Room Combine Logic with Mix-Minus Matrixing of Room Mics

In a large convention center or conference room, microphones may be routed to different speaker zones in a mix-minus configuration in order to reinforce microphones from one zone to another zone while minimizing the potential of acoustic feedback. When in a “mix-minus” configuration, microphones are routed to all zones except the zone in which the microphone resides, so the microphone level can be quite loud without creating acoustic feedback with the speakers directly overhead.

In most SymNet applications the mix-minus setup is straightforward and easily accomplished using a Matrix Mixer module. However, when the convention center or conference room using mix-minus routing is part of a larger divisible venue, where two or more rooms can be combined and uncombined, then the logic for combining/uncombining the audio, the automixers, and control parameters (such as mute and volume) must be taken into consideration.

When no mix-minus routing is necessary, room combining is simple using SymNet’s Room Combiner modules. These modules will combine and uncombine the audio, automixers, and control parameters (gain, mute, sources selection) of 2 to 16 rooms with the push of a combine button.

In the example above, when #1 Combine Button on the BGM Automix Combiner module is turned “on”, the audio, the automix, and the control parameters are shared between room 1 and 2. Any change to the room controls, such as BGM selection, volume, or mute, will affect both room’s controls. When the #1 Combine button is turned off, both rooms operate in a standalone fashion. This functionality is especially helpful when using a 3rd party control system, as no combine or uncombined logic needs to be added to the control system programming since SymNet will do all combine and uncombined logic automatically.

The limitation with the Combiner module in a mix-minus application is that each room has only a single room input and output for the local sources, whereas in a mix-minus configuration each room would have multiple speaker zones, each with their own unique mix of the microphones.

The solution is to use a Matrix Mixer and BGM Automix Combiner module in tandem, using linked controller assignments, to create a mix-minus, room combine system where audio, automixers, and control parameters combine and uncombine.
The following example will create a two-room system with combining/uncombining capabilities and mix-minus matrixing of the mics.

There are 12 microphones in room 1 and 8 microphones in room 2. Each room has 4 amp channels. For simplicity sake, this example includes only the processing associated with automixing, combining/uncombining capabilities, and mix-minus matrixing of the microphones. A real world design would also include dynamics processing and filtering/equalization at the input and output stages.

Follow these simple steps to program a mix-minus, room combine, SymNet site file:

**Step 1:**
Build the site file such that Slave Gain-Sharing Automixers are used for all mics in the system. Separate Slave Gain-Sharing Automixers should be used for the mics located in each room.

**Step 2:**
The Automixer discrete outputs should feed the inputs of a matrix mixer module instead of using the Mix output.

**Step 3:**
Add a BGM Automix Combiner to the site file that can accommodate the number of combinable rooms in the venue – two rooms in this example.

Wire the Chain output of the Automixers to their respective Chain input on the Combiner (blue wire). Wire up the Master out of the Combiner to the respective Master input of the Automixer.

Note: Vias are used in this example for returning the Master signal to the Automixer. They provide a pass-through of audio or control within a single DSP design view, helping to keep a design clean and organized.
Step 4:
Create the mix-minus configuration of the microphones using the Matrix Mixer user interface for the rooms when in the uncombined state.

Once the routing and crosspoint gains are configured for the individual uncombined rooms, right click the Connect Matrix and select Store “Connect Matrix” in Preset to store the matrix settings to a preset. This example uses preset 1 for the “uncombined/standalone” preset.

Step 5:
Create the mix-minus configuration of the microphones using the Matrix Mixer user interface for the rooms when in the combined state. Right click the Connect Matrix and store to a preset.

This example uses preset 2 for the “combined” preset.
Step 6:
To stay organized, open the Preset Manager and rename the combine and uncombined presets accordingly. Then recall both presets, checking the matrix each time, to ensure they are correctly changing the matrix.

Step 7:
Add the following logic circuit using control modules: 1 button latched, 1 inverter, 1 dual preset trigger.

The top Preset Trigger-1 should use the “combine” preset, the bottom Preset Trigger-2 should use the “uncombine” preset.

Step 8:
Open the 1 Button Latch and the BGM Automix Combiner and assign the same controller number to Button 1 and #1 Combine. This example uses controller #1.
Step 9:
On the BGM Automix Combiner assign the Volume fader for Room 1 and Room 2 each a unique controller number. This example uses 10 and 20.

Step 10:
Then assign the same controller number to all master output faders on the Mix Matrix on a per room basis.

For instance, matrix outputs that feed room 1 are assigned to controller number 10 and matrix outputs that feed room 2 are assigned to controller number 20.

Step 11:
Now that both the combine button and the latched button that triggers the combine/uncombine presets, and the volume faders on the Room Combine module and the Matrix Mixer, are all assigned to their respective controller assignments, these controller assignments need to be linked so that the duplicate controllers will work in parallel.

To link the controller assignments, open the Remote Control Manager and highlight the controller numbers that are assigned to the 1 Button Latched/#1 Combine button and all volume faders from the Matrix Mixer and Combiner (Shift + mouse click) and set them to link by hitting the Enable Linking button. Link should show “Yes” in the link column for all the above assigned controls.
Step 12:
The finished signal path should look similar to the below design.

Systems with more than 2 rooms and/or odd number of rooms:

For a room combine system with more than 2 rooms or an odd number of rooms, use the next largest available sized BGM Automix Combiner module. For example, for a 3 or 4 rooms system, use a 4 room BGM Automix Combiner in both instances.

In the case of 3 rooms, utilize only 3 rooms worth of control in the 4 room BGM Automix Combiner. Additionally, a unique controller number should be used for the room 3 volume control on the combiner which would be link enabled to the same controller assigned to the various room 3 volume controls on the mix-matrix module.

Also, a separate pair of combine and uncombined presets will need to be created and used in conjunction with the room 3 combine switch, link enabled with a separate set of logic modules for room 3 preset triggering as outlined in Step 7 of this document.

Step 13:
Push the site file to the SymNet system and test the controls in both the combined and uncombined state. The Combiner module provides the control and automix linking functions. The control is linked because the Combiner and Matrix Volume controls use the same controller assignments that have link enabled.

The Mastrix Mixer will provide the audio combining based upon the two created and named presets. The presets are triggered when the #1 Combine switch is engaged or unengaged because the 1 Button Latched that feeds the preset triggers has the same control number as the #1 Combine button on the BGM Automix Combiner, and this controller assignment is link enabled.