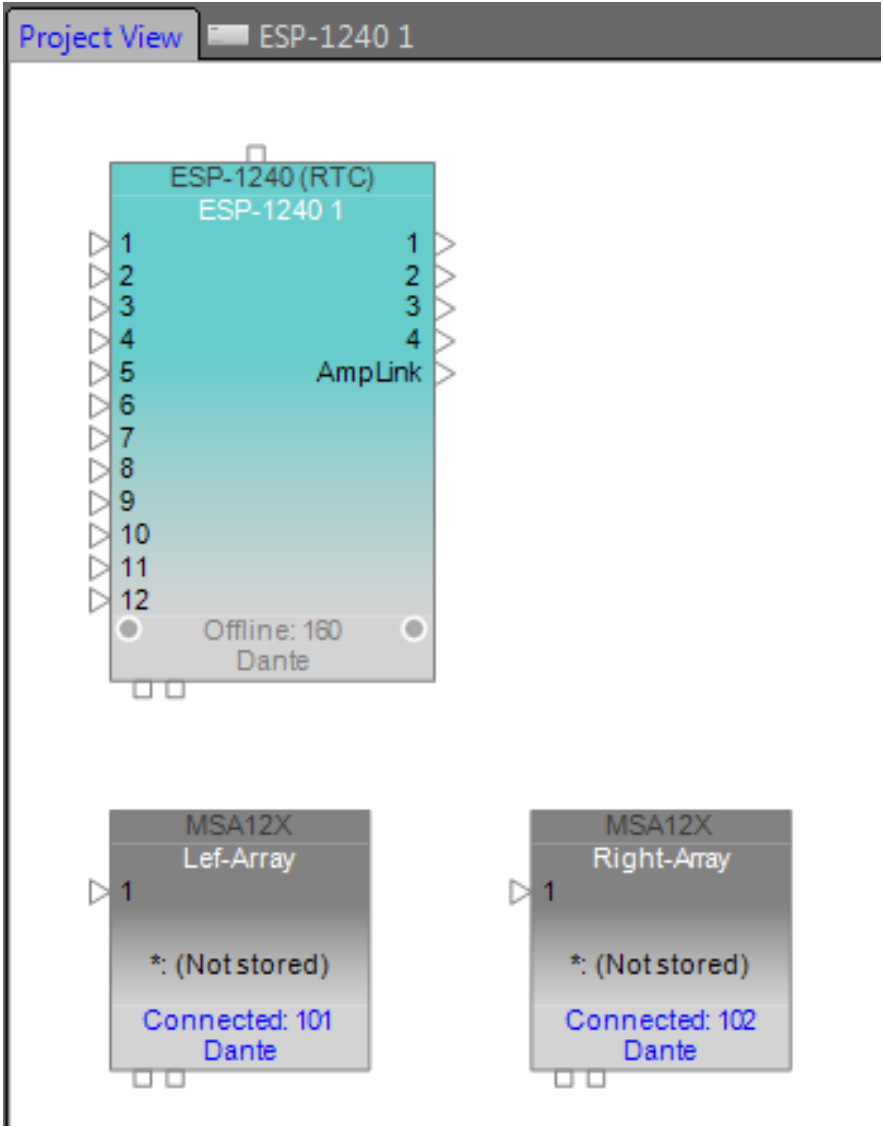 ControlSpace processor. Then, associate the MSA12X to the ControlSpace processor in CSD. Also through this process you can setup Dante® routing. If you use analog for your audio signal and do not need to set/invoke multiple beam patterns, you can skip this section.

1. Scan the network with CSD Scan. 👓

2. An ESP device block appears on the Project View.

3. Double-click the ESP device block and go to the device view of the ESP. Now you see MSA12X devices in the list under **Dante Endpoints** in the SP Tool Kit. Drag-drop these devices from the SP Tool Kit into the device view. This means that these devices are associated with the ESP currently selected.

4. When you drag-drop the devices from SP Tool Kit, red blocks appear in the Device View. These represent the Dante output blocks for the MSA12X devices. Notice you have two output channels for each MSA12X array. These 2 channels correspond to the two beams when the array is in dual beam mode; Ch1 is for Main Beam, and Ch2 is for Secondary Beam. If the array is in Single beam mode, signal for Ch2 is not radiated from MSA12X array.
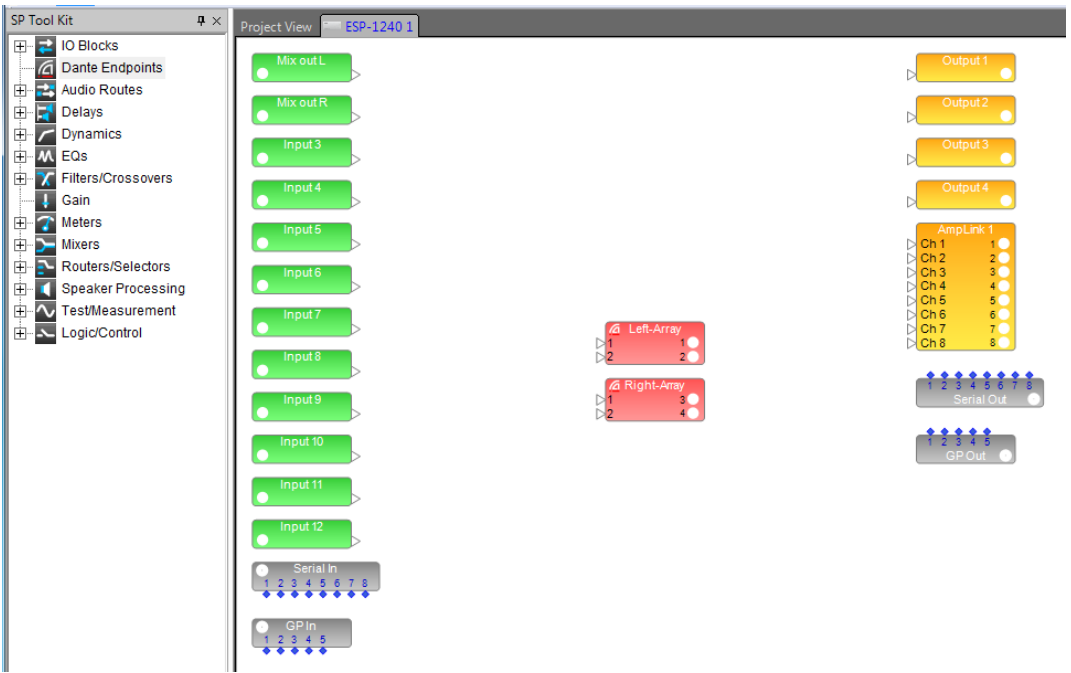
5. Add other signal processing blocks in the Device view and complete the system. You can apply different gain/EQ for each beam by feeding signals for output 1 and 2 of each MSA12X array.
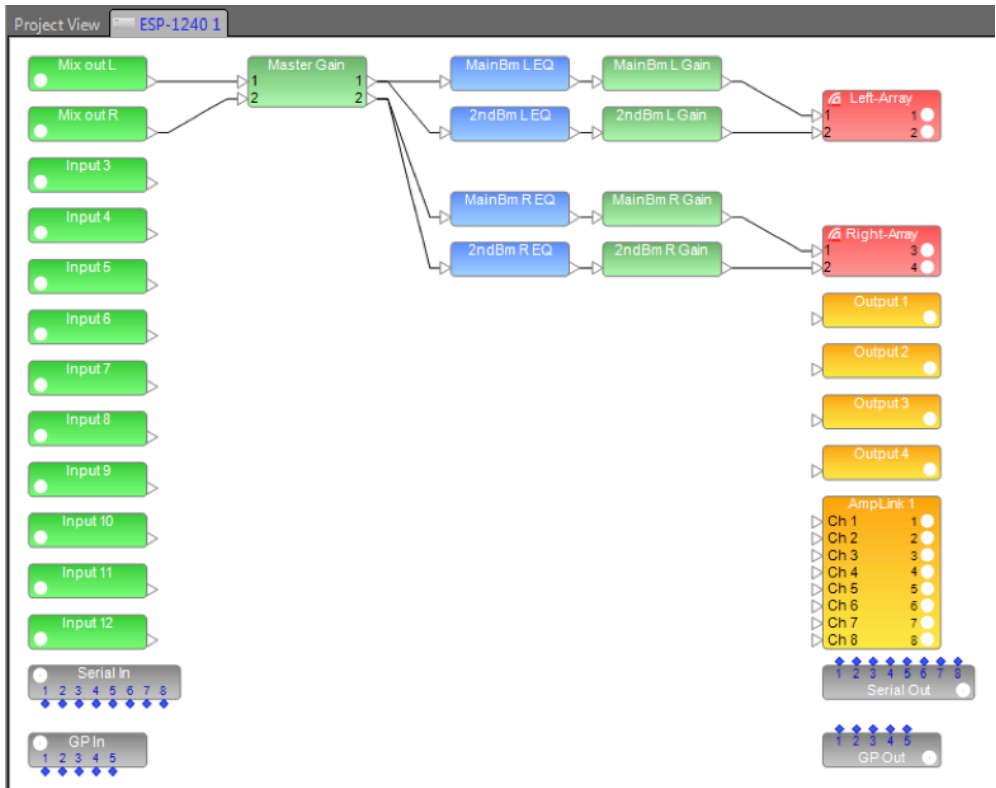
6. Go back to the Project View. Now the MSA12X device block indicates the ESP that it is associated with.

Dante® Subscription

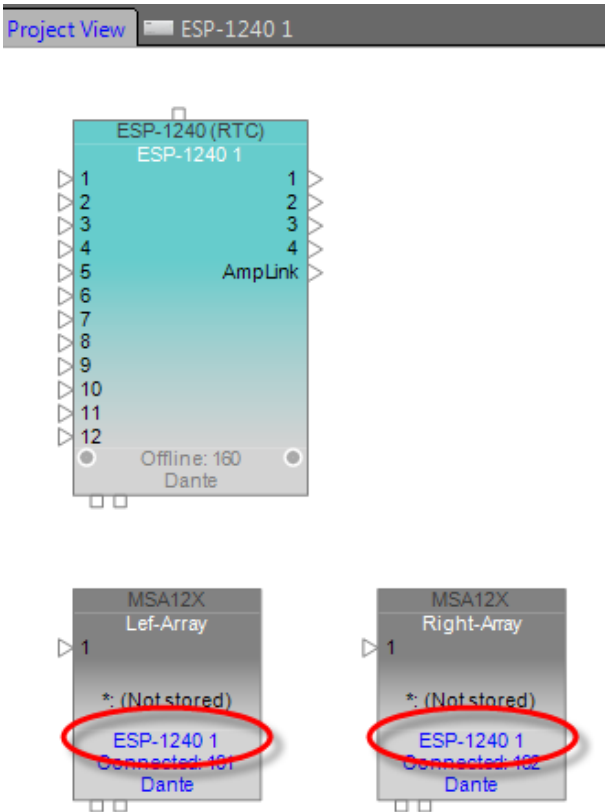When MSA12X is associated to an ESP, Dante channel subscription from the ESP to the MSA12X is executed automatically. Open the Dante Properties window by clicking the Dante icon (🔲) in the tool bar (or select from System > Dante Properties…) to see that Dante channel subscriptions have already been made.
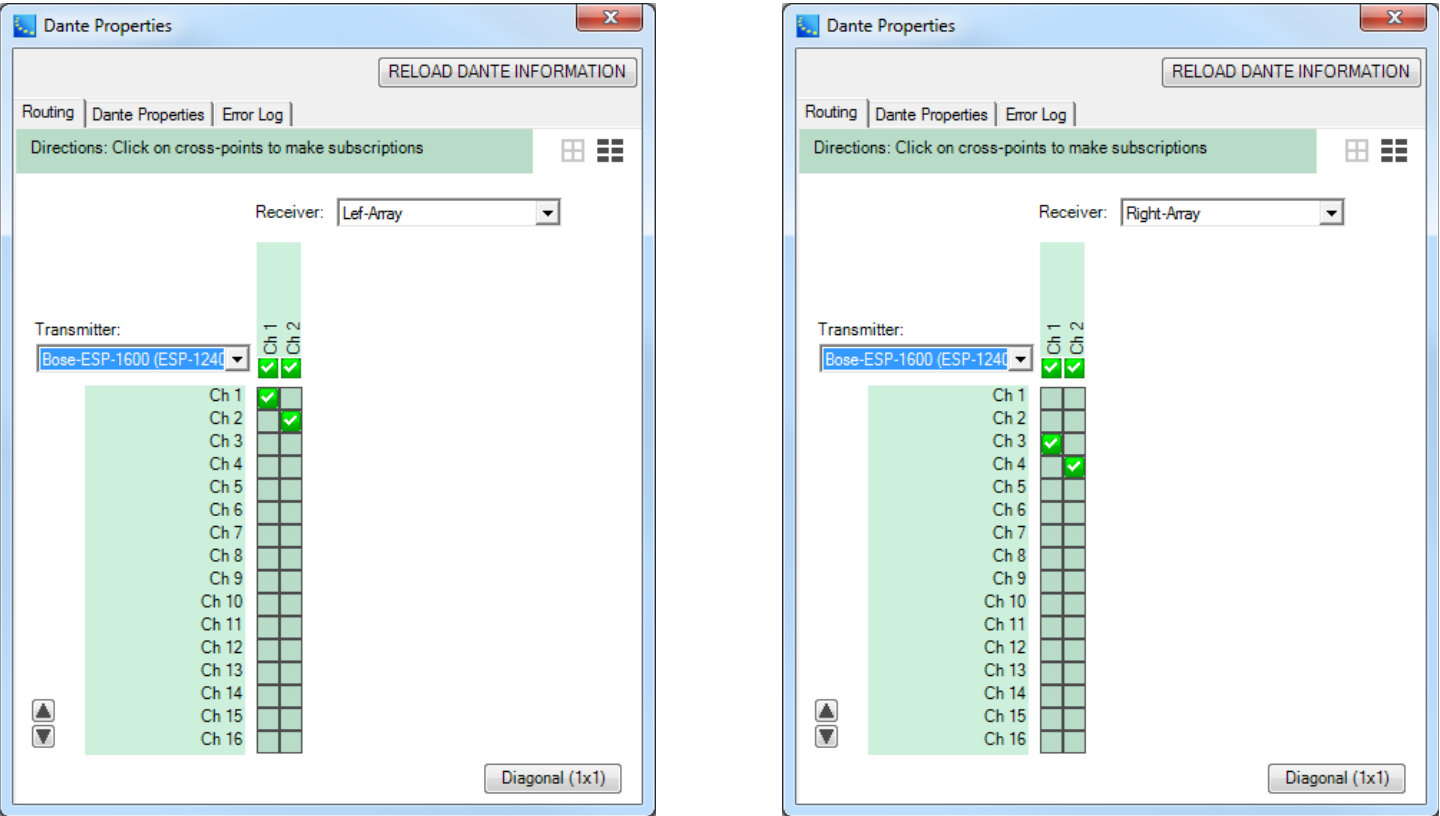
The Dante channel subscription can also be changed manually.

Adjust Input Settings

Adjust input settings to match your system. In the MSA12X control panel, you can

Select input type from Dante or Analog.

Select input gain (0 dB / +14 dB / +24 dB).

Select Speaker EQ (Music or Voice).
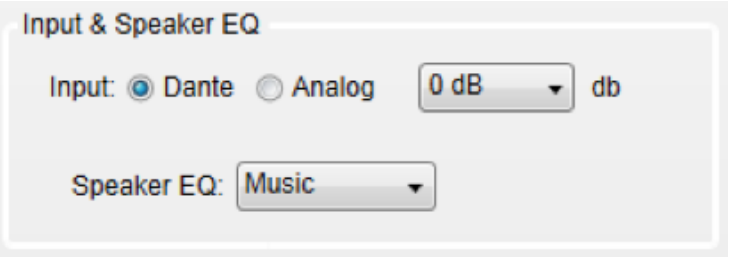
Send Beam Settings from Bose Array Tool or Modeler

Now you are ready to send beam settings designed in Bose Array Tool or Modeler to the MSA12X arrays.

1. Go to Modeler. Select the array and go to the Properties tab. Make sure the number of Modules (module count) in the Array Configuration matches that of the physical array.

2. Go to the Beam tab and click the 'Send to CSD' button.

2. Go to the Beam tab and click the 'Send to CSD' button.
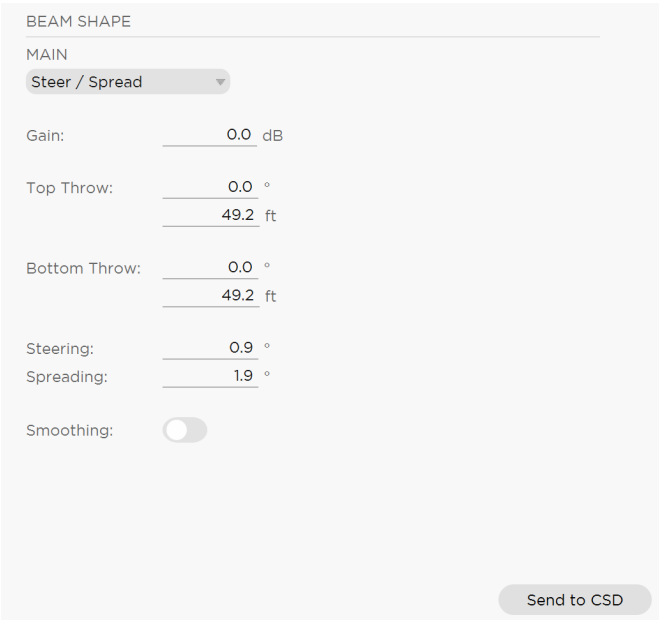
Note: CSD should have been launched on the same PC.

Send Beam Settings from the Bose Array Tool

1. Go to Bose Array Tool. Design your Array in the Speakers/Analysis tab. Make sure the number of Modules (module count) in the Array Configuration matches that of the physical array.
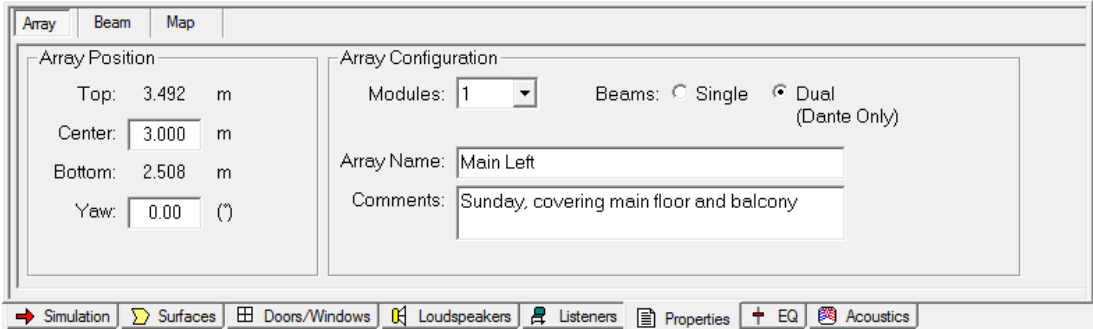
Receive Beam Settings within CSD
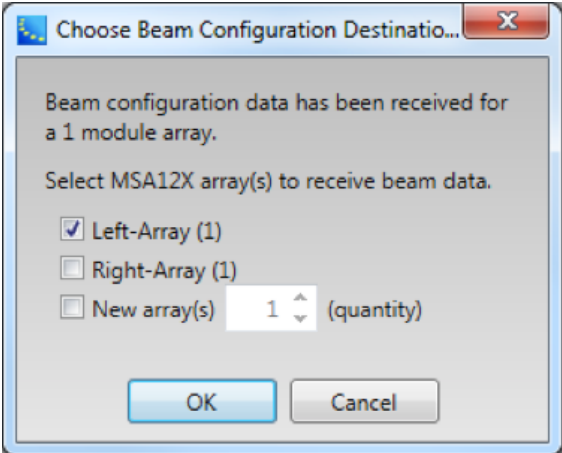
Beam Configuration Destination dialog box appears. The arrays that are selectable in this dialog box are the ones with the same number of modules (module count) in CSD. The number in parentheses after the device name indicates the module count. If the module count does not match, you cannot send beam settings to the array.

You can select multiple devices if needed. This is helpful when you have multiple arrays that require the same beam settings.

Now the beam setting has been sent to the array. If you are feeding audio signal to the array, you will be able to hear the beam pattern change. If you do not like the coverage, go back to Modeler or Bose Array Tool, adjust the parameters and repeat this process.

Adjust Beam Gain and Beam EQ
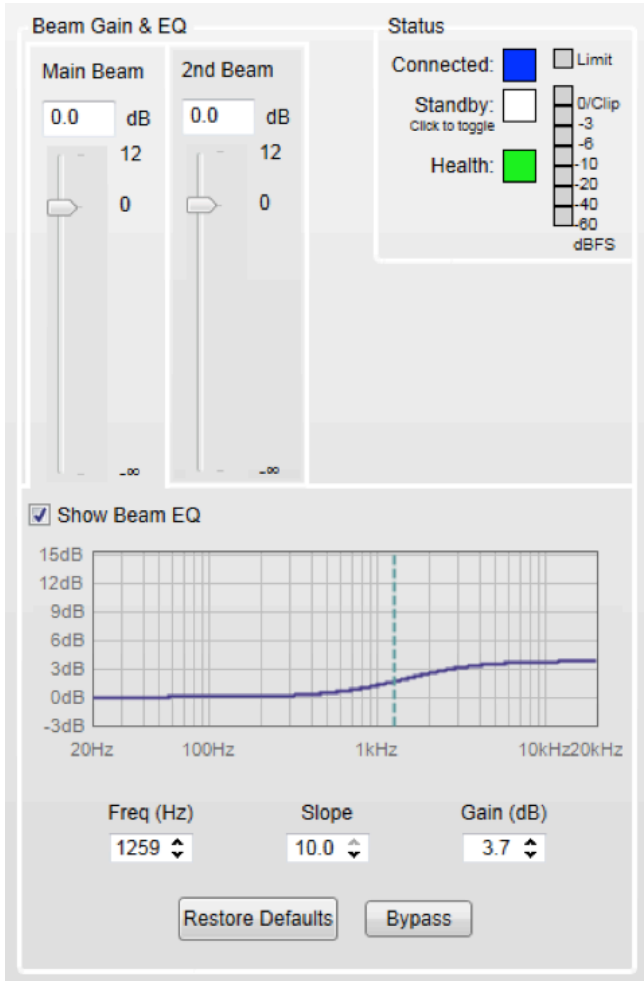
The Beam Gain and Beam EQ can be changed.

Beam Gain is for balancing gains between two beams when in Dual Beam mode.

Note: *Beam gain cannot be assigned to ControlSpace wall panels, such as CC-64 or ControlSpace Remote.*

Beam EQ is a filter to compensate for the tonal balance change depending on the beam spreading. The Beam EQ curve is calculated in Modeler for each beam automatically, and sent to CSD. The shape of the curve can also be adjusted. By clicking the beam gain for each beam, the Beam EQ display is toggled for that beam.

Beam Preset and Power On State

When you are satisfied with the coverage, Beam Gain and Beam EQ, the next step is to store that beam pattern to the array. Unless you store the beam pattern to a Beam Preset, the beam pattern is lost after the power cycle of the array. There are 10 memory banks for each MSA12X array, and you can store up to 10 different beam patterns along with other hardware properties (Beam Preset) to each MSA12X array. Beam Preset is a 'snapshot' of the state of the array.

Items below are stored in a Beam Preset:

  Input type, Input gain

  Speaker EQ

  Beam parameters such as Steer Angle, Spread Angle, etc.

  Comments

  Beam Gains

  Beam EQs

Store Beam Preset

1. Click 'Store' button.
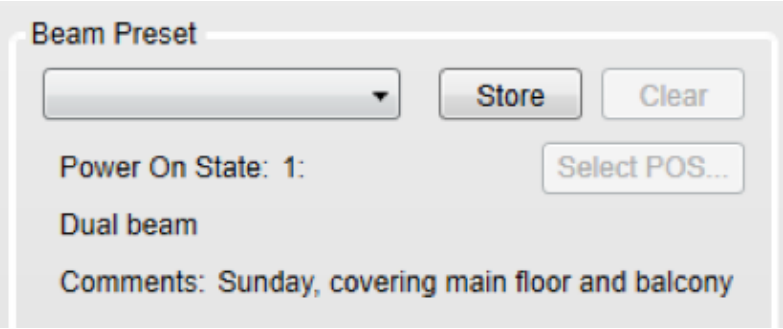
2. Store Beam Preset dialog box appears. Select the Preset number that you want to store the current state to. Change the label for that Preset. You can also edit the Comments field (up to 50 characters).
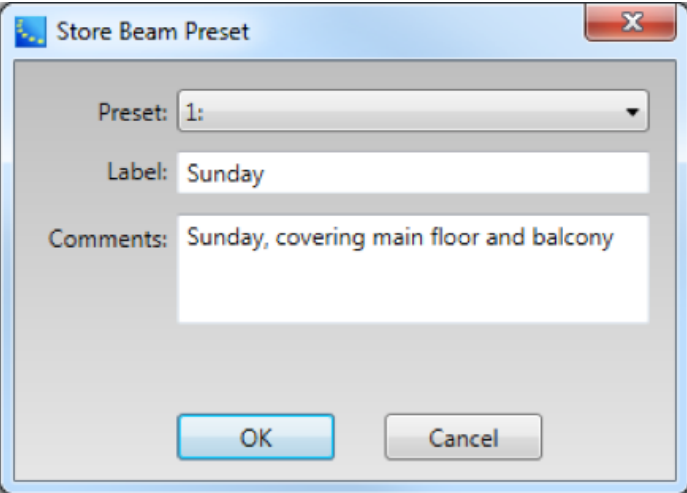
3. Now the current state is stored to the selected Preset. You can see the currently selected preset on the Beam Preset menu ('Preset 1: Sunday' in this case).
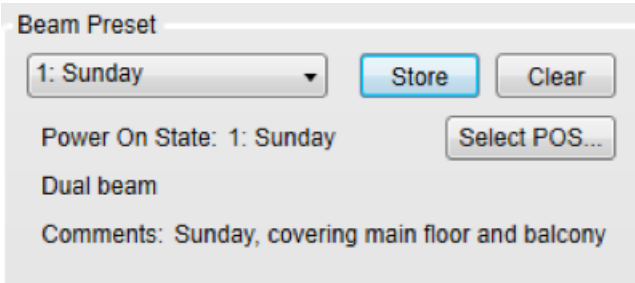
4. If you change any parameter (such as Beam pattern, Beam Gain) from here, the Beam Preset menu becomes blank. This means that the settings have changed, and the current state of the array has not been stored to a Beam Preset.
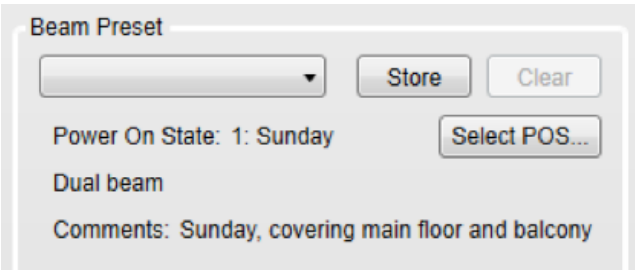
Above: Menu becomes blank after changing Beam EQ.

5. Once you store a beam preset(s), you can recall that beam preset from the drop-down list.
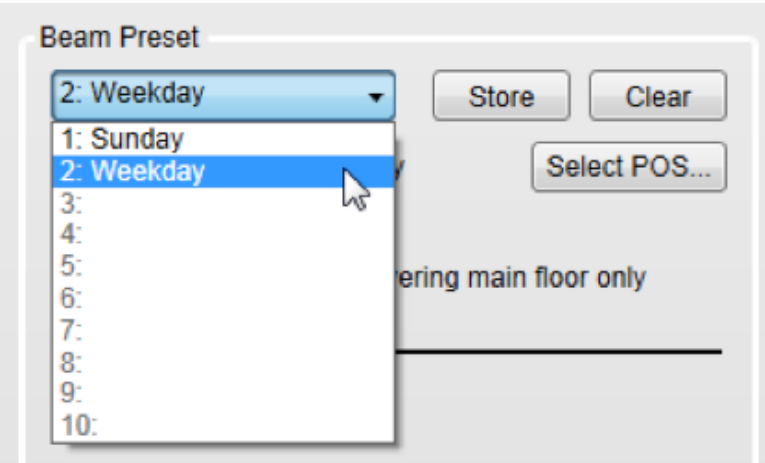
Power On State

Power On State is a Beam Preset that is automatically recalled right after the power cycle of the array. By default, the first stored Beam Preset is assigned to the Power On State. The Power On State is indicated below the Beam Preset menu.
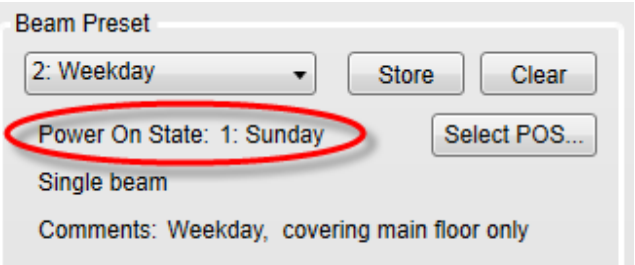
You can change the Power On State to a different Beam Preset.

1. Click 'Select POS...' button
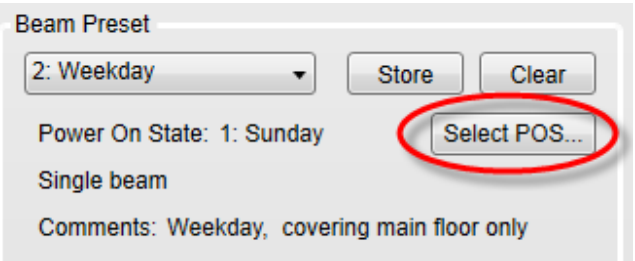
2. Select Power On State dialog box appears. Select the Beam Preset that you want to assign to the Power On State.
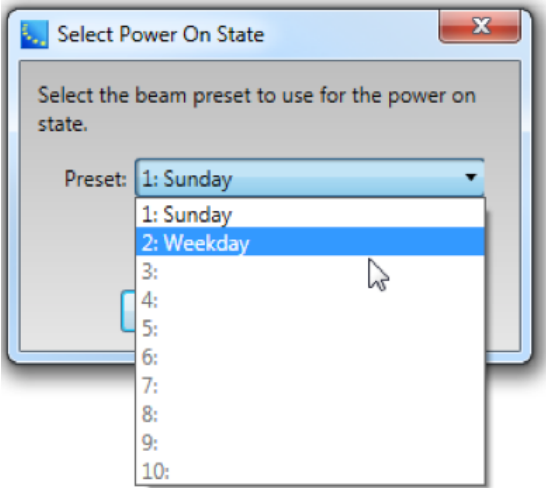
3. Click OK. Now the Power On State has been changed.
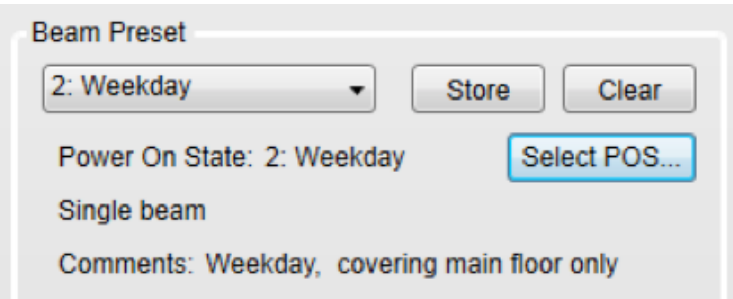
Assign Beam Preset to Parameter Set

Once you assign Beam Presets for each array, you can recall a Beam Preset by invoking a Parameter set from other ControlSpace control families (such as CC-64, GPIO, Timer in ESP, ControlSpace Remote). To do this, you have to assign the Beam Preset to the Parameter set.
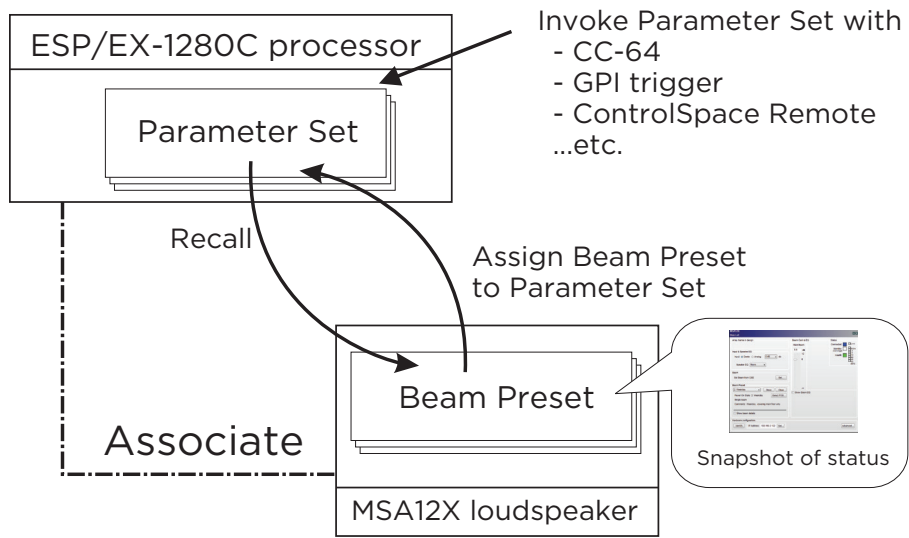
Note: You cannot assign each individual Parameter of an MSA12X device (such as Beam Gain, Beam EQ) to a Parameter set directly. Only a Beam Preset (which is a 'snapshot' of the state of the array) can be assigned to and recalled from a Parameter set.

This operation can be done while Dante is enabled, but cannot be done when CSD is online (blue background), which is a standard CSD programming procedure. You have to go offline before setting Parameter sets.

1. Recall the Beam Preset for the state that you want to assign to a Parameter set.
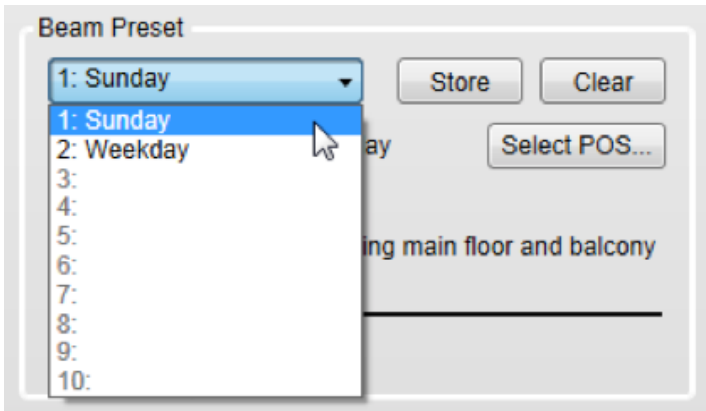
2. Go to the device view of the ESP that the MSA12X device is associated with, and select the output block that represents the MSA12X device.

3. Drag that output block into the parameter set tree in the Parameter Set window. Rename the parameter set if needed.
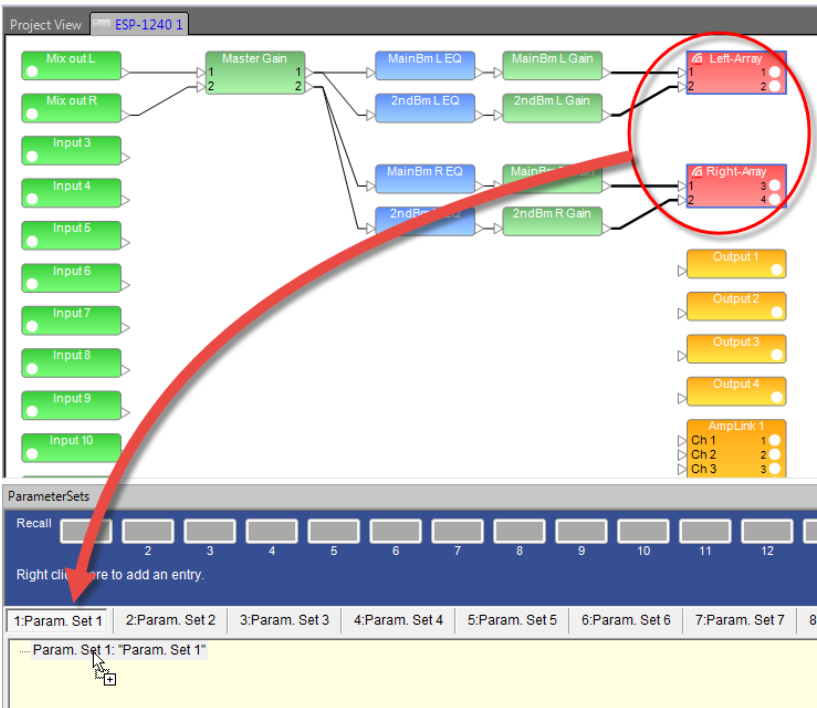
4. Select Properties window appears. Select 'Endpoint properties'. Click OK.
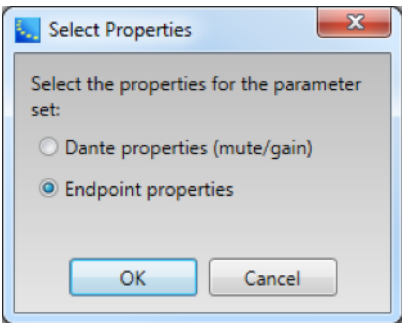
5. Now the Beam Preset has been assigned to the Parameter set.
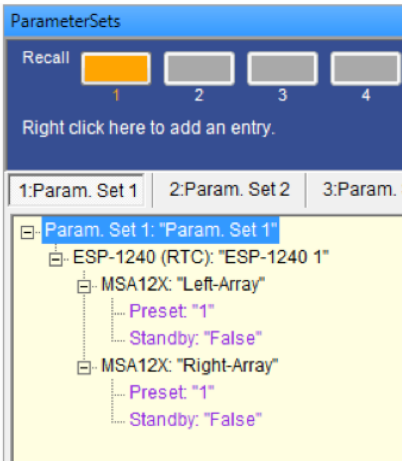
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1. Click 'Set...' button under Beam.
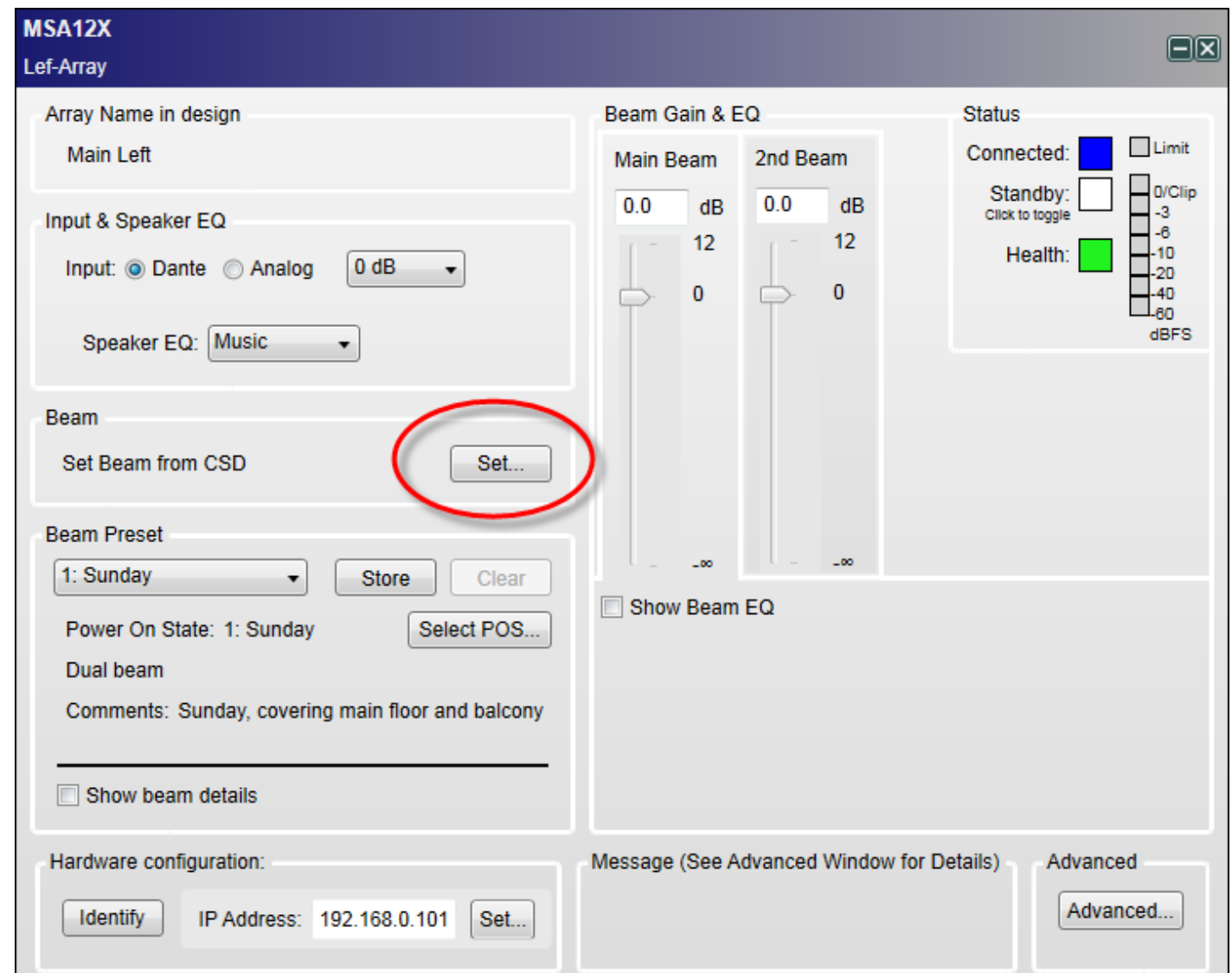
2. Beam Control window appears. Set the Steer angle and Spread angle for each beam. A red wire frame corresponds to the Main Beam; a blue wire frame corresponds to the Secondary Beam. 'Vocal Smoothing Option' is not available for this tool. Press 'Set' when you finish.
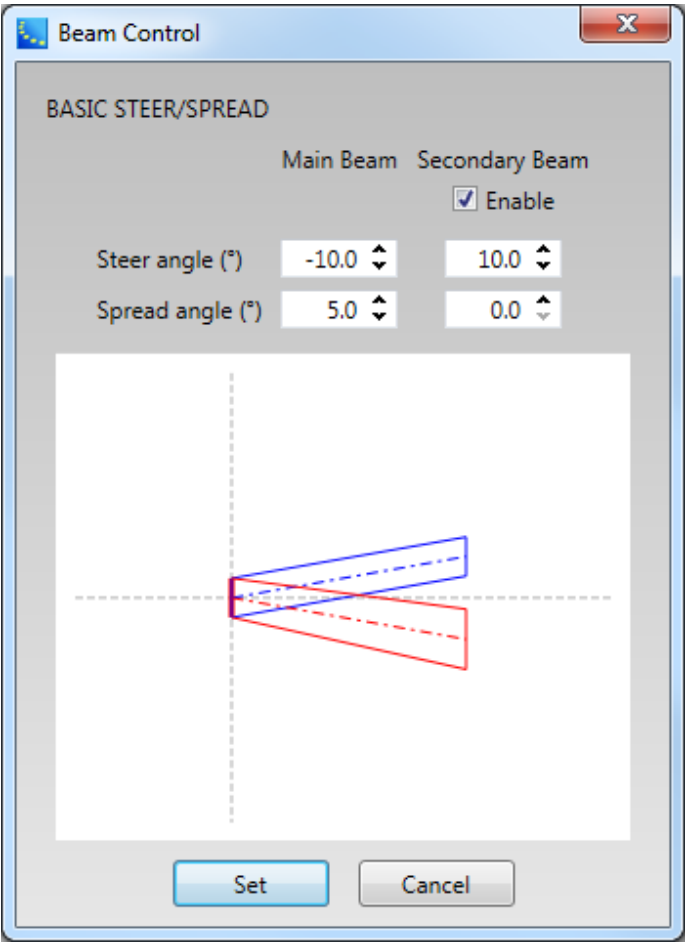
Note: The beam wireframes may look different from those in Modeler, even when the steering (and/or spreading angle) is the same. This is because in Modeler, a user can specify the Distance (length) of the beam lines, which does not affect the beam of this beam type. As long as the steering (spreading) angle is identical, the radiated beam pattern is identical.

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Template Files

Template files will be available on **PRO.BOSE.COM** to get you started using CSD and Modeler with MSA12X. These will include arrays for typical systems, including a 2-module Left-Right system with a single beam and a 2-module Left-Right system with dual beams. If you are new to CSD or Modeler, it is recommended to use these template files to start your projects.

Frequently Asked Questions

What is the angular limit for Basic Steering/Spreading?

Array	1-module	2-module	3-module
Steer	−20° to +20°	−20° to +20°	−20° to +20°
Spread	0° to 30°	0° to 40°	0° to 40°

1-module array

2- or 3-module array

30° 15°

15°

−20°

40° 20°

20°

−20°

Steer: ± 20°
Spread: Up to 30° (± 15°)

Steer: ± 20°
Spread: Up to 40° (± 20°)

What is the frequency limit for the beam control?

It depends on the length of the array. The longer the array, the lower the frequency limit for the beam control. A rough guide is shown below:

    1-module array: 500 Hz

    2-module array: 250 Hz

    3-module array: 160 Hz

How many modules per array are supported?

Up to 3 modules stack per array is supported.

How many modules do I need for the dual beam?

Regardless of number of modules of an array, up to two beams (single beam or dual beam) can be radiated. It is recommended to use a 2- or 3-module MSA12X array for better directivity control due to the longer array.

How many beams can be radiated from one array?

Currently, up to two beams per array (dual beam) are supported.

Do I need a power amplifier for driving a MSA12X array?

No. MSA12X is a powered loudspeaker with amplifiers in it, and you do not need additional power amplifiers.

Does MSA12X have DSP inside? Do I need an external signal processor?

MSA12X has on-board DSP inside, which manages Speaker EQ, beam shaping, beam gain and Beam EQ. If you need to apply more signal processing such as Room EQ or signal delay for rear arrays, you need an additional signal processor such as Bose ESP in the upstream of the system.

What EQ options does MSA12X offer?

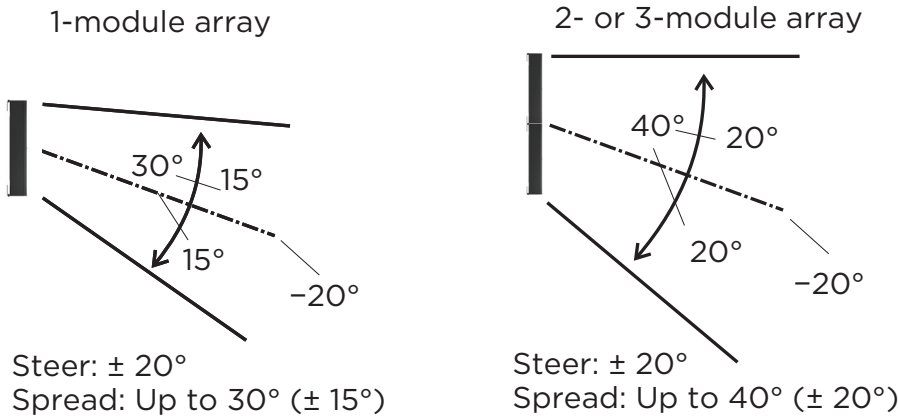MSA12X has 2 layers of EQ in its on-board DSP. First, it has an on-board Speaker EQ, with a Music and Speech option that updates for 1-module, 2-module and 3-module arrays. This provides the basic sound profile for MSA12X and the Music setting closely matches the MA12EX sound profile. Second, there is Beam EQ which compensates for the tonality change when spreading is applied. Beam EQ is automatically applied by the beam shape and this can be viewed and edited in the CSD MSA12X control panel. And optionally, a third layer, room EQ can be added to correct for room problems. This EQ is manually added as blocks in a DSP such as ESP-880/1240/4120/1600 or ControlSpace EX-1280C. Template CSD files include the recommended room EQ blocks for CSD.

Do I need Speaker EQ on external signal processor?

No. MSA12X has an on-board Speaker EQ, which you can choose from 'Music' or 'Voice'.

What is possible with/without a ControlSpace ESP, with/without Dante® Card?

	ESP* with Dante Card, ControlSpace EX	ESP* without Dante Card	No ESP in the System
Input Signal	Dante or Analog	Analog	Analog
Beam Pattern Change** via CC-64 and Bose wall controls	Yes	No	No
Beam Pattern Change** via ControlSpace Remote (CSR)	Yes	No	No
Beam Pattern Change** via Timer	Yes	No	No
Beam Pattern Change** via GPI	Yes	No	No
Toggle Stand-by via Bose wall panels, CSR, Timer, GPI	Yes	No	No
Dual Beam	Yes	No	No
Room EQ, delay	Use ESP* or ControlSpace EX	Use ESP*	Requires 3rd party processor

* ControlSpace ESP-880, ESP-1240, ESP-4120, ESP-1600 engineered sound processors
** Includes Dante/Analog input, input gain, Beam EQ settings

What is the input signal type?

Dante input and balanced analog input are supported.

Can I use Dante redundancy with MSA12X?

MSA12X array has only one RJ-45 input, and Dante redundancy is not supported. Note that for a multi-module array, you cannot use RJ-45 input(s) that belongs to slave module(s). Only the RJ-45 input on the master module can be used for the entire array.

Can I switch Dante/Analog input without a PC?

Yes. To do this, you need an ESP (with Dante Card) or EX-1280C in the system. Input type (Dante/Analog) can be stored in the beam presets. Once you set up the beam pattern, first store that beam pattern to one of the beam presets, with 'Dante' selected for the beam type. Then switch the input type to 'Analog', and store that state to another beam preset. Assign these beam presets to Parameter sets in ESP/EX-1280C. You can now switch between Dante input and Analog input using the Parameter sets.

Automatic failover is not supported.

Can I assign Beam gains to controls such as CC-64 or ControlSpace Remote?

You cannot assign beam gains in the main window of MSA12X device view. In order to achieve the same functionality, you need a supported ControlSpace processor. Insert a gain block in the signal chain in the ESP (with Dante® Card) or EX-1280C and assign that gain block to the controls.

Can the ControlSpace ESP-00 processor be used to support MSA12X?

You can use ESP-00 and MSA12X in the same system. However, ESP-00 does not support association with MSA12X. i.e. you cannot use Parameter Set via ESP-00 for invoking Beam Preset of a MSA12X array.

Can I use the beam shaping functionality from CSD?

Yes, with a specific beam type. In CSD, you can use 'Set beam from CSD', which enables you to setup basic steering/spreading on site without needing Modeler.

Can I use rear arrays? When do I need rear arrays?

You can use rear arrays just like when you design your system with line arrays such as MA12 or MA12EX. This will depend on the room shape and beam pattern that you design. It is recommended to use the Modeler SPL map and evaluate the acoustic performance based on the prediction.

Can I mix & match MSA12X with other Bose modular columnar arrays?

Yes. MSA12X is a member of the Bose Panaray modular line array family, which includes MA12 and MA12EX. For example, if you do not need to digitally steer the beam for rear arrays, you can use other passive modular line arrays with an amplifier (e.g. MA12 with a PowerMatch).

Does Bose offer an EASE .GLL file or EASE .GLL export for MSA12X to compare MSA12X performance directly against competitors within EASE or EASE Focus?

No, Bose does not offer an Ease .gll file at this time.   It is possible to import .CLF files in Modeler, however.

Does MSA12X offer Redundant Dante or Redundant Spillover from Dante to Analog in the case of a Dante failure?

No, Bose does not offer redundancy support at this time.

Is MSA12X EN-54-24 certified for voice-alarm systems?

No, Bose does not offer EN54-24 support at this time.

Does MSA12X bracket and software allow physical pitch?

No, included bracket will not allow you to vertically angle the MSA12X. However, Modeler software can accommodate physical pitch if it exists due to room dimensions.

How does MSA12X achieve such low dealer-prices compared to competitor beam-steering arrays of the same height?

The modular design allows us to stock the product like a normal higher-volume SKU; customers can order 2 or 3 and stack them if they need a taller column. Furthermore, putting some of the duties of DSP into an outboard DSP, specifically optional room EQ, allows a simpler design of the product.

Is the Panaray MSA12X modular line array loudspeaker paintable?

Yes, with Krylon® spray paints or other similar products.

Appendix: How to Set Up IP Address

We recommend having a router or DHCP server in the system for setting up, which will make the setup process simple and easy. However there will be cases where you do not have a router/DHCP server. This appendix shows example IP setting processes for typical situations.

For more complex Network settings, please contact the IT representative personnel.

*Note: Dante® Controller must be installed on your PC (download: **https://www.audinate.com/**).*

With EX-1280C or 1U ESP with Dante® Card, No Router

1. Connect PC and all the devices to the network.
2. Set IP of PC to DHCP.
3. Launch Dante Controller.
   a. Make sure all the Dante Devices (incl. MSA12X arrays, ESP) appear.
   b. At this point, all the Dante Devices should be
      i. IP: 169.254.xxx.xxx
      ii. Subnet Mask: 255.255.0.0
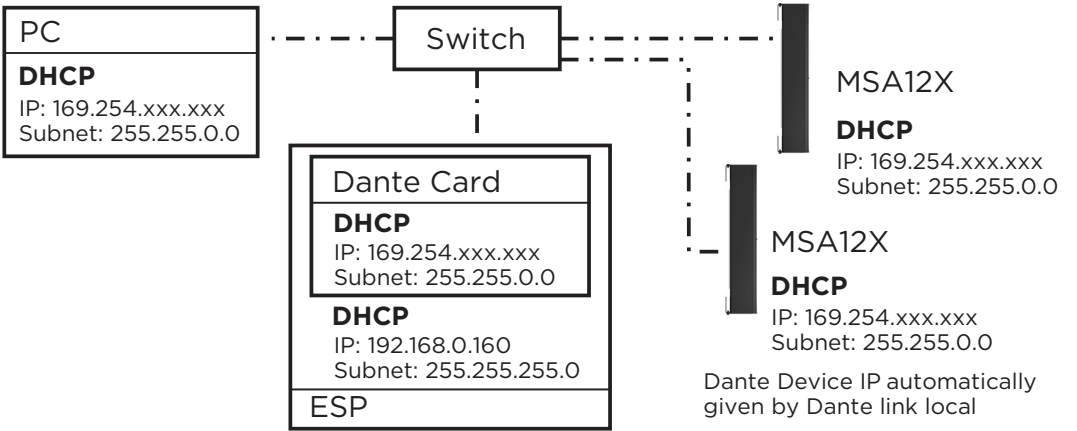
4. Change IP of all the Dante devices to static:
      i. IP: 192.168.0.xxx (e.g. 101, 102, ...)
      ii. Subnet Mask: 255.255.255.0

Each time you change the IP, that Dante device may disappear in the Dante Controller, or even if it can be seen, you may not be able to assign Dante subscriptions. This is OK.

5. Change IP of PC to 192.168.0.10, Subnet mask 255.255.255.0.

PC
Static
IP: 192.168.0.10
Subnet: 255.255.255.0

Switch

Dante Card
Static
IP: 192.168.0.**101**
Subnet: 255.255.255.0

DHCP
IP: 192.168.0.160
Subnet: 255.255.255.0

ESP

MSA12X
Static
IP: 192.168.0.**102**
Subnet: 255.255.255.0
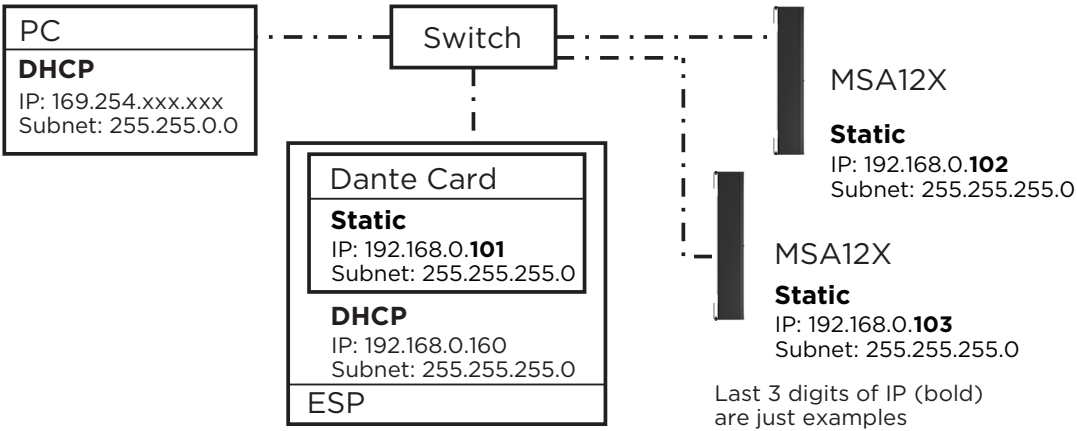
MSA12X
Static
IP: 192.168.0.**103**
Subnet: 255.255.255.0

6. Launch CSD. Now BMW arrays appear in the Project View.
   a. If not, go to System > Enable Dante Control.
   b. If MA12X arrays still do not appear, make sure the right Network Interface Card (NIC) is selected for CSD. You can see the current NIC from the top menu: System > Host NIC Setup.
7. Scan ControlSpace Network. Now ESP with Dante Card appears.
   a. If not, make sure the Project Network Address is 192.168.0.xxx. You can set this by selecting Tools > Set Project Network Properties.
   b. By default, the IP of ESP is 192.168.0.160.
8. Set the IP setting of ESP from DHCP enabled to static.

PC
Static
IP: 192.168.0.10
Subnet: 255.255.255.0

Switch

Dante Card
Static
IP: 192.168.0.**101**
Subnet: 255.255.255.0

Static
IP: 192.168.0.160
Subnet: 255.255.255.0

ESP

MSA12X
Static
IP: 192.168.0.**102**
Subnet: 255.255.255.0

MSA12X
Static
IP: 192.168.0.**103**
Subnet: 255.255.255.0

With 1U ESP without Dante® Card, Analog Input to MSA12X, No Router

1. Connect PC and all the devices to the network.
2. Set IP of PC to DHCP.
3. Launch Dante Controller.
   a. Make sure all the Dante Devices (incl. MSA12X arrays) appear.
   b. At this point, all the Dante Devices should be
      i. IP: 169.254.xxx.xxx
      ii. Subnet Mask: 255.255.0.0

PC
DHCP
IP: 169.254.xxx.xxx
Subnet: 255.255.0.0

Switch

DHCP
IP: 192.168.0.160
Subnet: 255.255.255.0

ESP (no Dante Card)

MSA12X
DHCP
IP: 169.254.xxx.xxx
Subnet: 255.255.0.0

MSA12X
DHCP
IP: 169.254.xxx.xxx
Subnet: 255.255.0.0
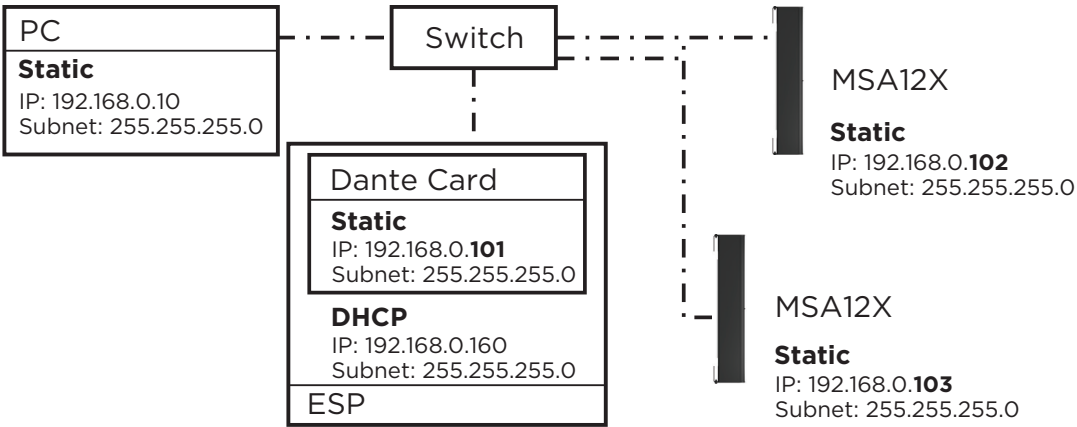
Analog input for MSA12X (Audio Signal)

4. Change IP of all the Dante devices to static:
      i. IP: 192.168.0.xxx (e.g. 101, 102, ...)
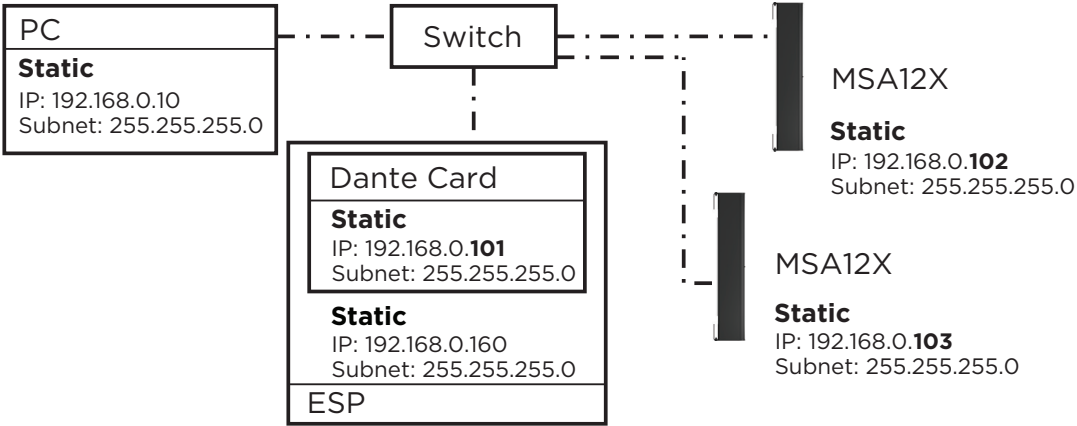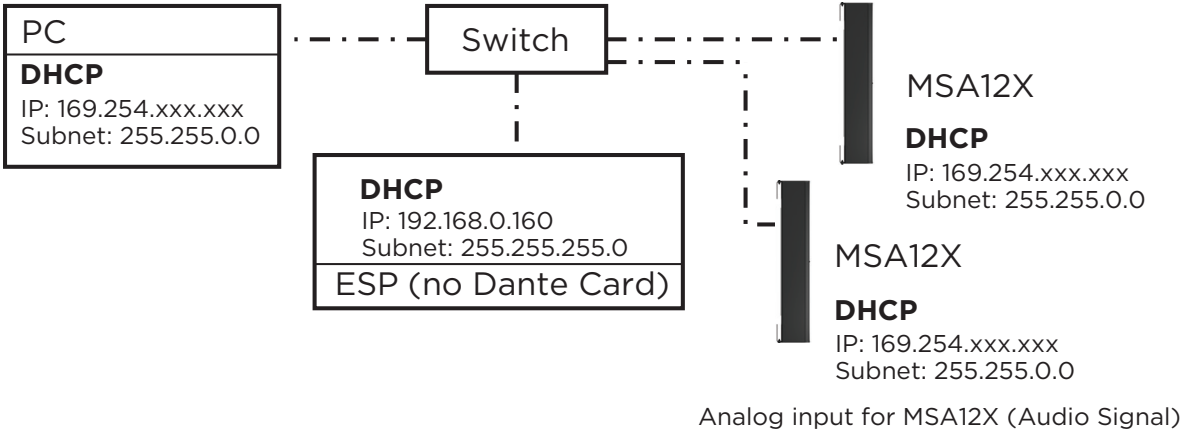   ii. Subnet Mask: 255.255.255.0

Each time you change the IP, that Dante device may disappear in the Dante Controller, or even if it can be seen, you may not be able to assign Dante subscriptions. This is OK.

PC
DHCP
IP: 169.254.xxx.xxx
Subnet: 255.255.0.0

Switch

DHCP
IP: 192.168.0.160
Subnet: 255.255.255.0

ESP (no Dante Card)

MSA12X
Static
IP: 192.168.0.**101**
Subnet: 255.255.255.0

MSA12X
Static
IP: 192.168.0.**102**
Subnet: 255.255.255.0

Last 3 digits of IP (bold)
are just examples

5. Change IP of PC to 192.168.0.10, Subnet mask 255:255:255.0.


```
PC
Static
IP: 192.168.0.10
Subnet: 255.255.255.0
```
Switch
```
DHCP
IP: 192.168.0.160
Subnet: 255.255.255.0
ESP (no Dante Card)
```
MSA12X
```
Static
IP: 192.168.0.101
Subnet: 255.255.255.0
```
MSA12X
```
Static
IP: 192.168.0.102
Subnet: 255.255.255.0
```

6. Launch CSD. Now MSA12X arrays appear in the Project View.
    a. If not, go to System > Enable Dante Control.
    b. If MA12X arrays still do not appear, make sure the right Network Interface Card (NIC) is selected for CSD. You can see the current NIC from the top menu: System > Host NIC Setup.
7. Scan ControlSpace Network. Now ESP appears.
    a. If not, make sure the Project Network Address is 192.168.0.xxx. You can set this by selecting Tools > Set Project Network Properties.
    b. By default the IP of ESP is 192.168.0.160.
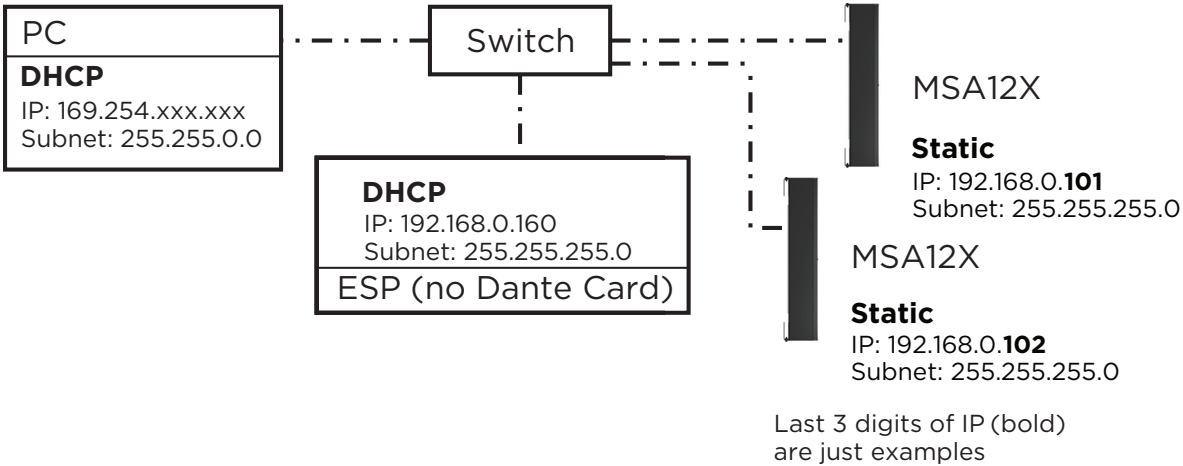8. Set the IP setting of ESP from DHCP enabled to static.


```
PC
Static
IP: 192.168.0.10
Subnet: 255.255.255.0
```
Switch
```
Static
IP: 192.168.0.160
Subnet: 255.255.255.0
ESP (no Dante Card)
```
MSA12X
```
Static
IP: 192.168.0.101
Subnet: 255.255.255.0
```
MSA12X
```
Static
IP: 192.168.0.102
Subnet: 255.255.255.0
```

9. Make sure to change the input type of each MSA12X device to Analog.

Note: Dual beam option cannot be used when the input is Analog. Without a Dante Card, you cannot change the beam pattern by invoking a beam preset via Parameter-set.

Without ESP/EX-1280C, Analog Input to MSA12X, No Router

MSA12X is a Dante device. Even if you do not use Dante connection for sending audio signal, the beam configuration setup is performed through Dante Network, and you have to setup IP of PC and MSA12X.

1. Connect PC and all the devices to the network.
2. Set IP of PC to DHCP. At this point, you may not be able to see MSA12X in CSD, since Project Network Address is still 192.168.0.xxx.
3. Launch Dante Controller.
    a. Make sure all the Dante Devices (incl. MSA12X arrays) appear.
    b. At this point, all the Dante Devices should be
        i.   IP: 169.254.xxx.xxx
        ii. Subnet Mask: 255.255.0.0


```
PC
DHCP
IP: 169.254.xxx.xxx
Subnet: 255.255.0.0
```
Switch

Project Network Address of CSD
192.168.0.xxx by default

```
MSA12X
DHCP
IP: 169.254.xxx.xxx
Subnet: 255.255.0.0
```
```
MSA12X
DHCP
IP: 169.254.xxx.xxx
Subnet: 255.255.0.0
```
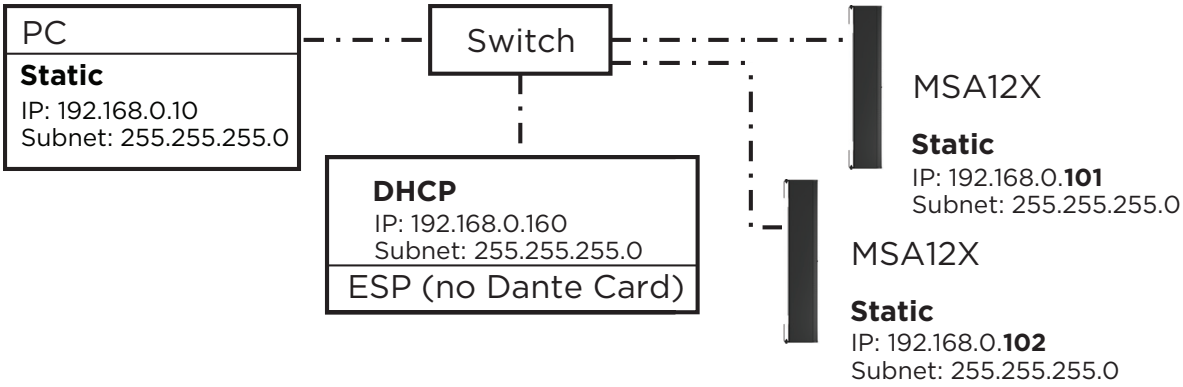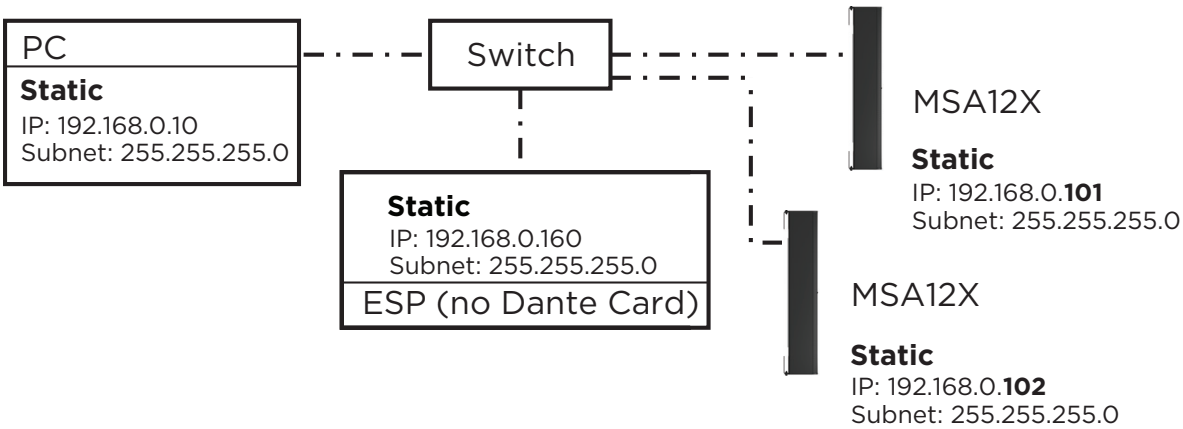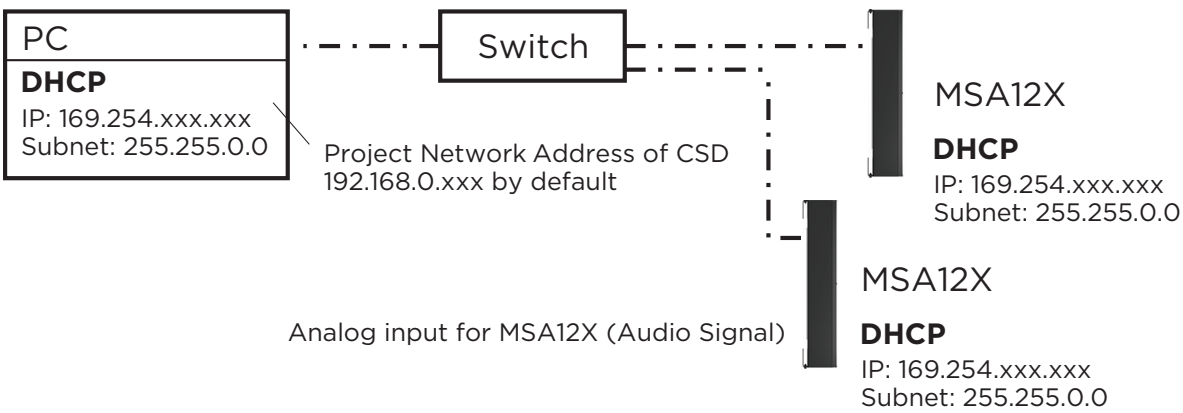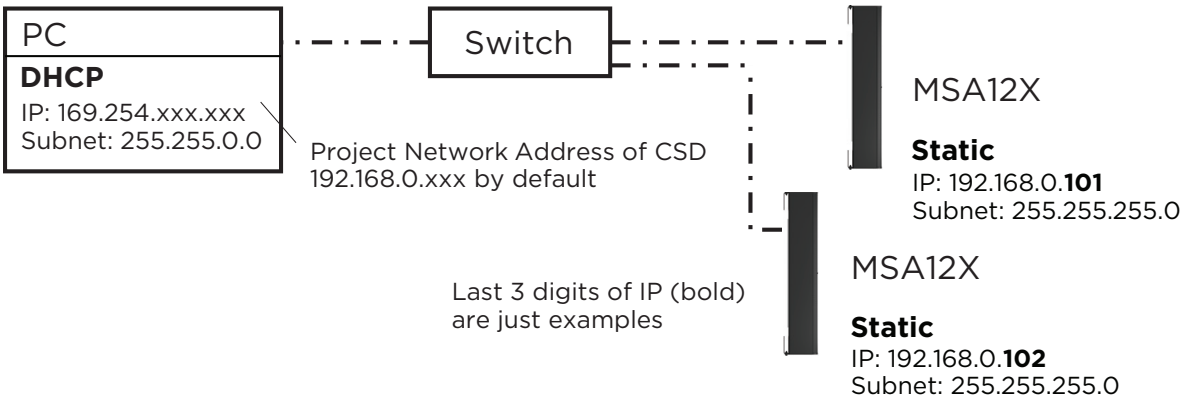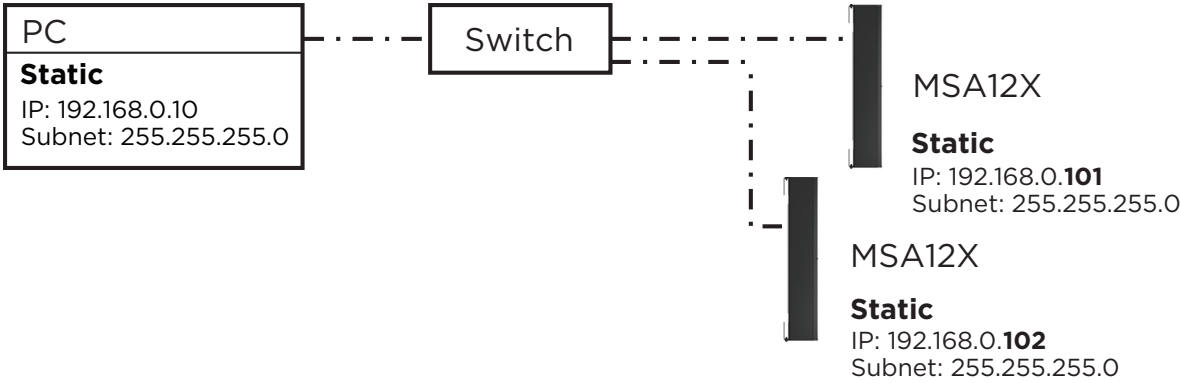Analog input for MSA12X (Audio Signal)

4. Change IP of all the Dante devices to static:
    i.   IP: 192.168.0.xxx (e.g. 101, 102, ...)
    ii. Subnet Mask: 255.255.255.0

Each time you change the IP, that Dante device may disappear in the Dante Controller, or even if it can be seen, you may not be able to assign Dante subscriptions. This is OK.


```
PC
DHCP
IP: 169.254.xxx.xxx
Subnet: 255.255.0.0
```
Switch

Project Network Address of CSD
192.168.0.xxx by default

```
MSA12X
Static
IP: 192.168.0.101
Subnet: 255.255.255.0
```
Last 3 digits of IP (bold)
are just examples

```
MSA12X
Static
IP: 192.168.0.102
Subnet: 255.255.255.0
```

Appendix: How to Set Up IP Address

5. Change IP of PC to 192.168.0.10, Subnet mask 255:255:255.0.

PC
Static
IP: 192.168.0.10
Subnet: 255.255.255.0

Switch

MSA12X
Static
IP: 192.168.0.**101**
Subnet: 255.255.255.0

MSA12X
Static
IP: 192.168.0.**102**
Subnet: 255.255.255.0

6. Launch CSD. Now MSA12X arrays appear in the Project View.

    a. If not, make sure the Project Network Address is 192.168.0.xxx. You can set this by selecting Tools > Set Project Network Properties.

    b. By default, the IP of ESP is 192.168.0.160.

7. You can set up the beam properties of MSA12X without 'Go Online...' in CSD, as long as the Dante Control and Endpoint Control are enabled.

8. Make sure to change the input type of each MSA12X device to Analog.

If you do not have a network switch in the system, connect your PC to each MSA12X directly, and repeat the above process for each array.

Note: You cannot change the beam pattern via a beam preset without a 1U ESP (ESP-880/1240/4120/1600) with Dante Card, or ControlSpace EX-1280C in the system.

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