EDC Acoustics iOS Application Guide

Version 1.0

Controls

Menu Bar - Hide and show Menu bar by tapping here

Project Page – Show and hide project page

Array Page – Show and hide array controls

Beam Page – Show and hide beam controls

Audience Page – Show and hide audience controls

Settings Page – Show and hide settings

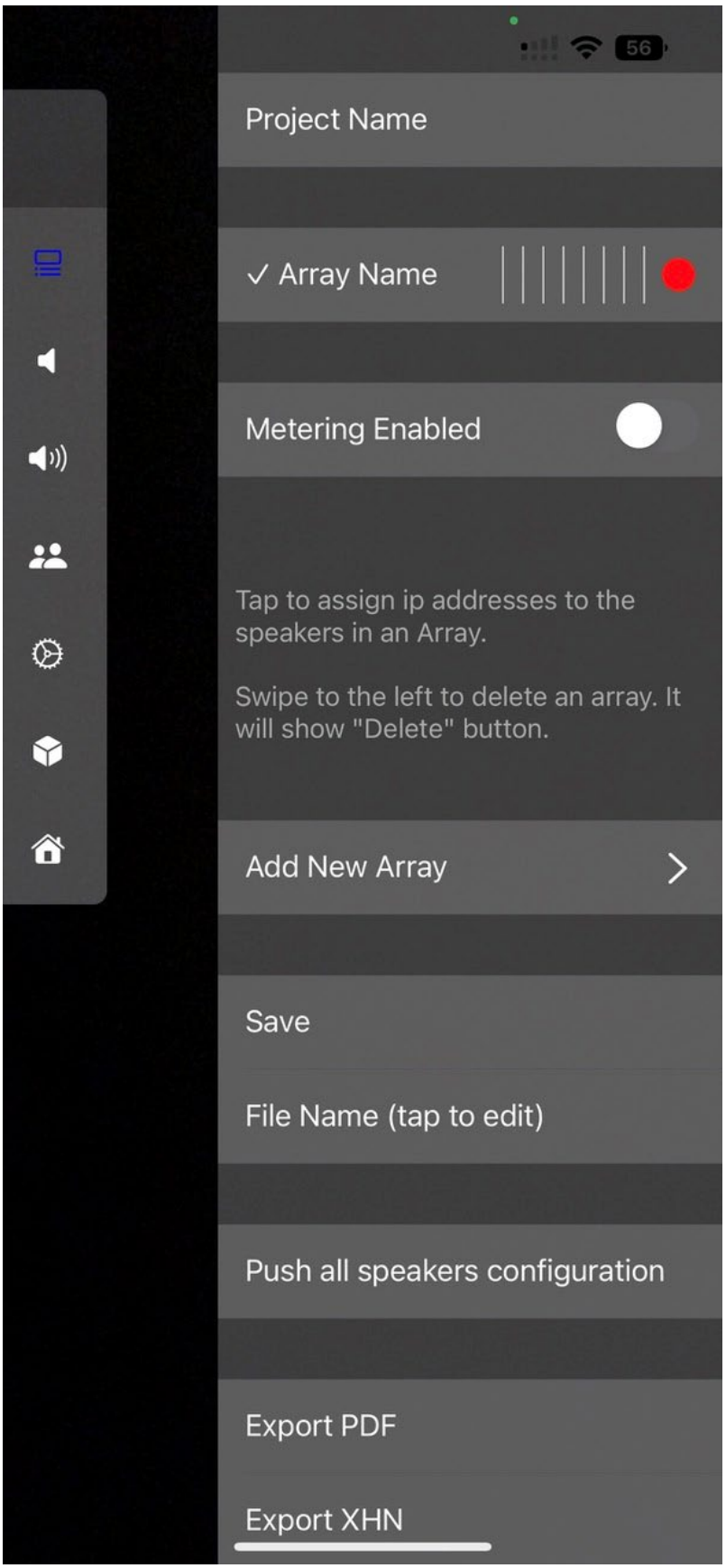
3D Model Page – Show and hide 3D object import and placement page

Home – Close project with or without saving

Note: The iOS application is an “offline app”, meaning a change to the project will not be instantly deployed to speaker hardware. This allows for simulation and verification before committing to changes. Changes are only ever applied to real speaker hardware when a “Push” or “Apply” button is pressed.

Note: When recalling a saved project, the user does not need to align the augmented reality with the real world. The user may simply open a saved project and “Push all speakers configuration” to recall a saved project.

Project Page



Tap to change project name

Tap array name to change array name, assign IP address to array, and clone array. ✓ indicates currently selected array. Red indicator – all devices offline. Orange– some devices offline. Green– all devices online.

Disable or enable metering (future feature)

Non selected arrays listed here. Tap array name to set as current array to change array parameters. Swipe left to delete array.

Tap to add a new array to a project.

Tap to save the current project to the files folder on the iOS device.

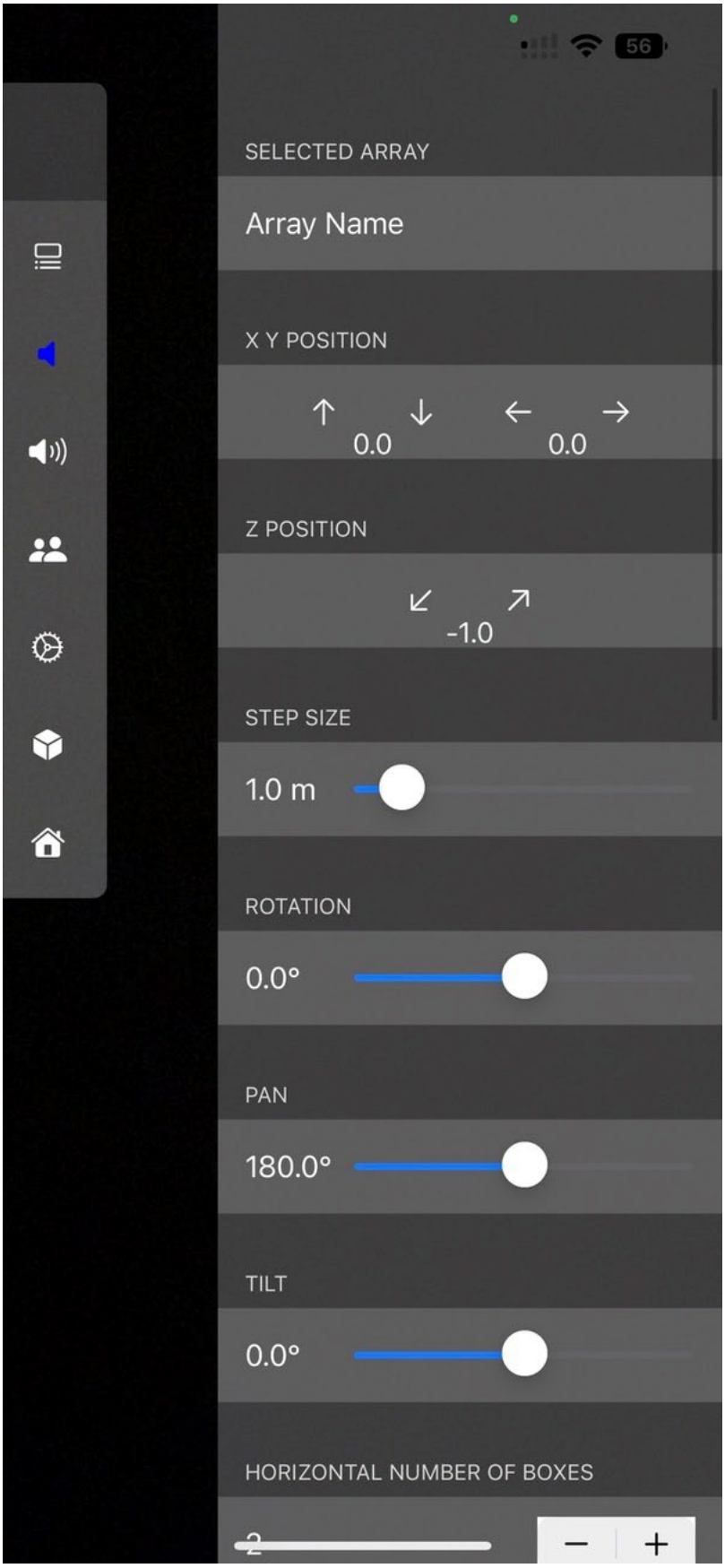
Tap the File Name to change the file name.

Push all project parameters for the project to all arrays in the project.

Creates a PDF report of the project performance, with 1/3 octave mappings for each array and each beam in the project.

Exports 3D balloon data for each beam and each array for use in EASE

Array Page



Shows name of selected array. Any changes to the settings below will impact this array. Change selected array on project page.

Moves the array up/down and left/right and near/far position in augmented reality by the step size. One arrow click moves the virtual speaker by the step size. Alternatively, click the numerical value to enter a position value. Locate the speaker in augmented reality where it will be, or is, in the real world. Remember the screen is 2D, so you will need to view the speaker in front and on the side to ensure its position is accurate with depth.

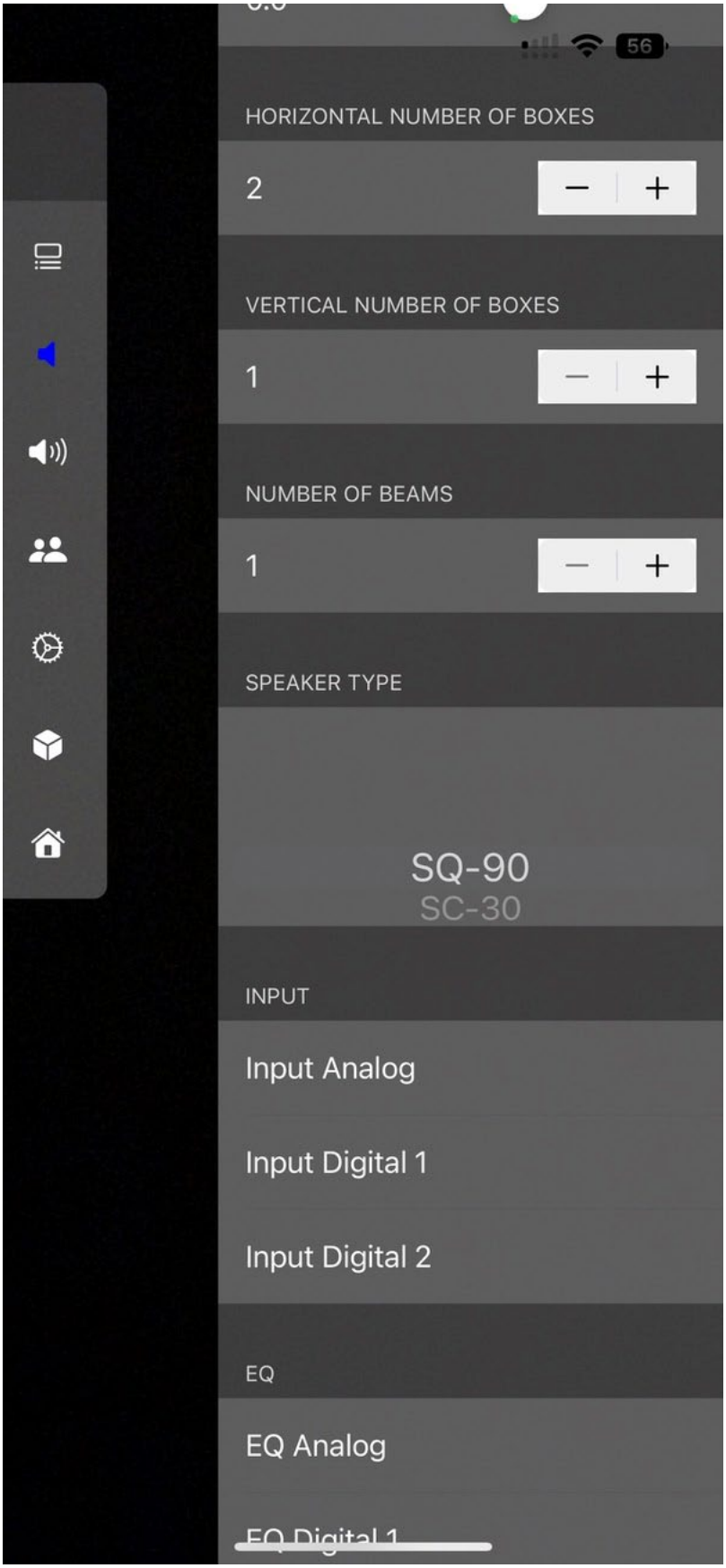
Tip: Compare the size of the virtual speaker and the real speaker. If it is the same physical size its depth is correct. If the speaker is smaller, it is further away.

Step size: Distance the speaker will move with each arrow tap

Set the rotation of the virtual speaker to match reality

Set the pan of the virtual speaker to match reality

Set the tilt of the virtual speaker to match reality. It is a good idea to use the level feature of the iOS “measure” app to get the physical tilt of the speaker in reality, instead of guessing.

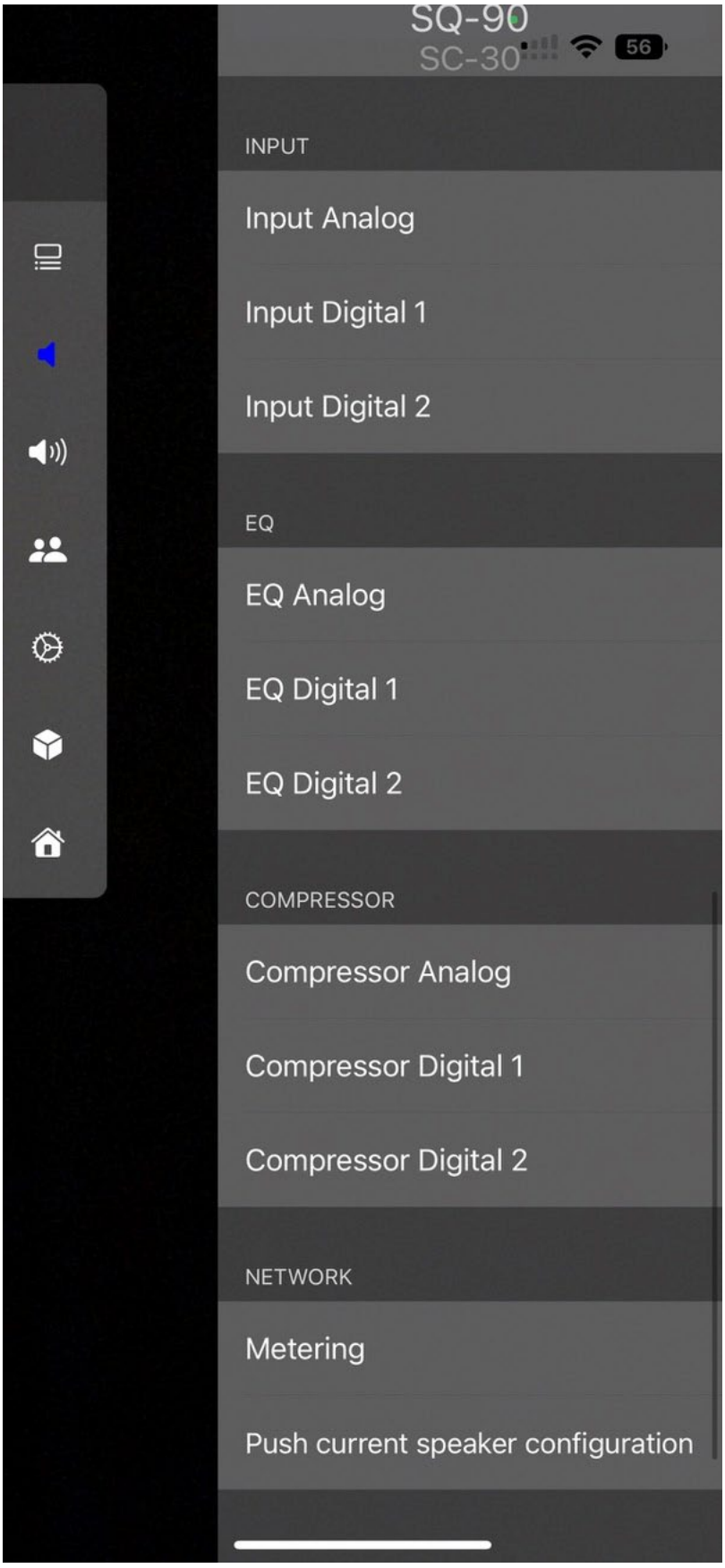


Set the number of horizontal rows in the array

Set the number of vertical columns in the array

Set the number of beams the speaker needs to produce. Reducing the number of beams will reduce computational time and conserve iOS battery

Select the speaker type of the array



Adjust the input trim and input mute of the three inputs to the speaker. Note: This adjustment impacts all beams as it is an input control.

Click the “Apply Input” button to deploy the settings to the selected array. Changes are not deployed to the real speaker hardware unless applied.

Adjust the input EQ for any of the three inputs. 8 bands of EQ are provided. Select the type of filter, bypass state, frequency, gain and Q for up to 8 filters. Tap the numbers 1 through 8 to select any of the 8 filters. Click the “Apply Input” button to deploy the settings to the selected array.

Note: Each EQ filter is bypassed by default. Disable the bypass button to enable the filter.

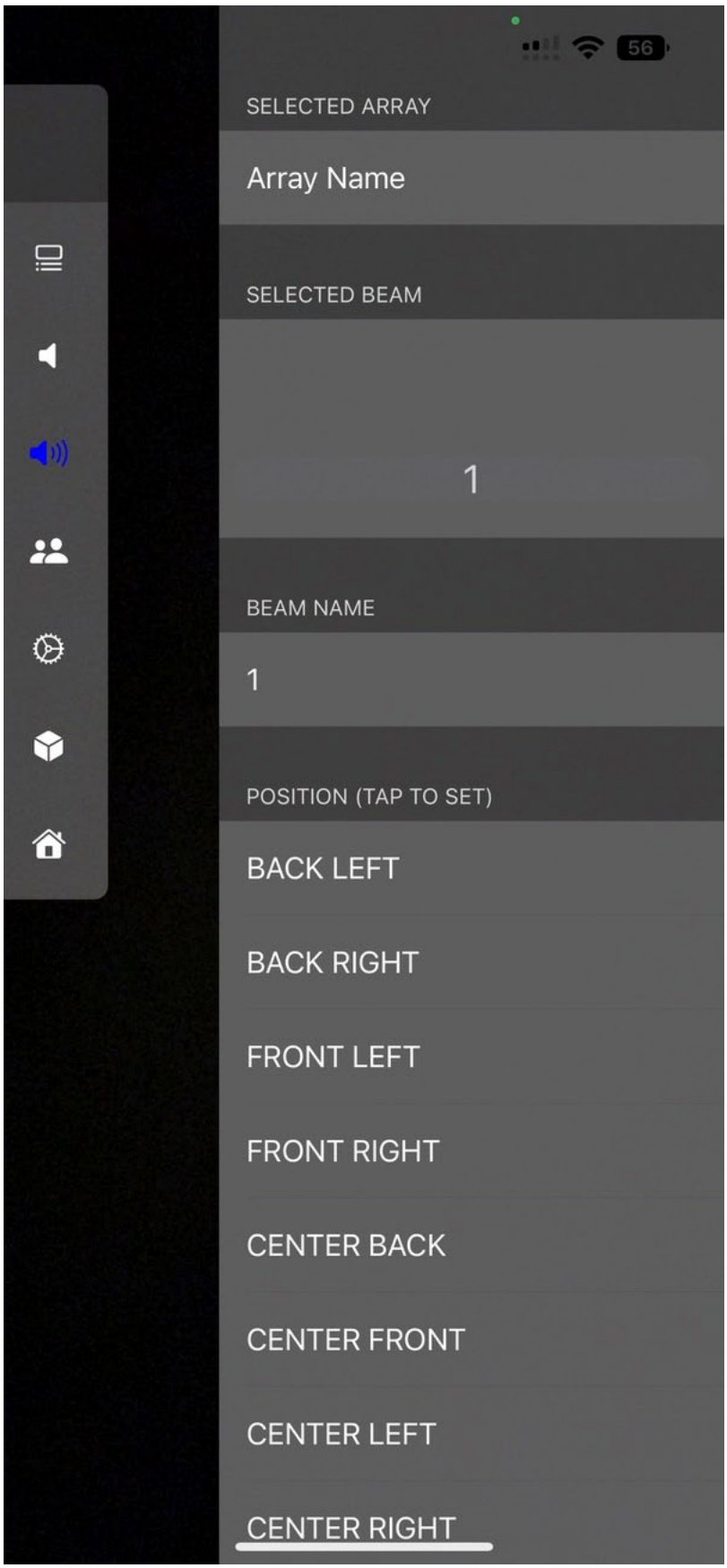
Adjust the compressor settings for each of the three inputs. Adjustments can be made to attack time, threshold, ratio, release time and post gain. Click the “Apply Input” button to deploy the settings to the selected array.

Note: The compressor settings are already set to a default state that is useful.

Displays input and output metering for the selected array. Future use, not currently functional.

Push the configuration of all beams and all parameters to the currently selected array. Does not push a configuration for non-selected arrays in the project.

Beam Page



Shows name of selected array. Any changes to the settings below will impact this array. Change selected array on project page.

Shows the selected beam that the below parameters will impact. Use this scroll wheel to change between beams.

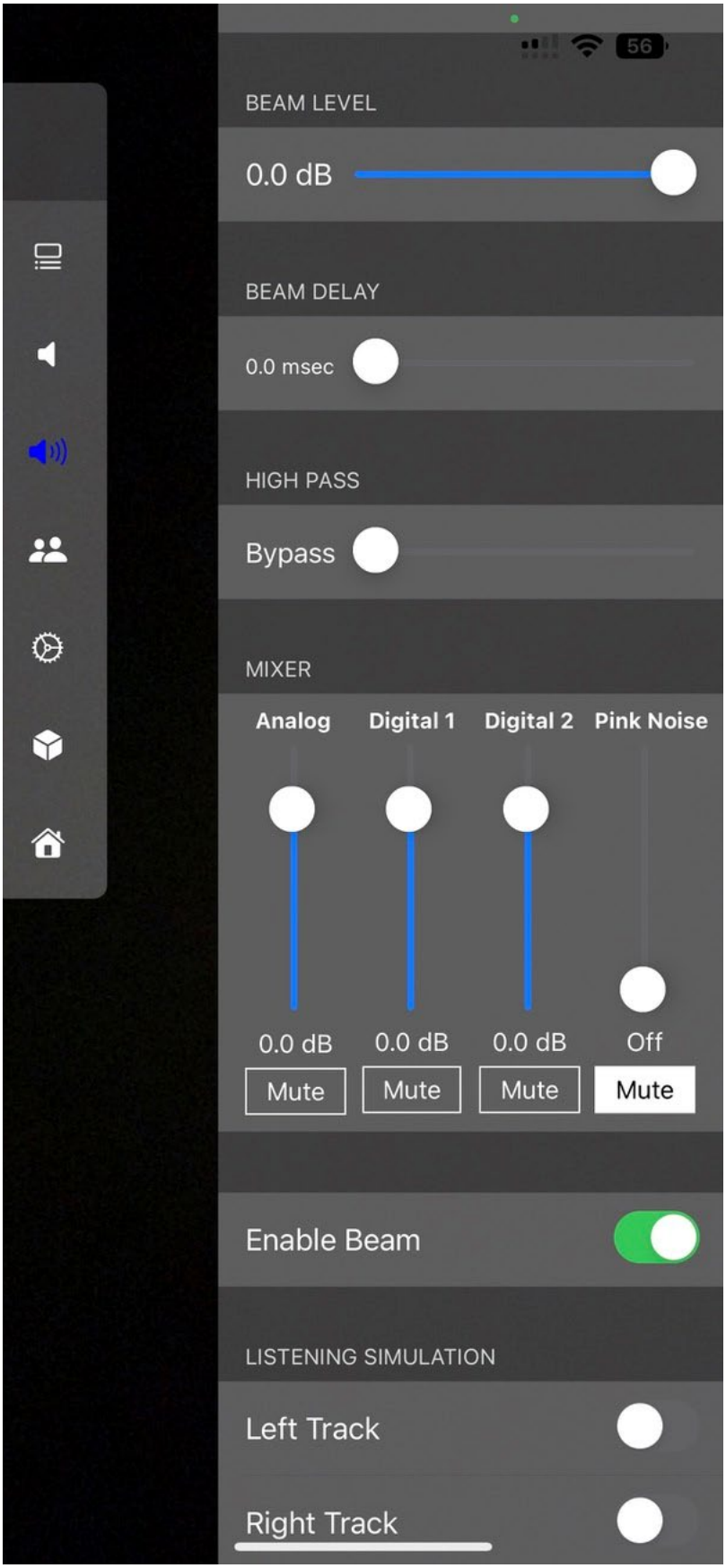
Tap to change the name of the beam

To set the beam shape, walk the perimeter of the audience and tap the corresponding button when standing at each location: Back left, center back, back right, center right, center, center left, front left, center front and front right.

Note: Each location is labelled **FROM THE PERSPECTIVE OF THE SPEAKER.** So, the back left is the further audience position at the back of the room on the left-hand side when viewing the audience from the perspective of the speaker.

Note: Height matters! For the front position, place the height of the iOS device just below ear level for someone sitting in a seat. For the back positions, place the height of the iOS device just above ear level of someone standing. For center positions, place the iOS device around chest height.

Note: Check for drift before capturing the position. Ensure the augmented reality speaker is still in the same location as the real speaker. Adjust for drift by using the XYZ adjustments under the settings page to realign the speaker before tapping any position button.



Sets the overall beam level. Used to compensate for difference in beam dispersion efficiencies and variances in projected distance. Beam level is automatically set by the software to level match all beams and arrays in a project. Can be overridden by moving the slider.

Beam delay, used to time align sources where multiple speakers are used in the same venue.

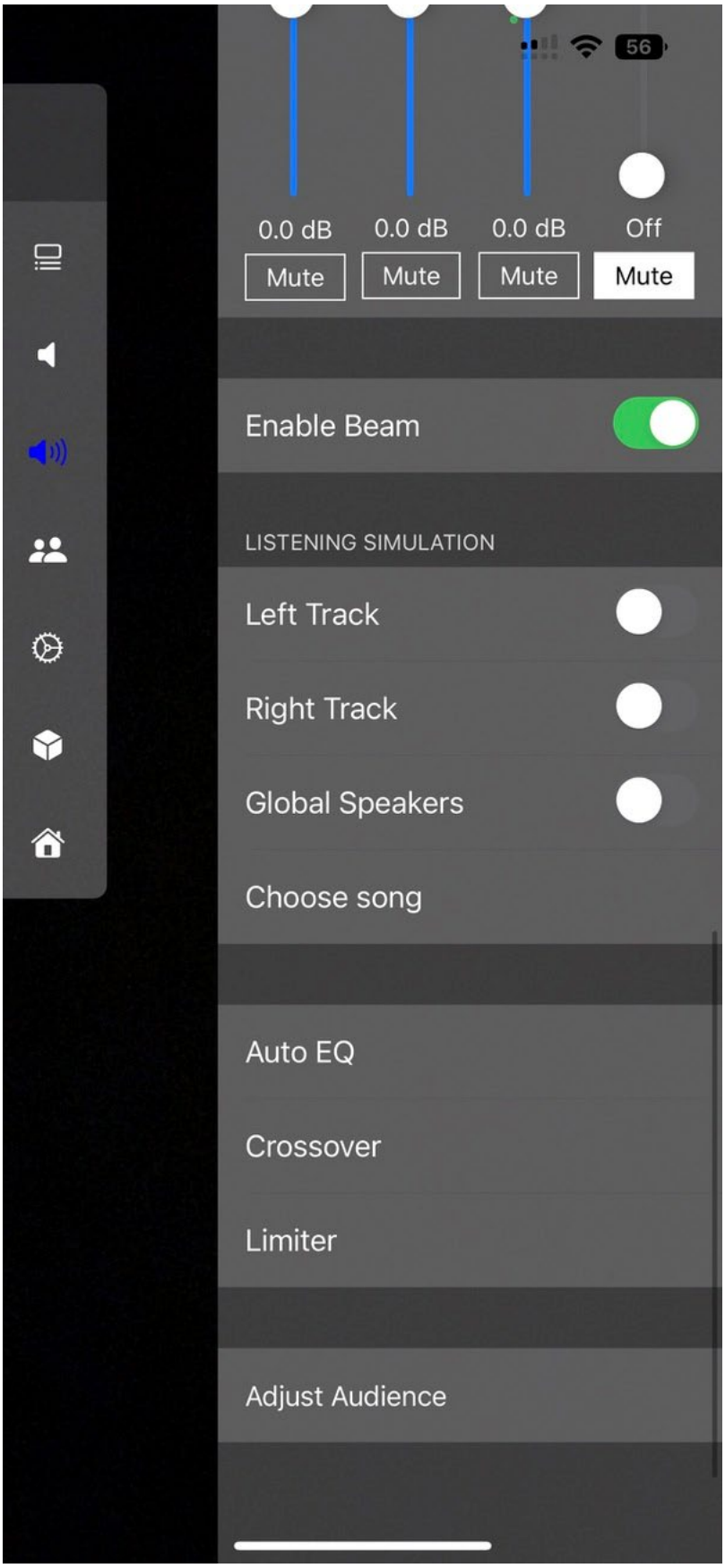
High pass used for simulation purposes only (mapping and listening simulation). Does not engage a speaker high pass filter. Use crossover feature below to deploy a high pass to the speaker array.

Input mixer selects which inputs are routed to the selected beam.

Warning: Pink noise is generated internally and is very loud. Typically, pink noise is set to around -30dB.

Note: Input mixer settings, along with other settings, is not updated to speaker hardware immediately. Mixer settings are only applied when an “Apply” button is pushed, or the “Push” button is selected on the array page or project page.

Enable beam is used for simulation purposes only (mapping and listening simulation). Also impacts automatic level adjustment.



Listening simulation allows for the user to walk around a space and listen to the EQ and level at any location, without the need for the speakers to be present in reality. Use good quality headphones with natural tone. The iOS device will simulate the listener experience at the location of the iOS camera. This simulation is in true stereo and will localize the sound with the camera. To turn your head, ensure you turn your iOS device as well (keeping the iOS screen parallel to your face).

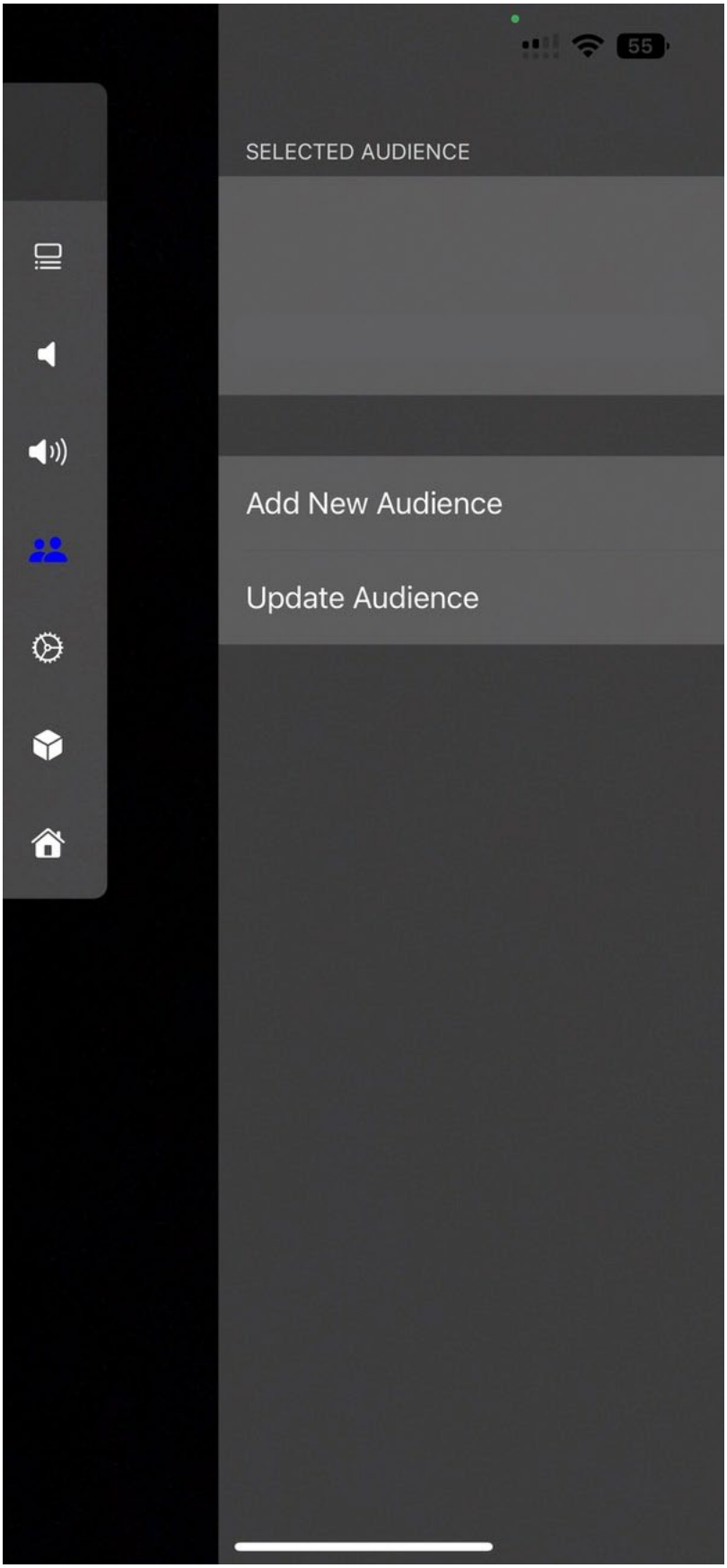
To enable the listening simulation, enable either the left track or right track (or both tracks for mono sum) for the beam. Select a song by tapping the “Choose song” button. (You require an MP3 or similar audio track in the folders file of your iOS device) and then select the play button. You will be listening to the selected beam of the selected array. To listen to the summation of all beams from all arrays, select the “Global speakers” option. (You need to assign either left or right track to any beam of any array you want to include in the simulation, and also ensure that the beam is enabled). Press the stop button to cancel the listening simulation.

Auto EQ deploys the current configuration of selected array and allows the tuning of the system in the real world. See application notes below for more detail.

Crossover allows setting of the crossover settings of the beam including crossover type, bypass and frequency. Default settings are already provided. HPF should not be disabled unless there are already high pass settings in the system processing, in order to prevent damage. Minimum 24dB/oct HPF at 80Hz for full range speakers and 25Hz for subs. 100Hz HPF recommended for columns.

Adjust Audience allows for complex audience shaping with imported 3D model or LiDAR scanned rooms. See application notes below for more detail.

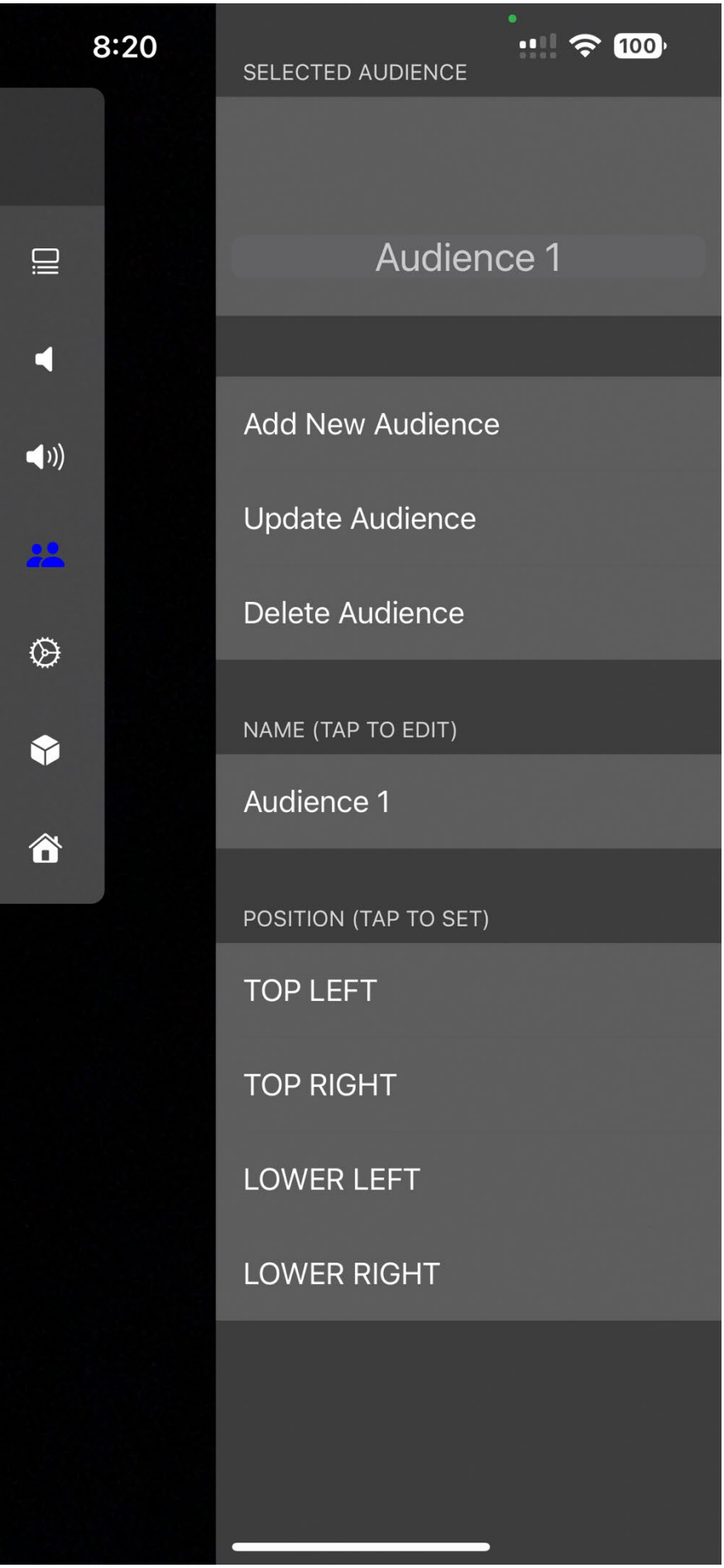
Audience Page



An audience plane is an unbounded area of mapping. It shows the summation of energy of all active beams for all arrays in a project. This allows for scientific investigation of the amount of energy directed to a specific location - for instance a stage area.

Tap “Add New Audience” to create a new audience area.

Update audience recalculates the energy directed at the audience based upon the current project settings for all speaker arrays and beams.



Scroll wheel to change currently selected audience plane to make adjustments.

Add a new audience.

Update the audience mapping to reflect current project settings.

Delete the selected audience plane.

Tap to change the name of the currently selected audience plane.

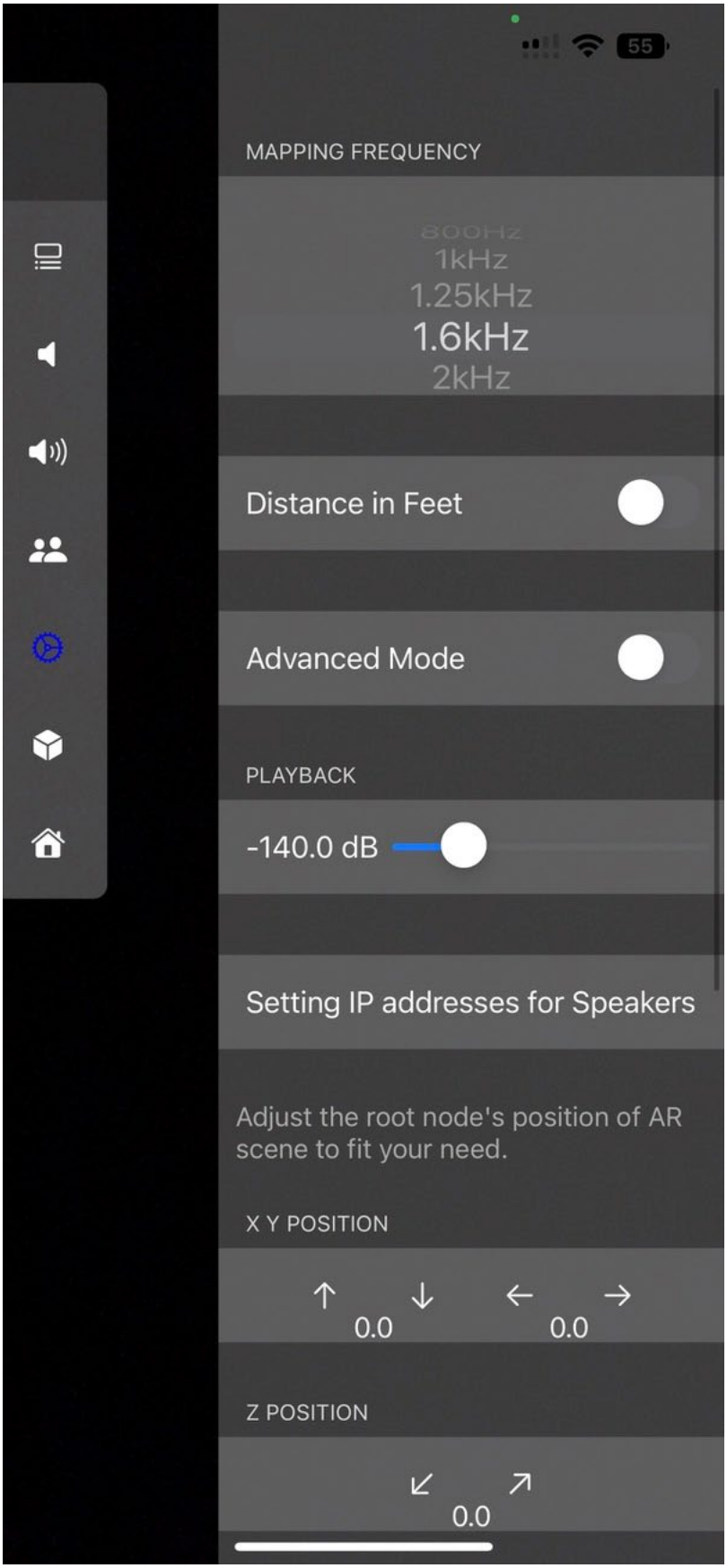
To adjust the shape of the audience plane, walk the space and at each of the 4 corners of the audience plane boundary, tap the respective location “top left”, “top right”, lower left” or “lower right”.

Note: Left/Right and Top/Bottom is not important for the audience plane as it is not bound to any single array or beam.

Note: Height matters! Place the height of the iOS device at the height you are interested in for the audience plane.

Note: Check for drift before capturing the position. Ensure the augmented reality speaker is still in the same location as the real speaker. Adjust for drift by using the XYZ adjustments under the settings page to realign the speaker before tapping any position button.

Settings Page



Scroll wheel that changes the frequency of mapping in augmented reality in 1/3rd octave bands or Broadband. Typically set to 1.6kHz or Broadband SPL.

Changes the unit of measurement in the app from Meters to Feet.

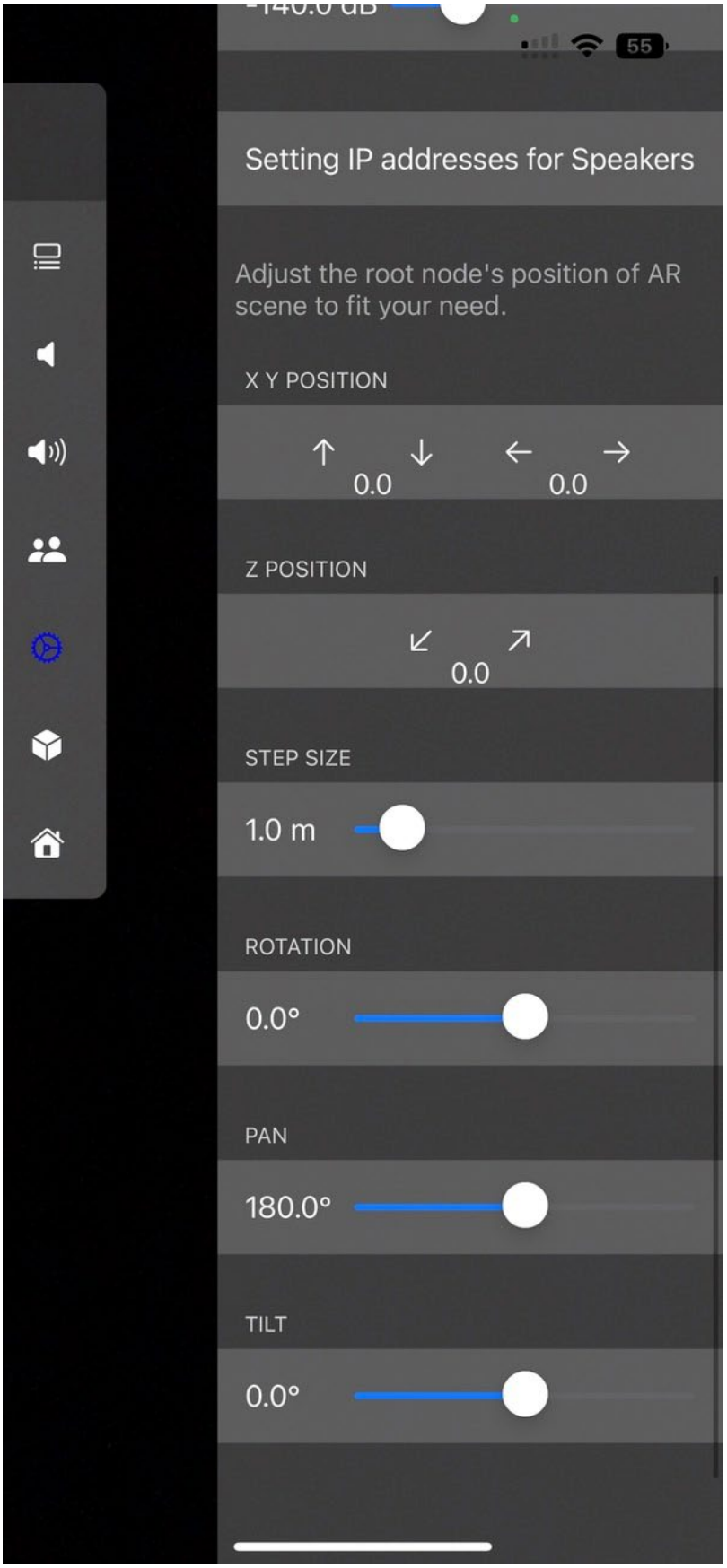
Enables advanced mode where the user can set coverage of the beam using sliders instead of walking the room.

Adjusts the level of the listening simulation in headphones.

Finds any EDC Acoustics loudspeaker on the network and allows the user to change the IP address or enable DHCP automatic addressing.

Compensate for the drift of augmented reality. Augmented reality can drift when the camera sees repetitive patterns (such as many chairs of the same type, or a repeating pattern in carpet), low light, or plain color walls and surfaces.

Before any location data is stored (tapping a position button) it is highly recommended to go to this screen to compensate for any drift before tapping the position button.



Moves the entire project (all arrays, all audiences and all 3D models) up/down and left/right and near/far position in augmented reality by the step size. One arrow click moves the entire model by the step size. Alternatively, click the numerical value to enter a position value. Re-align any speaker in augmented reality where it will be, or is, in the real world. Remember the screen is 2D, so you will need to view the speaker in front and on the side to ensure its position is accurate with depth.

Tip: Compare the size of the virtual speaker and the real speaker. If it is the same physical size its depth is correct. If the speaker is smaller, it is further away.

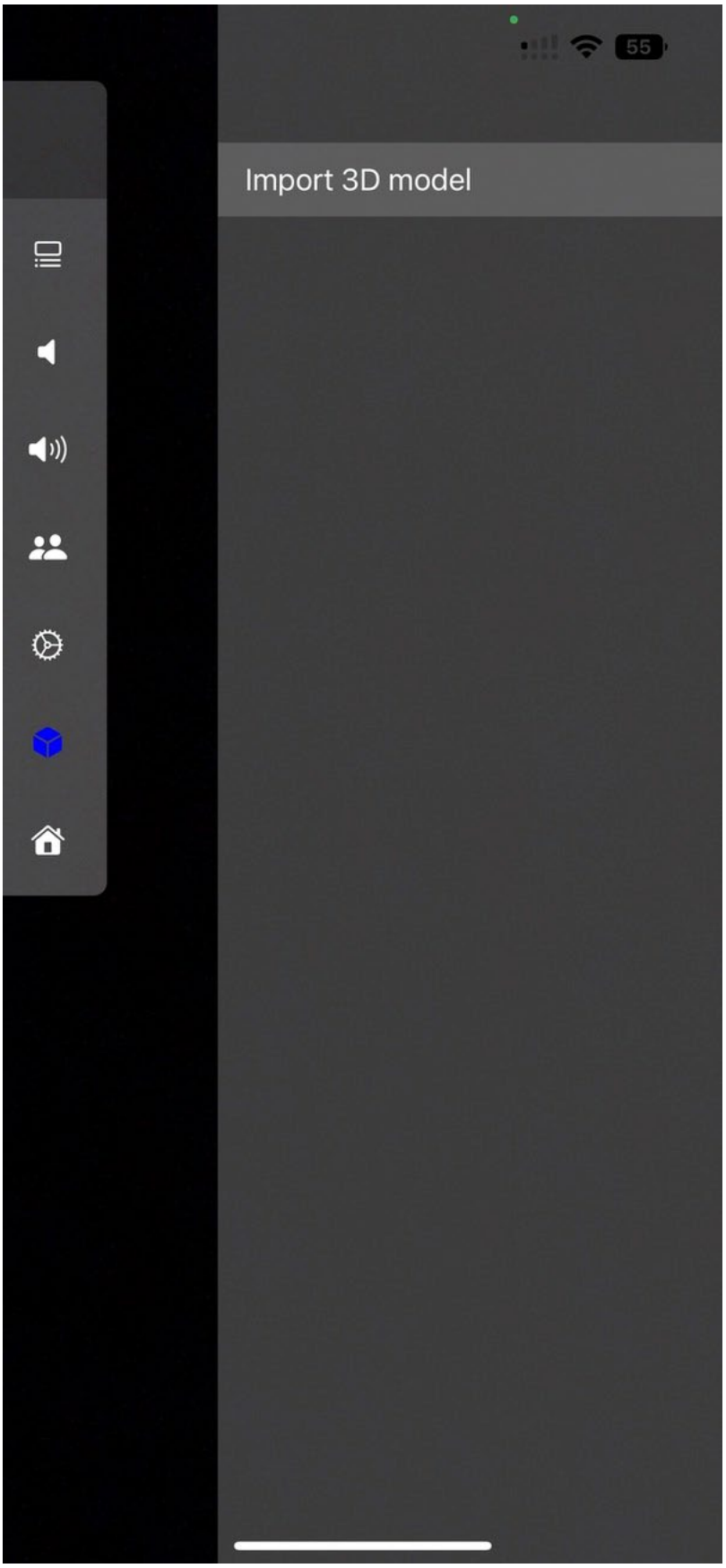
Step size: Distance the entire project will move with each arrow tap.

Set the rotation of the entire project to match reality.

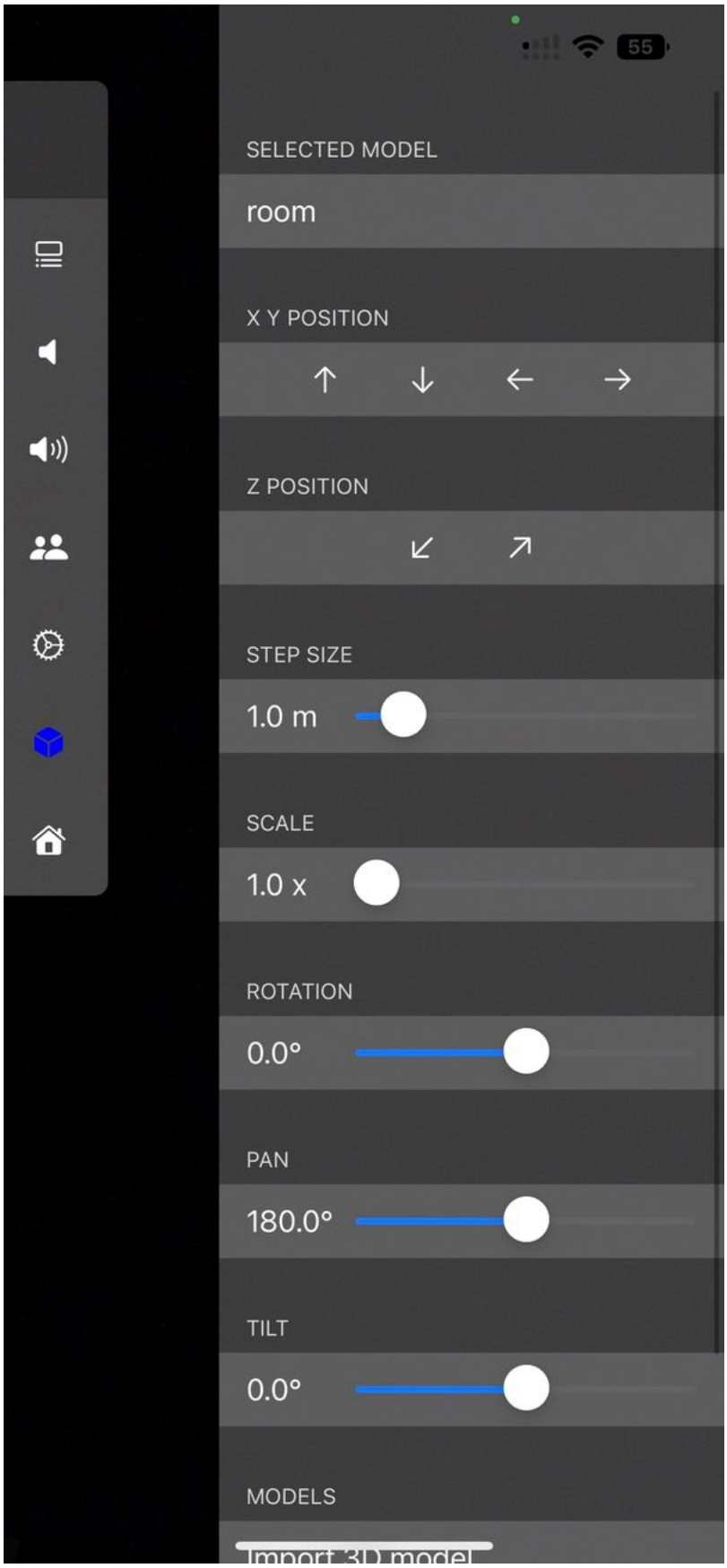
Set the pan of the entire project to match reality.

Set the tilt of the entire project to match reality.

3D Model Page



Tap to import a 3D model into the project. Supported models include: .DAE, .OBJ, .USDZ and LiDAR scanned spaces. (We recommend the free LiDAR room scanning app called “3S Scanner App” and to share the file to your folder app in the .USDZ format after processing the scan with the ‘Fast’ option.)



Displays the name of the selected 3D object.

Moves the 3D model up/down and left/right and near/far position in augmented reality by the step size. One arrow click moves the entire model by the step size. Re-align any 3D model in augmented reality where it will be, or is, in the real world. Remember the screen is 2D, so you will need to view the 3D model in front and on the side to ensure its position is accurate with depth.

Step size: Distance the entire project will move with each arrow tap

Set the scale of the 3D object. Typically, not adjusted.

Set the rotation of the 3D object to match reality.

Set the pan of the 3D object to match reality.

Set the tilt of the 3D object to match reality.

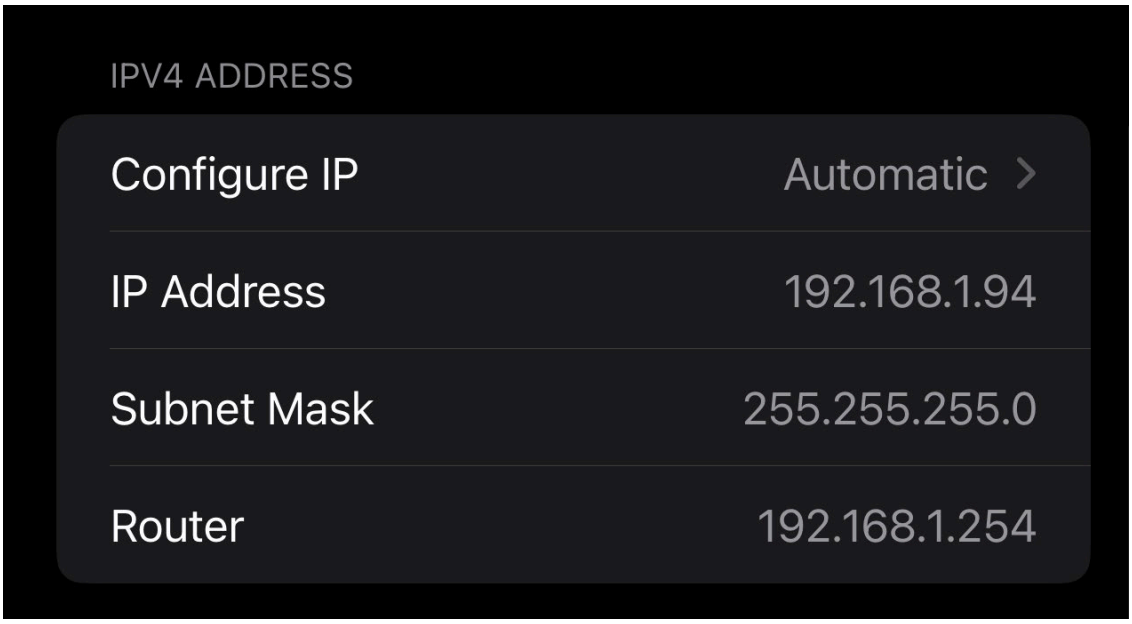
Change which model is currently selected by touching the name of the model at the bottom of the 3D Object page.

Application Notes

The following application notes detail the process flow and steps required to setup and commission an EDC Acoustics system.

Step 1: Network Configuration

Connect iOS device to Wi-Fi network. On the iOS device, go to Settings -> Wi-Fi and select the currently selected network. Note the iOS device IP address. In the example below, the IP address is 192.168.1.94. Also note the router IP address. In this example the Router is 192.168.1.254. Also note the subnet mask of the iOS device. In this case 255.255.255.0



The IP address of the iOS device is important, as all EDC Acoustics speakers must be in the same subnet for communications to work. In this example, the subnet is 192.168.1.xxx meaning the speaker IP addresses must also be 192.168.1.xxx where xxx is a unique number that is not used already on the network.

Each speaker must have its own unique IP address, and not used by any other device on the network. If you are unaware of what IP addresses are free on the network, you can use a free iOS application such as “iNet” to scan the network and display a list of used IP addresses on the network.

Note: iOS can automatically change Wi-Fi networks when range is poor. It is good practice to set the following in your iOS Wi-Fi settings (Settings -> Wi-Fi):

1) Set “Ask to Join Networks” to “Ask”
2) Set “Auto-Join Hotspot” to “Ask”
3) Under the list of networks in “My Networks”, click the “I” information button and DISABLE the ‘Auto Join” option
4) On the network being used by the EDC Acoustics application ensure “Auto Join” is enabled

This will ensure the iOS device will not switch automatically from the network to join another network in the background, which will cause network communications failure.

Step 2: Setup Bluetooth Receiver for System Tuning

The application will send a Bluetooth test signal from the iOS device for use with automated system EQ. You will require a Bluetooth receiver to receive this test signal, and you need to route this test signal to the speakers being commissioned.

We strongly recommend the use of the Denon DN-200BR. Connect the Bluetooth receiver to the analog input on all speakers in the array under test (every speaker within the single array under test MUST receive the Bluetooth signal. Sending the Bluetooth signal to only one speaker in the array will yield incorrect results.

Go to the Bluetooth settings on the iOS device, and tether to the Bluetooth receiver (Settings -> Bluetooth and select the DN-200BR). See the Bluetooth device manual on how to pair your iPhone or iPad to the Bluetooth receiver.

If the Bluetooth receiver is stereo, only connect one channel to the array under test. It does not matter if you use left or right channel. Do not route both left and right channels as this may change the frequency response, gain and phase of the test signal.

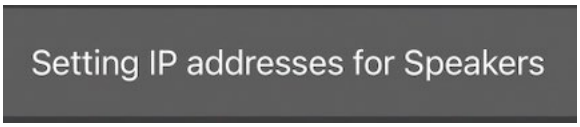
Step 3 – Connect EDC Acoustics Speakers to the Network

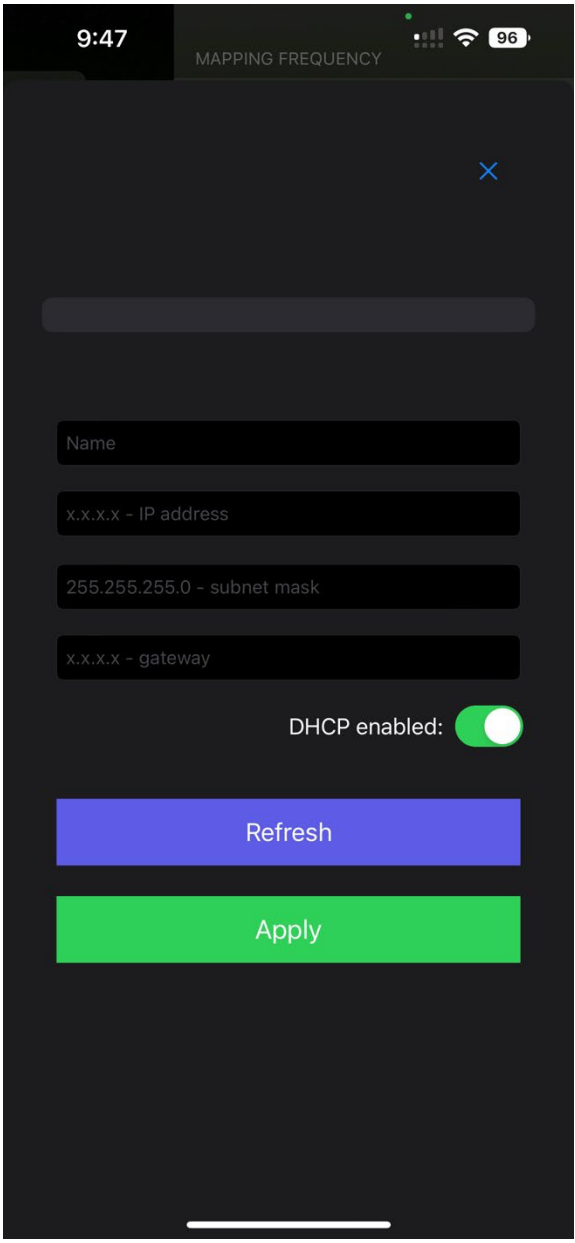
Connect one EDC Acoustics speaker to the same network as the iOS device, and power on the speaker.

Connect only one EDC Acoustics speaker at a time to ensure the IP address will be known correctly for each speaker. It is important that the IP address for each speaker is known in order to correctly assign the speaker to the correct position in an array. Failure to correctly assign each speaker to the correct position in the array based upon the IP address will yield undesired results.

Launch the EDC Acoustics application. Create a new project. Go to the Settings Page

 and select





The window to the right will pop up.

The top scroll wheel will list all EDC acoustics speakers found on the network. It is highly recommended in this step to only connect one EDC Acoustics speaker on the network at a time, so there should only be one speaker in the scroll wheel.

Give the speaker a meaningful name. It is suggested in an array to give each column an alphabetical value with the top row being A, and each column a number with the left most column looking at the speaker array being 1. So, the top left speaker in an array might be given the name “Right Array A1”, and the second speaker on the same row might be given the name “Right Array A2”.

Give a **UNIQUE** IP address to the speaker (in our example above we will give the IP address 192.168.1.95. Ensure the IP address is not used by any other device in the network and the IP address is in the same subnet as the iOS device.

Set the subnet mask to match the subnet of the iOS device (in step 1). In this example, it shall be set to 255.255.255.0.

Set the gateway to match the Router address (noted in step 1). In this example the gateway is 192.168.1.254. NEVER set the gateway to 255.255.255.255 as this is a broadcast address.

DISABLE the DHCP enabled button. If you enable the DHCP button the IP address information will be ignored. DHCP is NOT recommended for network control, as the IP address of devices can change without notice, breaking control connectivity. DHCP is typically enabled as default on EDC Acoustics speakers so they can be initially assigned an IP address when connecting to the network for the first time, but it is not recommended to leave DHCP enabled as static IP address assignment is far more reliable.

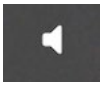
Click Apply.

Note the IP address for each physical speaker. You will require the IP address for each speaker, as well as the position the speaker is in the array for Step 4.

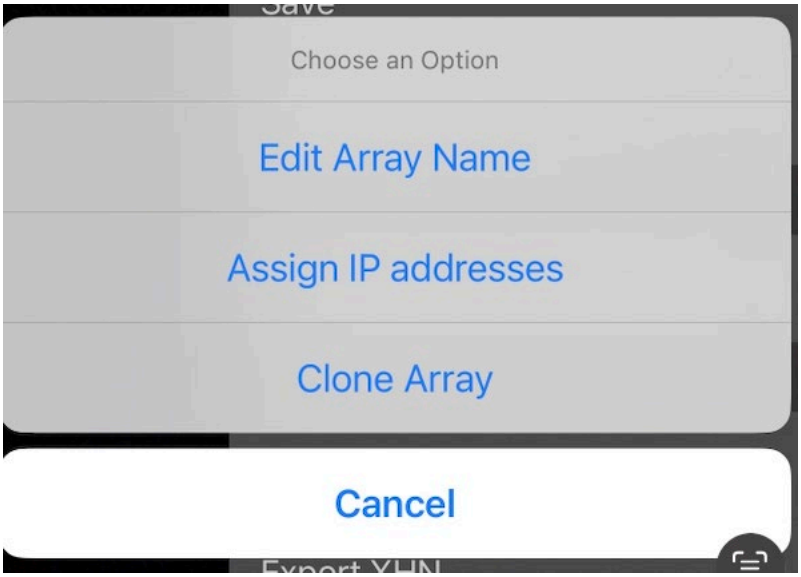
Disconnect the EDC Acoustics speaker from the network and repeat Step 3 until all speakers in the project are assigned a unique IP address. Once all speakers are assigned a unique IP address, connect all speakers to the network and power on.

Step 4: Setup The Array

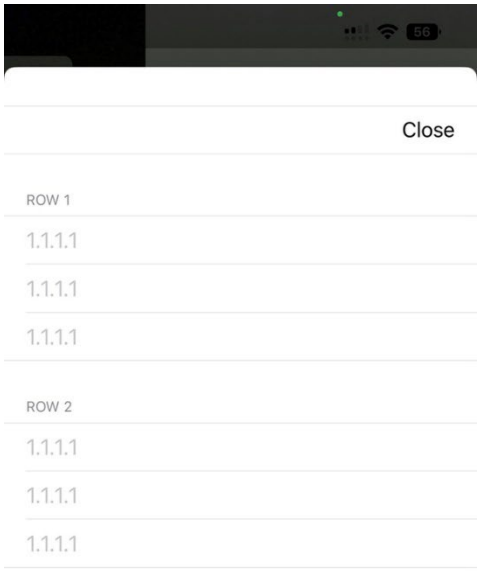
On the Project Page  ensure the array being worked on is selected, indicated by a tick next to the array name. If you need to change the selected array, tap the name of the array and then select 'Set As Current Array'. Now is also a good time to give the array a logical name. Tap the array name to edit the array name.

On the Array Page  set the correct speaker type, horizontal number of boxes and vertical number of boxes. After around 5 seconds the array in augmented reality should update and be the size of the array required. If you are using more than 1 beam, now is a good time to enter the number of beams.

Go back to the project Page  and tap the name of the array. Select 'Assign IP addresses'.



Enter the IP address of each speaker in the array. Ensure the IP address is correct with the correct position of the speaker. Incorrect ordering will yield unexpected results. The IP address table is assigned by looking at the speaker array from the view of the listening audience. The IP address table is entered left speaker to right speaker, with row 1 at the top of the array and row 2 the second top row etc.

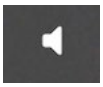


Once you enter the IP address information correctly and select close, The red circle next to the array name will turn green indicating all speakers in the array are online. Orange indicates a speaker is missing.

If the indicator is orange or red, ensure all speakers in the array are powered on and connected to the network. Also ensure the IP address is entered correctly and your iOS device is on the network. If the communication is still red or orange, repeat steps 3 and 4. Usually orange is due to a typing error of the IP address and a red indicator is due to a network or power issue.

If network failure is still present, go to the iOS settings -> Privacy & Security -> Local Network and ensure EDC Acoustics is enabled.

Once the Array is online, position the speaker in augmented reality to match the location and angle of the speaker in the real world.

On the Array Page  set the X Y Z position of the speaker.

One arrow click moves the virtual speaker by the step size. Alternatively click the numerical value to enter a position value. Locate the speaker in augmented reality where it will be, or is, in the real world. Remember the screen is 2D, so you will need to view the speaker in front and on the side to ensure its position is accurate with depth.

Tip: Compare the size of the virtual speaker and the real speaker. If it is the same physical size its depth is correct. If the speaker is smaller, it is further away.

Set the rotation, pan and tilt of the virtual speaker to match reality. It is a good idea to use the level feature of the iOS “measure” app to get the physical tilt of the speaker in reality instead of guessing.

Once this is done, set up any desired custom settings for the array, including input EQ, dynamics, beam mix settings, crossovers or delays. This should be done prior to setting the beam coverage and Auto EQ process so the calculations are carried out with knowledge of the system settings.

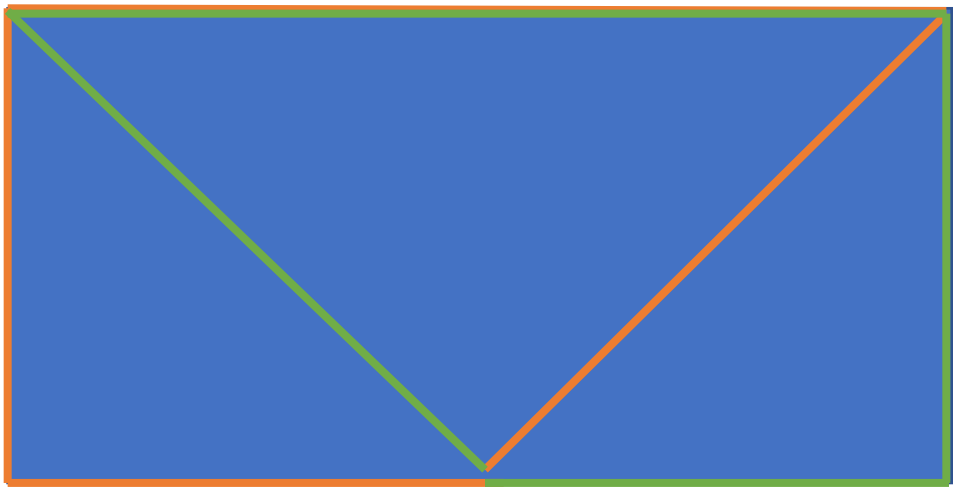
Step 5: Setup The Beam Coverage

On the beam page  use the scroll wheel to select the beam to be modified. (In step 4 you should have changed the number of beams if you are using more than 1 beam). Tap the beam name to give the beam a logical name.

Now determine the area of target coverage for the array.

Note: An EDC Acoustics array should be limited to +/- 60 degrees from its center axis of coverage. If more than 60 degrees is required to cover the audience, you will need to physically change the location or angle of the speaker so that the audience is within this coverage limitation.

When a single array is used to cover the audience, the target coverage is logically the entire audience. When two arrays are used to cover an audience, typically one array will only cover half of the space at the front of the room (i.e. usually from the outer edge to the middle of the audience at the front of the audience). The back of the audience is usually overlapped. Ideally the overlap should be a similar angle to the front of the room. This creates stereo overlap, without creating too wide a stereo image. An example of ideal coverage for a stereo room is below. For wide rooms it will not be possible to cover the entire back of the audience by both arrays. Try to be logical and keep target audiences within the +/- 60-degree limits.



Front of Audience

Right Array

Left Array

There are 3 methods provided to set the beam coverage:

1) Location Capture Method
2) Visual Sight Method
3) Virtual Reality Method

The Visual Sight Method is highly recommended as it is extremely fast, minimizes augmented reality drift, and yields a result that is typically within 1dB of optimal performance for array sizes of less the 4 elements in an array.

Location Capture Method is the default option provided in the iOS app as it requires the least amount of training for new users – however this method typically sees the most augmented reality drift which significantly slows the configuration process. Drift is when the augmented reality object (the EDC Speaker) moves away from the physical EDC speaker in the real world due to the iOS device attempting to track movement in the real world. The iOS devices use the in-built gyro, accelerometer and camera to detect and track movement. This tracking of movement produces errors when there is low light, movement occurs with the camera obscured, if the camera sees objects with little detail while moving (for instance looking at a white wall), or if object or patterns are repeated causing confusion of the instance the repeated pattern is (for instance the same chair material at the same spacing).

Virtual Reality Method is the most accurate method and can compensate for more complex audience shapes and energy skews. Virtual Reality Method requires the importation of 3D model or LiDAR scan of the audience to provide context. This method is more accurate and is more intensive in setting and validating. The more advanced algorithms used in the Virtual Reality method require a higher number of transducers to produce improved results over the Visual Sight Method. Therefore, this method should only be used for arrays of 4 elements or more.

Use only one of these three methods. Each method is detailed below.

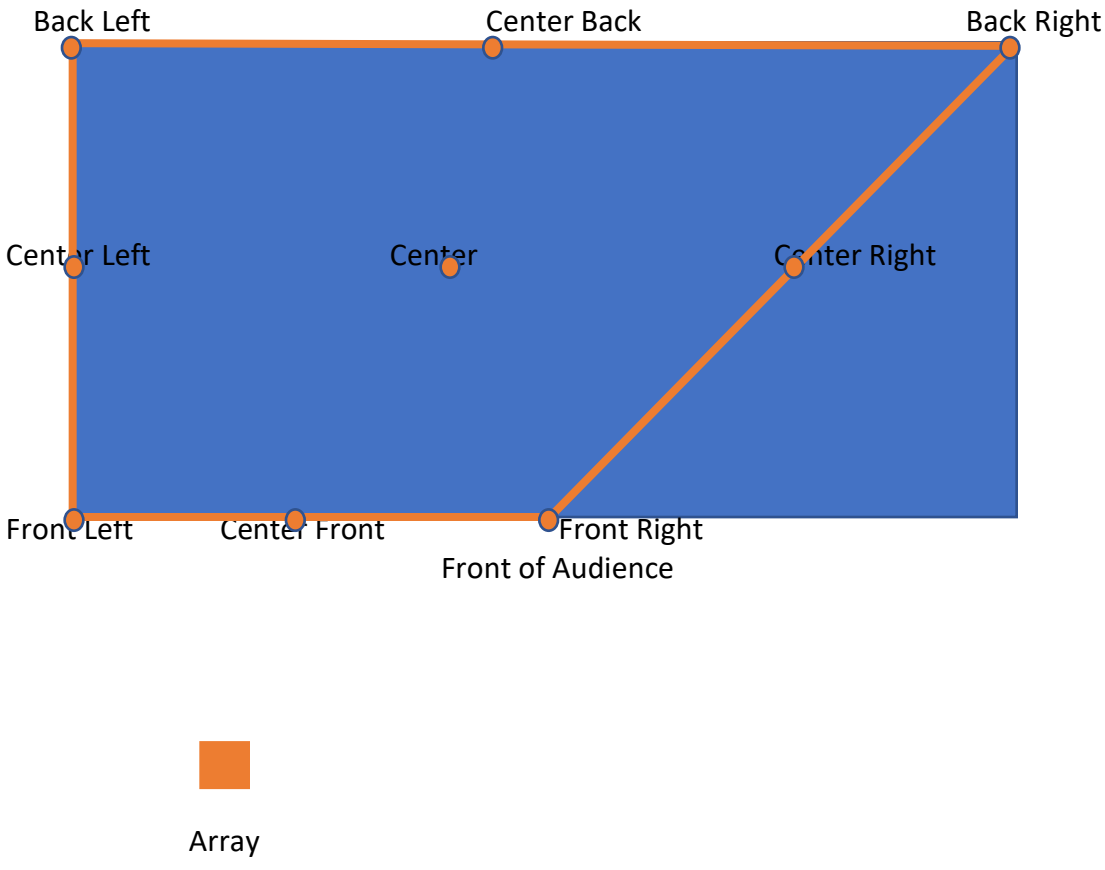
5.1 Location Capture Method

To set the beam shape, walk the perimeter of the audience and tap the corresponding button when standing at each location: Back left, center back, back right, center right, center, center left, front left, center front and front right.

Note: Each location is labelled **FROM THE PERSPECTIVE OF THE SPEAKER.** So, the back left is the further audience position at the back of the room on the left-hand side when viewing the audience from the perspective of the speaker.

Note: Height matters! For the front position, place the height of the iOS device just below ear level for someone sitting in a seat. For the back positions, place the height of the iOS device just above ear level of someone standing. For center positions, place the iOS device around chest height.

Note: Check for drift before capturing the position. Ensure the augmented reality speaker is still in the same location as the real speaker. Adjust for drift by using the XYZ adjustments under the settings page to realign the speaker before tapping any position button.



5.2 Visual Sight Method

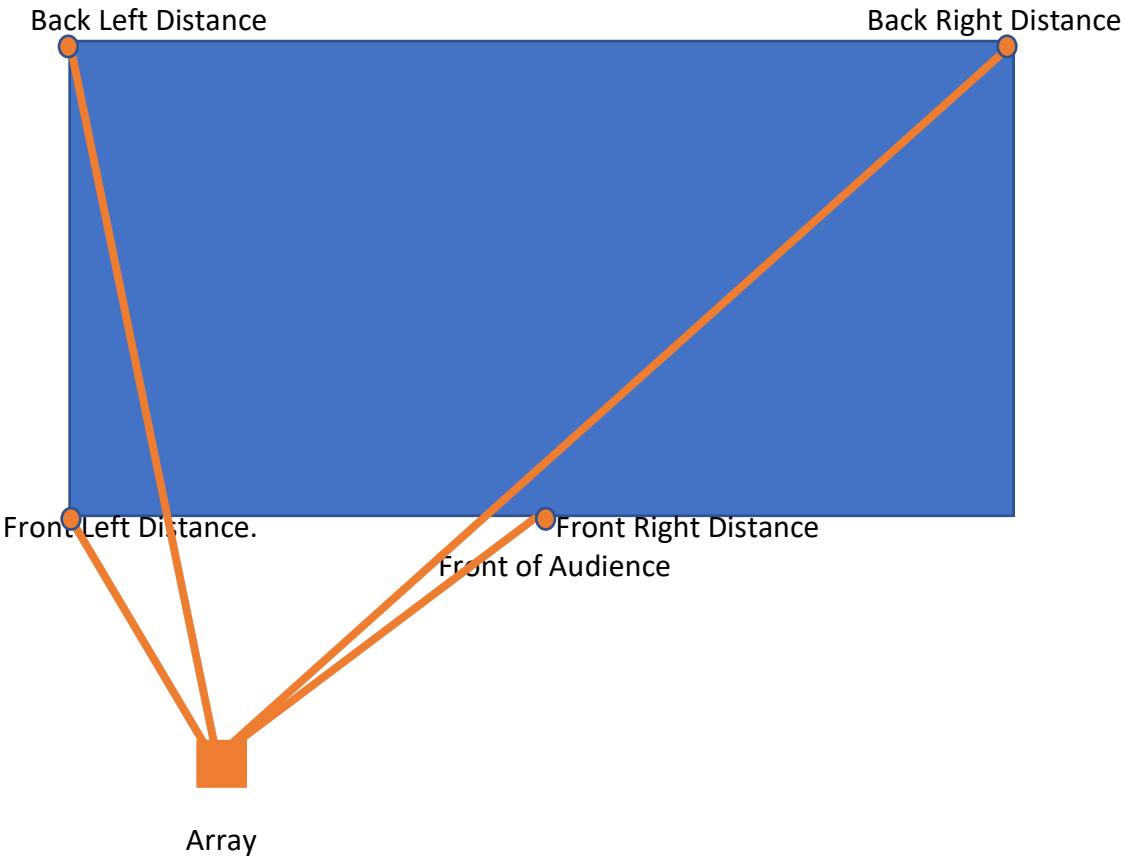
Got to the settings page  and enable ‘Advanced Mode’

Go to the beam page  and select the beam to be set using the scroll wheel.

Once the Advanced Mode is enabled you will see a set of sliders that will be used to configure the beam coverage pattern.

Note: Check for drift before setting the beam coverage. Ensure the augmented reality speaker is still in the same location as the real speaker. Adjust for drift by using the XYZ adjustments under the settings page to realign the speaker before tapping any position button.

It is important to firstly set the four distance sliders. There are four distances to set. “Back Left Distance”, “Back Right Distance”, “Front Left Distance” and “Front Right Distance. This is the distance from the audience to the speaker array as a direct line of sight. This is from the audience corner TO the speaker in 3D space, not the horizontal floor distance. Using a laser distance meter is highly recommended.



Once these distances are entered (Accurate within 2 meters) then what you will see in terms of coverage will match the coverage of the speaker. As the iOS screen is 2D but the real world is 3D, setting the distances will ensure that the flat 2D augmented reality display will be accurately covering the visible

audience area and not passing through walls. If the distance is not correct, then this may result in overshooting or undershooting the target audience space.

After setting the four distances, stand as close as possible to being directly underneath the speaker (you do not have to be directly underneath, but the closer the better) and move the left edge, right edge, back edge and front edge sliders so that the target audience area is covered.

Note: It is important that the back edge is higher that the ear height of someone standing. Picking a doorway or similar as a visual aid will ensure your back edge is covering someone standing.

Note: It is important that the front edge is lower that the ear height of someone sitting. Picking a chair in the front row or similar as a visual aid will ensure your front edge is covering someone sitting.

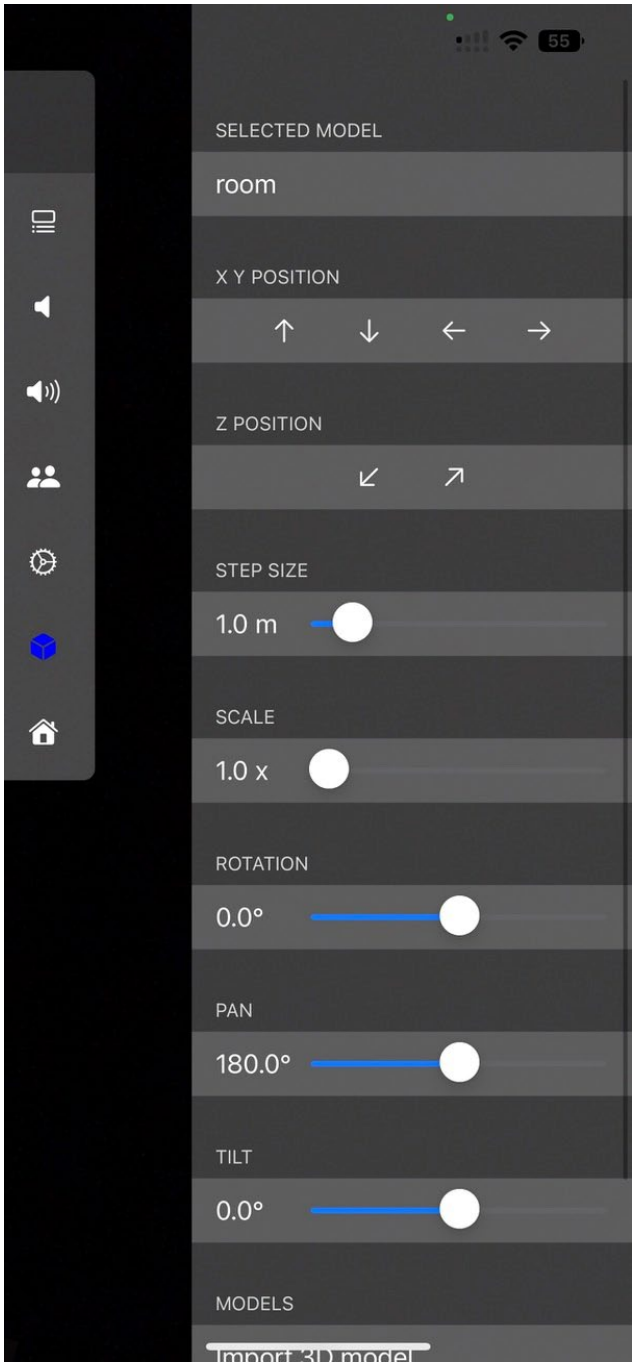
Note: try to minimize the coverage of the space as much as possible. Ensure the left and right edges are just covering the front row of the audience. In a stereo array configuration ensure the left and right edges are just covering from the edge of the audience to only halfway into the room.

Try not to move about the room when setting the audience coverage with this method in order to minimize drift. What you see in terms of coverage is what will be covered if the distances have been set correctly.

5.3 Virtual Reality Method

On the 3D Model Page  import a 3D model. Tap to import 3D model to insert a 3D object into the project. Supported models include: .DAE, .OBJ, .USDZ and LiDAR scanned spaces (we recommend the free LiDAR room scanning app called “3S Scanner App” and to share the file to your folder app in the .USDZ format after processing the scan with the ‘Fast’ option)

A LiDAR scan of a space does not have to include all details and all parts of a room. It is only important to include the perimeter of the audience area, and where the speakers are located, as this is the only information that is required to determine the shape and size of the target audience area.



Once a 3D model is imported, controls will be displayed to change the position, scale, pan, tilt and rotation of the model.

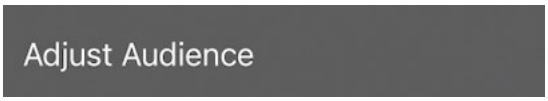
These controls operate in the same way as the Array position controls.

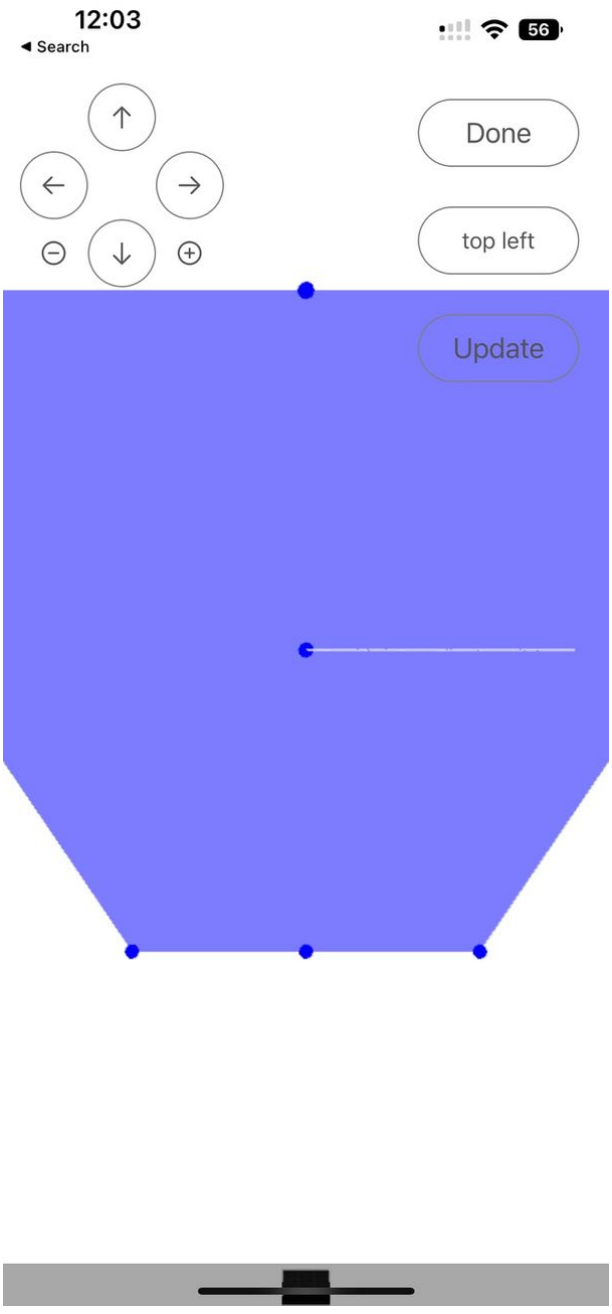
The model needs to be rotated and positioned so that the 3D model that has been imported matches the location of the speakers in augmented reality. After placement of the 3D model, the speakers in augmented reality should be placed in the correct position in the 3D model.

It is also possible to import multiple 3D models. So, it is possible to LiDAR scan a balcony separately to a lower audience space and import them separately into the program.

Once the 3D model is imported into the model, go to the beam page  and select the beam to being set using the scroll wheel.

At the bottom of the beam page, select “Adjust Audience”





This will open a virtual realty screen where a virtual camera can move about the space in 3 dimensions.

The camera view starts in a view that is directly above the audience, looking directly down. Your first view should see the target audience, the black speaker array, and the imported 3D model.

The middle button initially labelled “Top Left” selects the audience point that is being adjusted. Tap this button to change between the 9 audience boundary points.

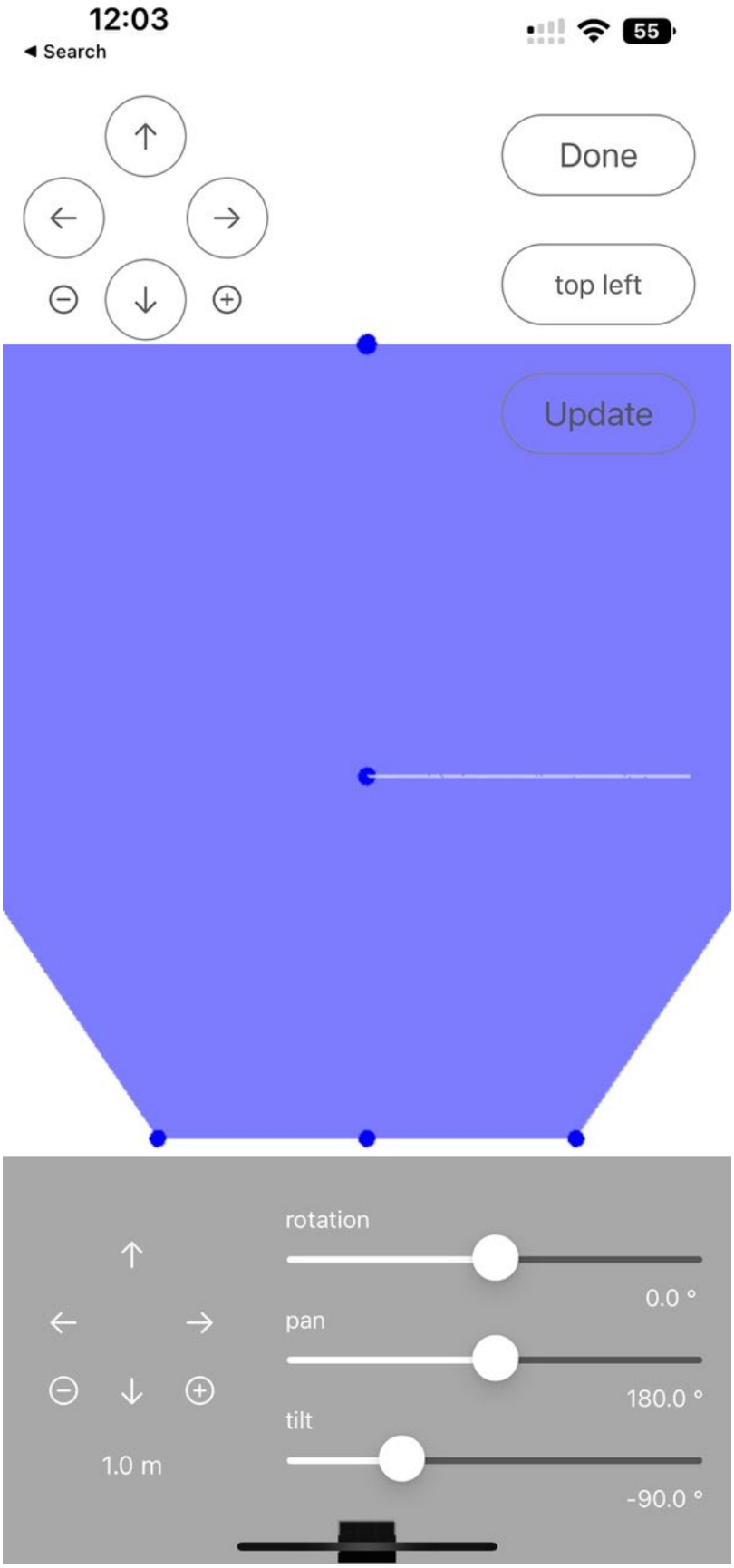
The Update button will refresh the predicted frequency response mapping instead of showing a generic blue audience shape. This is purely for intrigue and is not necessary.

Done will save the target audience shape and exit virtual reality.

The arrows in the top left-hand corner adjusts the position of the selected audience point up/down, left/right, forward/backward.

As the virtual camera, speaker arrays and 3D model can be rotated and adjust orientation you may find that left/right or forward/backward controls are inverted. Adjusting the camera position can correct this experience but it is more efficient to check which direction the arrow moves a point and modify the input in the desired direction.

To adjust the virtual camera position, tap the grey bar at the bottom of the window. This will expand the camera controls.



The Camera controls move the virtual camera so you can change perspective of view in virtual reality. Note that when you start the Adjust Audience process, the camera is tilted -90, meaning the camera view is directly down. This will be important when adjusting the audience as you will need to move between 2 views repeatedly. A directly down view (camera view set to -90), and a directly forward view. (camera view set to 0)

The step size can also be adjusted here by tapping on the 1.0m value and changing the value of the step size.

Starting with the camera view looking directly down (camera tilt set to -90), and with the camera positioned directly above the center of the audience, adjust each of the 9 audience points using the white arrows at the top left hand corner of the screen. (Don't get confused and hit the camera control arrows). In this step you are ONLY controlling the forward/back and left/right position of the 9 audience points. You are NOT adjusting the height of the points.

If you cannot see the entire audience perimeter, zoom the camera out by hitting the + button in the camera control section.

Once the 9 audience points have been set, move the camera position (lower arrows on the grey section) so that the view is from the perspective of someone standing at ground level, and at the front of the room looking towards the audience. The camera tilt should now be at 0, indicating the view is straight ahead. Now adjust the HEIGHT of the 9 audience points. (Do not adjust the left/right or forward/back positions from this view).

Ensure that the back points are above head height for someone standing at the back row of the audience, and below head height in a seating position at the front row of the audience. Middle row points should be in a middle height position.

Once the height is set correctly, move the camera back to the initial point looking directly down on the audience from above (camera tilt at -90, and centered above the audience). Ensure the 9 audience points are still forming the correct boundary shape and a point is not astray. If a point is astray, it means you have accidently moved a point in error. (it is a common mistake to accidently move the height of a point in the plan view, or accidently move the point forward/backward in the forward facing view).

Once the 9 points have been set correctly and have been verified in both plan view and forward view without any changes, hit the "Done" button to save the changes.

Step 6: Apply EQ

Once the audience shape is determined it is required that an automatic EQ is applied to the space. This is necessary as each unique beam shape will have varying efficiencies at each frequency. The iOS app will use AI to determine and automatically EQ, through use of surface detection and distance calculations, but there is still error in the predicted EQ. This error is overcome with 5 simple measurements. The iOS application will take 5 measurements and compare the predicted EQ and SPL of the measured location and compare it to the predicted EQ and SPL. After 5 measurements the beam configuration will be updated to correct for this error.

On the beam page  select Auto EQ

This will automatically deploy all settings for the array and beam to the array hardware, including a predicted EQ.

The beam mix settings will be overridden, setting analog input to 0dB, setting digital 1 input to 0dB, and muting digital 2 input. Furthermore, all other beams in the speaker array will be muted. This is to ensure the auto EQ test signal is routed only to the beam under test.

You should see the software deploy the settings in around 10-30 seconds. If the settings take more than a minute to send, or if a warning pops up that the settings were not sent to all speakers, ensure all speakers are connected to the network, powered up, and the array indicator is green on the project page.

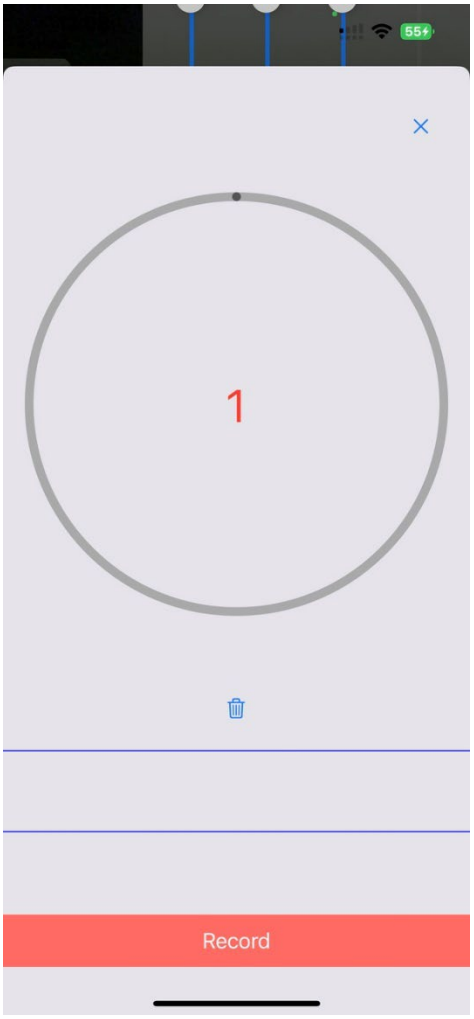
Note: The most common reason for failure of sending settings is speaker hardware having the same IP address as another device on the network (duplicate IP address) or the IP address is not in the same subnet. If network failure occurs, check IP addresses are unique, in the same subnet as your iOS device, entered correctly, and that your iOS device and speaker elements are on the correct Wi-Fi network and powered up. Also ensure the gateway is not set to 255.255.255.255 and that no IP address is set to 255.255.255.255

In Step 2 you have already connected the speaker array to the Bluetooth receiver. As a reminder, the Bluetooth receiver must be connected to EVERY speaker in the array under test.

Note: It should not be connected to any other array, otherwise the measurement will be measuring other speakers as well that software is not expecting to measure, and results will not be correct

Note: The Bluetooth signal must go to EVERY speaker in the array under test. Connecting to only 1 speaker will yield unexpected results.

Turn the volume of the iOS device down by using the iOS device physical volume controls.



Clicking the record button will play the test sweep signal. You may press the record button repeatedly, and each time the last recording will be automatically deleted, and the new recording stored.

Turn up the volume of the iOS device and signal feeding the speakers until you have a reasonable level of around 75dB. Do not use a loud test signal as the iOS microphone will compress and yield unpredictable results above 90dB.

Note: As the beam mixer settings are overridden, you cannot adjust the test signal in the app. You can only adjust the signal on the Bluetooth receiver or on the iOS hardware volume controls.

Additionally, the test signal should be at least 6dB louder than background noises. Try to minimize background noises. Background noises can be present without impacting the results as long as the noise is at least 6dB below the test signal. It is better to try to minimize background noise during the measurement.

Once a good level is determined, do not make any further adjustments to the level. Ensure all settings remain constant for all 5 measurements.

When you hit record, listen to the test signal. You will hear a click followed by a 2 second sweep tone. Bluetooth uses low power modes, so it is possible that the Bluetooth device is waking from a low power state and the initial click is missed. It is also possible the Bluetooth signal has interference, and the sweep signal is not clean or breaks up. If this occurs, immediately click the record button again. This will ensure the Bluetooth receiver does not enter a low power state. Repeat this step until a clean signal is heard. If a clean signal cannot be heard, try to move the Bluetooth receiver closer to the iOS device.

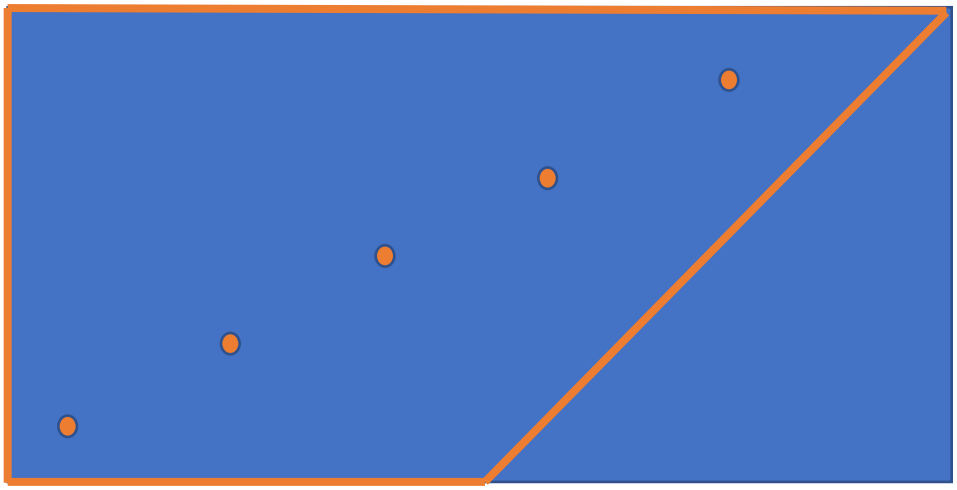
Once a clean signal is recorded, swipe the screen to the left. You will now see a number 2 in the center of the circle. Move to a second location (outlined below) and take another clean measurement. Swipe left again and repeat until all 5 measurements are recorded.

The 5 measurement locations should be randomly located across the audience with varying angles off axis from the speaker, and varying distance from the speaker. To simplify this process, we recommend the 5 measurements are taken in a diagonal line across the audience like below.

Note: You MUST only take a measurement INSIDE the area of coverage of the speaker. Do not go too close to the edges of the audience. Measuring outside the coverage area will result in additional high frequency boosts to compensate for the out of coverage attenuation.

Note: Measurements should be taken at ear height. The app will use the top edge microphone on an iPad and the lower edge microphone of an iPhone. Point this edge in the direction of the speaker. The microphones are technically omnidirectional, but we find best results when these microphones are directed at the speaker. If you are using a case, ensure there is at least 2mm clearance on the holes around the microphones. Some iPads have two microphone elements on the top edge, and some cases only have one hole. Ensure both microphones are clear.

Recommended locations of measurement across a coverage area:



Front of Audience

Array

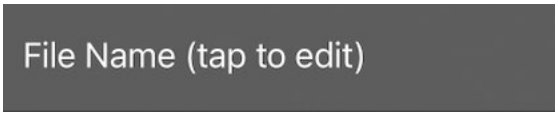
After the 5 measurements are made, a Green button that says “Deploy EQ” will show. Tap this button. This will deploy the correct FIR system tuning that matches the space and corrects for any errors. This process will also restore the mixer settings to what you had set in the mix block and will unmute all other active beams in the project.

Note: As the Auto EQ process changes the mix settings and mutes all other beams it is important to complete the Auto EQ function once you commence it, otherwise the mix settings will remain in the test condition, and all other beams will remain muted.

Step 7: Save the Project

Repeat steps 5 and 6 for the number of beams being used, then save the project.

On the Project Page  tap on the File name to set the name of the file to save.



Then tap the save button

This will launch the iOS directory to select where to save the project. Usually in iCloud or on the iOS device in the files folder app.

Summary of Process Flow:

1) Note iOS device IP address, subnet and router
2) Pair Bluetooth receiver and connect to physical hardware
3) Connect one EDC Speaker in the array at a time to the network, and set the IP address
4) Create a new project, and set the type of speaker, number of horizontal and vertical boxes and number of beams
5) Set the speaker IP addresses to match the position of the speakers in the array
6) Move augmented array to match position and angle of speaker in the real world
7) Set any user desired parameters like custom mixer settings, EQ, dynamics or crossover settings.
8) Set the beam coverage (recommended to use the Visual sight method, first setting the 4 distances, and then moving the left/right/back/front edges to match the audience shape)
9) Apply the Auto EQ and take 5 measurements across the coverage area and deploy
10) Repeat beam coverage and auto EQ steps for additional beams
11) Save the project