

VOICE ARRAY

BY RAFAEL LOZANO-HEMMER



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GENERAL IMPORTANT INFORMATION

This short section must be read for proper operation.

VOICE ARRAY (2011)

BY RAFAEL LOZANO-HEMMER

Technique

Intercom, array of lights (usually LED), holosonic speaker, custom-made hardware and software

Description

As a participant speaks into an intercom, their voice is automatically translated into flashes of light and then the unique blinking pattern is stored as a loop in the first light of the array. Each new recording pushes all previous recordings one position down and gradually one can hear the cumulative sound of the 288 previous recordings. The voice that was pushed out of the array can then be heard by itself.

The installation is made up of a series of aluminum strips, with LED lights and control electronics concealed behind them, installed in a long horizontal line around the room. The audio component of this piece is made from a series of speakers, hidden in the walls below the strip of LED fittings. Participants interact with the installation using an intercom, which contains a button, a microphone, and a speaker.

Operation

Please refer to [Appendix I - Installation](#) for detailed system information and wiring diagram.

Turning the installation ON and OFF is very straightforward because one main socket powers all of the electronic control devices, and one or multiple sockets power all the LED strips and speakers.

To avoid constant maintenance of the installation, the electronic control devices MUST be left ON throughout the exhibition.

1. To turn OFF the installation each night, simply cut the power to the speakers and the LED power supplies. If they all run from one power socket, then this is a one-switch job. If this is not possible, and multiple power sockets are in use, then switch off each applicable socket.
Remember to leave the control electronics ON!
2. To turn ON the installation, simply switch the power to the speakers and the LED power supplies back ON. After doing this, it is a good idea to check and see if the piece is running correctly. Consult our [troubleshooting steps](#), if needed.

Maintenance

The aluminum strips might become dirty with fingerprints during installation. Please use methylated spirits (or another pure form of alcohol) with a microfibre cloth is a good method for cleaning the LED strips.

Be careful not to touch the electronics behind the strips, as this might cause short circuits and damage the piece.

Placement Instructions

Summary:

The visual part of the installation is made up of a series of aluminium strips, with LED lights and control electronics hidden behind them, which are installed next to each other in a long line around a room.

The audio part of the installation is made up of a series of speakers, hidden in the walls below the strip of LED fittings.

The interactive part of the installation is an “intercom”, containing a button, a microphone, and a speaker.

A short video of the successful running of the installation can be viewed on [our website](#).

Preparing for Installation:

Please keep in mind two things: first, that this work involves a lot of hidden cables, and second, that using very flat walls will make the installation easier. The simplest option is to build an entirely new set of walls within your space, with enough room for someone to walk around behind them, which can also be used to store the equipment necessary to run the piece. If you plan on using existing walls, please be aware you will need to do a lot of cable fishing, including around each corner of the installation.

You can design new walls depending on the number of strips you plan on using. Each strip is one metre long. Do not forget to allow extra space at one end to accommodate the intercom.

In your custom or non-custom building, your plans also need to account for an area that will house all the electronics that run the installation, and a computer and a screen with enough room to use them. The intercom has some shorter wires than need to connect to the main electronic setup, so the best position for the electronics is right behind the intercom. You can extend the intercom wires if necessary.

Installation Overview:

There are four stages to this complex installation:

- 1. Front-End Installation:** Initial installation of the objects that will be seen in the gallery;
- 2. Back-End Installation:** Setting up the electronics and cabling to run the installation;
- 3. Cabling:** Running the cables from the control setup to the LED strips and speakers;
- 4. Final Installation:** Aligning the strips and tightening the brackets.

1. Front-End Installation

The first thing to do is decide where the LED strips are going, and where the intercom will be situated (either at one end of the run or the other.)

When you have decided the layout, use a laser level, a water level, or a string to mark the position of the strips. The lower part of the strip that touches the wall, and rests on the bracket, should be 1.4 m from the ground.

The brackets are positioned at each end of a strip, supporting two strips at once, with another bracket at the centre of each strip. You can now mark their location on the wall.

Because the installation is composed of a straight line, any inconsistencies on the wall will be noticeable. It might be easier to adjust a wall at this stage, or to build an entirely new wall, rather than adjust the installation later—which will add a significant amount of time to an already lengthy installation.



Next, screw the brackets to the wall, making sure you leave them slightly loose, to allow enough room to modify and remove the strips. Also, make sure that the small bolts used to clamp the strips in place are screwed out enough to allow the strips to be fully seated.

You can now loosely fit the strips. They will stay loose until the final stage to allow for any modifications to be made.

The aluminium strips are fixed to the wall on smaller aluminium brackets. Each strip is one metre long. A series of LED lights are located on top of the strips, hidden behind the front face, and another series is located on the underside of the strips. The LED controller boards (two per strip) are also located on the underside of the strips, fixed to the back side of the face, as are the signal wires and the power strip.

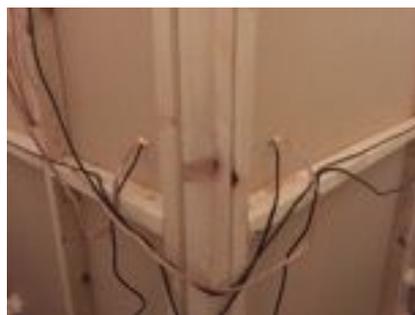
The aluminum strips send power signals to each other through the flat, wide black connectors that stick out from the left side of the strips, so they can be plugged into the right side of the neighbouring strip. When packed, these connectors will probably be folded inside the strip. These connectors need to be lined up correctly when they are connected, which can be a little finicky at first. While there is no power circulating the strips at this stage, later, when you are connecting and disconnecting the power, an incorrect connection might create a large spark, and cause damage.

From the black connectors, a signal wire made up of twisted white and coloured thin wires terminated in a series of small green connectors, will connect to the white, double-pinned connectors on the LED control boards. Another set of these twisted-pair cables connects the two boards of the strip together. Power is sent through the flat, copper-coloured strip-cable.

Now, connect the strips.

The strips are controlled by two EntTec DMX devices. Each device controls half of the strips. The signal from the EntTecs runs to the first strip of each grouping through a modified XLR cable. From there, the signal travels along the thin, white and coloured cables within the strips. **This signal MUST run from RIGHT TO LEFT of the installation.** On the aluminum strip located on the far right, behind and underneath its right corner, you can drill holes in preparation for feeding the green terminal blocks on the XLR cables, which we will connect later.

The power can run in any direction, but running it left to right it will make these instructions easier to follow. You need to feed power to the strips every FIVE strips, so drill a hole in the wall on the LEFT end of each strip, every five strips, for the power feed. This hole needs to be wide enough to accommodate thick speaker cables. Next, connect the wide, black connectors between the strips. You will see that there are several male-to-female parts on each connector—these need to line up correctly. Anywhere you have drilled a hole, you do not need to connect the strips.



At the corners, the connectors must be woven into the wall, around the corner, and back out of the wall to connect to the next strip. Remove the strips to drill the necessary holes behind the lower part of each strip. Feed the cables around the corners, replace the strips, and reconnect the cables.

Next, install the intercom.

The intercom hangs from a single screw, and a large hole drilled into the wall behind it accommodates its different cables. It is possible to mount the intercom more permanently by taking it apart and screwing it to the wall, then reassembling it, or by using some carpet tape or other double-sided tape in addition to the single screw.



Next, install the speakers.

You need to install one speaker for every two strips, each positioned below the intersection of the two strips. The speakers are used in pairs, so, starting with the set closest to the intercom, put a left speaker (with the power running to it), then a right speaker, then alternate between left, right, left, right, etc.

To install the speakers, drill a hole in the wall measuring the same size as the fabric-covered speaker, while still allowing sound to travel to the room. The fabric can be stretched and stapled like a canvas over a frame made from MDF or timber.

Afterwards, you should caulk around the wooden frame, and paint everything the same colour as the walls. You may also need to make a small shelf behind the wall for the speaker to sit on. The speakers should be as close to the floor as possible.



2. Back-End Installation

Please note that [Appendix I](#) includes a visual overview of the setup, and a technical diagram of the wiring setup.

An Apple Mac Mini computer with a custom software runs the piece. An LCD screen is connected to the Mac via its HDMI port.

Three USB hubs (or more if necessary) are connected directly to the Mac Mini:

The first USB hub connects to the keyboard, the mouse, the webcam, and a keyboard simulator (a small square piece of electronics with a grey cable on one side and an USB connector on the other.) The grey cable connects to an XLR wrapped in black electrical tape, with a speaker cable coming out of it.



Keyboard simulator

The other two (or more) USB hubs connect to the M Audio units, which send audio signals to the speakers. You will need one M Audio unit for each pair of speakers, plus one extra for the intercom. Each M Audio unit also has its own power supply.



M-Audio units

The Extron is a mini amplifier for the speaker in the intercom. A single phono (RCA) cable runs from the extra M Audio unit to the Extron unit.



Extron amplifier

Power to the Extron unit comes from a power supply with two bare wires, which connect to the green terminal block on the backside of the unit. If one of the cables is marked, it should be connected to the live (L) terminal, and the other to the neutral terminal. If the cables are not marked, they can be connected either way.



If you are doing some complex troubleshooting, please keep in mind that the signal for the Extron unit can also be sent from the minijack-Out terminal on the back of the Mac Mini.

The EntTec units are DMX controllers. They control the LED controller boards located on the strips, which, in turn, control the LEDs. As already mentioned, you need one EntTec for each of the two groups of LED strips.

The EntTecs connect to the Ethernet Switch, which itself connects to the Ethernet port on the Mac.



EntTec (DMX)



Switch

The Intercom has several cables running from it:

A black cable with bare ends which needs to be connected to the bare-ended speaker cable, which connects to the Keyboard Simulator. Using a terminal block is ideal, but you can also just twist the wires together, using electrical tape to isolate them;

The thin, copper-coloured speaker cable coming from the intercom connects to the terminals on the back of the Extron unit;

The USB cable from the Intercom connects DIRECTLY TO THE MAC (not through a USB hub.) This connects to the microphone in the Intercom;

Important Note: If the USB end is covered with white electrical tape, leave it on. If not, wrap it with electrical tape, or mark it by another means.

3. Cabling

The EntTec units must be connected to the first strip on each half of the installation, as already described. This is done using the specially-adapted XLR cables, which, on one end, have the small green connectors as described in the previous section. The XLR ends of the cables connect to the EntTec units. Use additional XLR cables to extend the run as necessary. Feed the green terminals through the holes to the strips and then directly to the first LED controller board of the strip, while simultaneously disconnecting any already-connected green terminals and bypassing the feed from the flat, black connectors which connect the boards together.

Power Cables:

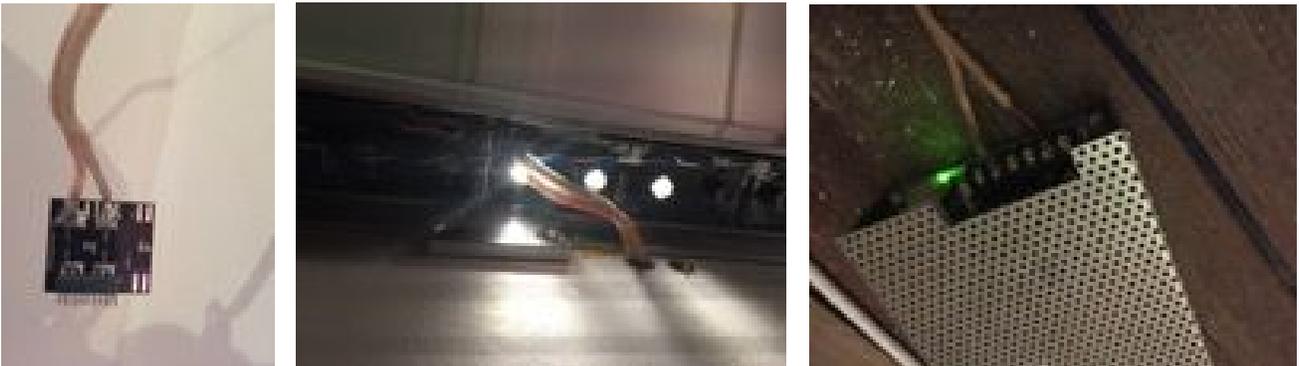
The strips are powered by the heavy, metal-covered power supplies, which are situated behind the wall every five strips, starting from the left.

The cables which feed power to the strips from the power supplies are made from thick, copper-coloured speaker cable, terminating in the flat, wide connectors that you will recognise from installing the strips. There are two types of cables, one with the connector oriented to the left, and one oriented to the right. Collect all of the connectors oriented to the right, as pictured below (the left-oriented ones are for running the power the other way round the room).

Starting with the first strip on the left, and repeating every fifth strip, feed the power cables through the holes drilled in the wall and connect them to the black connectors.

Wherever you have connected the power in this way, you have broken the signal transmission between the strips. Find the box of spare signal connectors (the pairs of twisted wires with the small, green connectors on each end) and connect the strips with interrupted signals to the power feeds.

This is also a good time to check if the signal cables are present throughout the installation, including the connections between the control boards on each strip. Replace any missing cables.



Next, connect the power cable to the power supplies behind the wall, on the side of the power supply with six terminals. The cable with the stripe connects to the 24V live (L) terminal, and the cable with no stripe connects to the 24V neutral (N) terminal.

The cable running from the main wall socket to the power supplies ends in bare wires, which connect to the side of the power supply with three terminals. The cables supplied for this are British. If working elsewhere, you may substitute these with your own cables. If using the British cables, use the following color system: the live (brown) wire goes in the live (L) terminal; the neutral (blue) wire goes in the neutral (N) terminal; and the green and yellow wires go into the earth (E) terminal. It is a good idea to set up all of the power supplies beforehand, running from one switch main socket to another, which will make turning on and off of the installation and troubleshooting much easier.

The power supplies draw a lot of current, so your space has limited electrical supply, you may need to distribute the connection of the power supplies across different rings. Each power supply draws approximately 6 amps of power. Use this value to calculate the power required and check this against the specifications for the electrical supply to the gallery. Consult an electrician, if needed.

Speaker Cables:

Double-phono (RCA) cables run from each M Audio unit to each pair of speakers. White goes into the left socket, and red into the right (these will be changed around later.)



It is worth labelling each cable so that you know which speaker it feeds.

The speakers are self-powered, requiring no external amplifier. They are set up in pairs, left then right, as already described. The left speaker takes power from the main socket, and the right takes power from the left, using a length of thick, copper-coloured speaker cable. If possible, run all of the speakers from the same socket, ideally the same socket that feeds the LED strips power supply. Turn the volume controls on the speaker to 50%.

Next, now that everything is connected, it is time to switch everything on.

If some or all of the installation has power, turn everything off, then wait 30 seconds and turn it all on again. Depending on the software setup, you should see flashing LEDs on the strips and sound coming from the speakers. Do not worry if this does not happen; there is another stage to complete before everything will run correctly.

The whole control setup is fairly stable, so you can turn it all off and on again without causing it any major problems.

All devices and power supplies related to the electronics have North-American plugs, which are compatible with the included North-American four-ways. These need to be plugged into a local main socket. All the power supplies for the electronics work on both 110V and 240V.

All the control electronics should be powered from one main socket, making troubleshooting and power cycling easier. However, the power supplies for the speakers and LED strips should be run from one or more separate sockets, as will be explained later.

4. Final Installation Work

Tightening the Brackets:

After confirming that all the strips are working well, you can now tighten the brackets holding the strips to the wall. Tighten the screws with a drill driver or impact driver at a slight angle, making sure the brackets are flush with the wall.



Ratcheting wrench

Next, tighten the bolt that holds the strips to the brackets. The install kit provided includes a flat ratcheting wrench, used to tighten and loosen the bolts.

As you work your way around the room tightening the bolts, check that the strips line up correctly with each other, as even a minor inconsistency will affect the whole installation. Adjust the bolts accordingly by adding packers behind the strips, or loosening and re-tightening the strips.

Hiding the Wires:

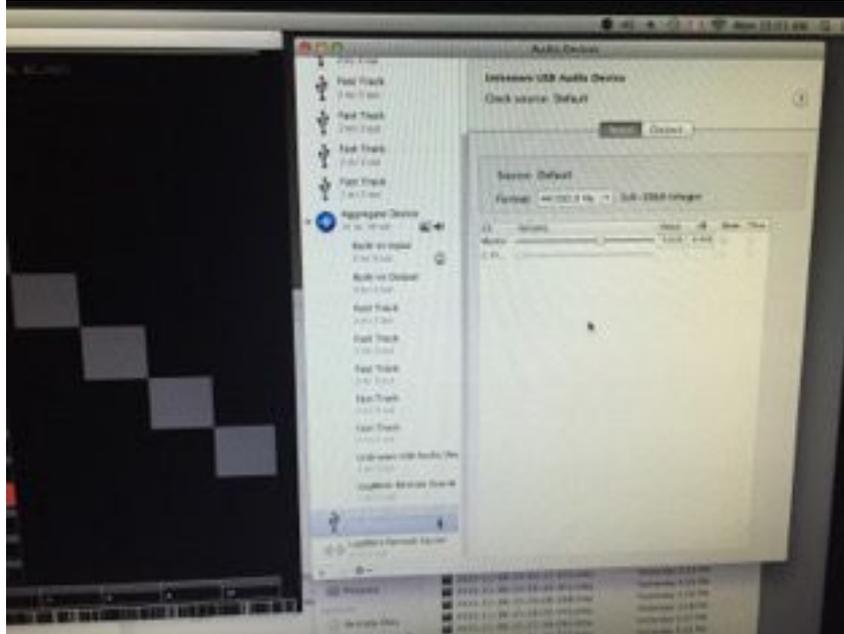
If there is any wiring left hanging from the underside of the strips, now is the time to tuck it away and hide it. You need extra strong tape to keep it hidden for the duration of the exhibition. Even gaffer tape is not strong enough. Gorilla Tape works well and some is included in the installation kit. Any other tape that is advertised as extra strong should work.

When taping things in place, make sure none of the metal power connectors are touching the metal of the strips, as this could create a short circuit which could damage the work.

DETAILED TECHNICAL INFORMATION

Normal Software Operation

Audio MIDI Setup



Audio MIDI Setup is a native Mac application, used for managing any MIDI (audio) devices connected the computer. Open **Audio MIDI Setup**, either by clicking on the piano icon in the dock on the left side of the screen, or by pressing **command-space keys** and then typing **Audio MIDI SETUP** (until you see it self-complete) and pressing **Return key**. Next, set the M Audio units up correctly within **Audio MIDI Setup** so that they receive signals from the software and so that the correct signal is sent to each speaker.

Within the **Audio MIDI Setup**, look for is a blue circle with a **+** sign and the label **Aggregate Device** in the left-hand column. Clicking this icon will activate a list of possible MIDI (audio) devices which can be assigned to the **Aggregate Device**, in the right-hand window. Select all the **Fast Tracks** in the right-hand window. If they are not present in the right-hand window, drag them from the top part of the list in the left-hand window. They should now also appear in a sub-menu under the **Aggregate Device** in the left-hand column. Click the **Aggregate Device** icon again to show this if it is not visible.

You should have one **Fast Track** showing for each pair of speakers, plus one extra (or alternatively the Mac Mini's minijack out), to send a signal to the speaker of the Intercom. Whether using an M Audio/Fast Track or the minijack out, this should also be selected as part of the **Aggregate Device**. For example, if you have 20 strips, you will have 10 speakers and 5 M Audios or Fast Tracks for the speakers, and one extra for the intercom, so 6 Fast Tracks selected within

the Aggregate Device in the Audio MIDI Setup. You also need to add/select the **Blue Snowflake** device to the **Aggregate Device** this is the Intercom's microphone.

When restarting either the Mac or the whole electronics setup, the **Fast Tracks** (M Audios) will be remembered by the Audio MIDI Setup software but the **Blue Snowflake** will not. This is why we made sure there was tape around the USB connector of the Intercom microphone; after each setup, you must remove and reconnect the microphone's USB to the Mac Mini, and then make sure it is selected as part of the **Aggregate Device**. Sometimes, upon restarting, the computer will recognise it as "Unknown USB Audio Device" instead of **Blue Snowflake Device**. Simply re-select **Blue Snowflake Device** if this is the case.

If after restarting either the Mac or the electronics the speakers are not working, the **Audio MIDI Setup** might have created a second set of **Fast Tracks** which are not "selected" within the Aggregate Device. The first set of **Fast Tracks** might still be selected, but are no longer related to the actual M Audios. If this happens, you need to deselect the old M Audios and select the new ones.

When connecting the M Audios to the USB hubs, the software might get confused and stop producing any audio. If this happens, simply unplug the M Audio units and reconnect them one by one. Try different variations of plugging them in, or plugging them into different USB ports.

Manual Software Calibration

The software should launch automatically when the Mac boots up. If sound is coming from the speakers and lights are coming from the LEDs, the software is already running. If the software is not running, open it manually by clicking on the icon (a white “N” on a black background) on the dock on the left of the screen.

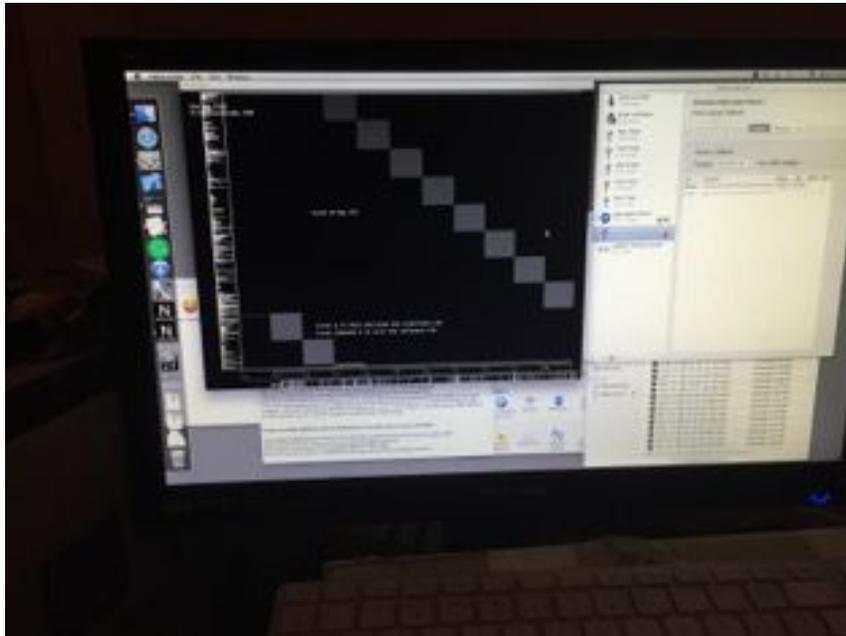
When starting up the software manually, make sure that you launch the **Voice Array App**, NOT the **Voice Array Launcher**. The **Voice Array Launcher** application will start up automatically when the computer starts up, and it does not need to run again.

This is the time to switch the direction of the LEDs if you have the Intercom at the left-hand end of the LED strips. To do this, select the **INVERSE DMX** box. If it is already selected and you want the installation to run right to left, simply unselect it. There are many other settings within the **Voice Array App**, but these should only be altered after consulting with Antimodular technicians.

Hardware

Sequencing the Speakers

The speakers play audio specific to the LEDs on the strips above them, and when a new sample is added to the work, both the LEDs and speakers turn off and then come on again in sequence around the room. It is therefore imperative that you sequence the speakers correctly to synchronise with the LEDs.



To do this, you will need one person in the gallery space and one person with the Mac and M Audios. In the software, press **key g** to hide the settings page. You will now see a largely black screen with a waveform on the left and a series of numbered rectangles along the bottom. You should have the same number of rectangles as you do speakers, including one extra for the Intercom speaker. Clicking on each rectangle will isolate the signal going to that speaker, so that it is playing alone. The order of the M Audios will almost certainly be random when everything is first set up. Click on a rectangle to isolate a speaker, then ask the person in the space to tell you which speaker is playing, comparing this to the labelled M Audio end of the phono/RCA cable, and unplugging and assigning the correct speaker to the correct M Audio output if needed. **0** rectangle should be the Intercom speaker, **1** the first speaker in the series, **2** the next speaker, and so on.

If you prefer, you can swap the order of the M Audios around by selecting them in the correct order within the Audio MIDI Setup software. If you restart the electronics and need to reassign the M Audios in the Aggregate Device, make sure that the order of the speakers is still correct.

If you have the wrong number of rectangles in relation to the number of speakers, you will need to use a different version of the software, or the software needs updating. Please contact Antimodular Studio.

If you encounter further problems, please check through the above steps again.. If your problem is still not resolved, contact us.

Adjusting the Volume

Adjust the volume individually on each speaker, or from the software on the computer, using the **Master Volume Level** adjustment on the main settings screen (press **key g** to reveal the settings.) As already mentioned, the Intercom speaker can be adjusted using the Extron unit or from within the **Audio MIDI Setup** software.

Remote Access to Artwork's Computer

There is a software installed on the computer running this artwork that allows the studio to connect remotely to the artwork. This feature is helpful when you require assistance from the studio, as we can remotely connect to it, do a quick inspection, and do a debugging session of your components, if needed. In order to enable this feature, the computer has to be connected to the internet at all times. Depending on the computer's operating system (Windows 7/8/10, OSX), the procedure to set the computer online will vary. Please look online for tutorials, if necessary.

Preliminary Troubleshooting Steps

Before starting any troubleshooting tasks, first check to see if the LED strips are all functioning correctly on the gallery side of the installation. The LEDs should be flickering and dancing. If there are problems with the wiring connections, you will potentially come across one or more of the following situations.

A section of the track is dark.

The power is not connected. Remember in which direction the power runs (left to right, if you followed these instructions), and at the relevant (left) side of the power outage, disconnect and reconnect the flat, black connector. This should return power and light to the LEDs. You may need to restart the electronics for the software, in order for the newly powered units to be recognized..

A section of the track has frozen LEDs, or only has two LEDs on per track.

There is a broken signal feed to the track. Remembering that the signal runs right to left, go to the right side of the point where the freeze is, and check both the black, wide connectors and the small, green connectors. When you have checked and resolved any issues, turn the power supplies to the LED strips off and on again, then restart the electronics, or try restarting the **Voice Array App**.

Check that the installation is functioning properly, from start to finish.

This installation is quite complex, so please check that the piece is working properly, from start to finish. Here is a description of how it should work:

Press the button on the Intercom, and record yourself speaking. Participants have 30 seconds to record their voice, afterwards, if no sound is heard, the software will assume there was an error, and the button must be pressed anew. While speaking, the LEDs will switch off, then pulse according to the speaking voice. When the button is released, the recording will repeat on the first speaker, and the first LED on the first strip will pulse according to the repeated voice. Then, the rest of the voices will play, one by one, along with each of the LEDs, in a sweeping wave around the length of the LED strips. After all the strips activated, everything will go off once more, and a single recording will play—this is the track that has been playing the longest, and it will subsequently be deleted as it is pushed away by the new recording. Then, all of the voices and LEDs will fade, and the installation will continue.

Check that the Intercom is working correctly.

If the Intercom button is not working, check that the **Voice Array** software is selected on the computer. The Intercom button, through the simulated keyboard device, is essentially pressing the **x key** on the keyboard. The button needs to be integrated in the software to have the necessary effect. To check if the button is working, you can open the computer's **Text Edit** software, then press the Intercom button, and an "x" should appear on the blank page of **Text Edit**. Don't forget to return to the **Voice Array** software.

The sound coming from the Intercom might possibly be distorted. Unless there has been a change in hardware, the only way to adjust the sound is by adjusting the volume of the speaker on the Extron unit or in the **Audio MIDI Setup** software.

Check that the LEDs are working correctly.

Examine the LEDs closely. Do any of LEDs never come on, or, alternatively, do any LEDs stay on permanently, after pressing the Intercom button and after the final recording has played? Are there any groups of LEDs that are noticeably more yellow than others? If you encounter either of these situations, you will need to replace some equipment, as outlined below.

Swap the LED strips with the spares.

If you have spare LED strips, you can try swapping the entire strip with a new one. This is the simplest solution.

Swap the LED boards and the controller boards.

If there are no more working or spare LED strips, you will need to replace the electronic components within the strips themselves. Each LED board has four LEDs. These LED boards are controlled by Controller Boards. If a section of four LEDs on the top or bottom are overly yellow, or dull, or not working altogether, you will need to replace the LED board. If both the top and bottom LED boards are off, then you need to replace the controller board. If just one LED is broken, it may still be easier to replace the whole LED board altogether.

The top-facing LED boards are the easiest to swap. Pull them up gently to pry them loose, then push in a replacement strip in their place. The bottom-facing LED boards are more difficult to remove because they are connected to each other and to the controller board. When replacing a bottom-facing LED board, you will need to remove the controller board first. To remove the controller board, use a small flat-headed screwdriver to carefully pry apart the green connection strips, which are securely attached to the LED boards. There may also be some double-sided tape holding the controller boards to the aluminium strips. To remove a bottom-facing LED board, carefully pull the board down and away from the strip, gently angling it and pulling it apart from its connection with the LED board next to it. Look out for more double-sided tape.

Swap the individual LEDs.

If there are no working LED boards left, you can remove and replace individual LEDs, but this will involve some soldering. Don't forget to label the dysfunctional LEDs before turning off the installation and removing the board.

Erase the test files.

In the **View** section on the top left of the **Finder** window, select the icon with the five horizontal lines to generate a list view of the files. In the list view, click the **Date** title on the date column to organise the files by date, in order to find the most recent files. Selecting a file and pressing the **space bar** will play it. Select the ones you want to remove and delete them by right-clicking them and selecting **Move to Trash**, or by dragging them to the **Trash Can** in the dock.

There are many archived files saved as part of the work, built up during its previous installations. These must be kept, but if you have created a lot of files through testing the work, or if you have any other reason for wanting to delete files, follow these instructions:

- Open a new **Finder** window. Select **Applications** from the left-hand menu bar.
- Select the **of-v.0.8.0 OS X** release folder.
- Select the **apps** folder.
- Select the **Voice Array** folder.
- Select the **Voice- Array-16** folder.
- Select the **bin** folder.
- Select the **Data** folder.
- Select the **Sounds** folder. The audio files are in this folder.

The Intercom button not working.

Make sure the **Voice Array** application is selected on the computer.

For any other issue with the artwork, try the following steps.

Quit the **Voice Array** application (**Menu Bar** → **Voice Array** → **Quit**, or **command-q**). If the application doesn't quit, **Force Quit** the application; press the **command-shift-esc** keys simultaneously, which opens a window, then select **Voice Array** and click the **Force Quit** button. Then, re-launch the application from the dock. Remember to open the **Voice Array App**, NOT the **Voice Array Launcher**.

If restarting the application doesn't solve the problem, do a **hard reset**; turn off the power to the whole installation, including the control electronics (which will have a label on the switch telling you not to turn it off.) After the computer has finished booting up, pull out the USB plug

labelled with white electrical tape (or in some other way), an reinsert it directly in the Mac Mini computer.

If after performing a hard reset (all the electronic control devices turned off and on) the sound is not working as it should, follow the steps below.

Open **Audio MIDI Setup**: the piano icon located in the dock. See the image below as a reference.



The following should be selected in the boxes listed in the right-hand window, under **Aggregate Device** of the **Audio MIDI Setup** software: 1 x Built In Audio Output 6 (or more) x Fast Tracks 1 x Audio Input, probably named “Blue Snowflake.”

If there are more checkboxes with blank entries, deselect them. If the **Built in Audio** or **Fast Tracks** are not selected, please select them IN THIS ORDER.

No sound and no waveforms are moving on the left edge of the Voice Array application.

Find the two or more USB hubs that connect the M Audios to the Mac Mini. Unplug all the USBs running from the M Audios to the USB hubs. Reinsert them one by one and, if while re-inserting them, the sound and the waveforms stop again, remove the last USB inserted, and more if necessary, until the sound starts again. Then, insert a different USB into a different port on the USB hubs. Continue this process until all the speakers are working.

Next, check to see if the speakers are working in the correct order. Two people are needed for this: one in the gallery space and one at the computer. On the computer, select the **Voice Array** application and, if necessary, press **key g** to hide the settings page of the software. You will see a largely black screen with a waveform on the left and a series of numbered rectangles along the bottom. Clicking on each rectangle will isolate the signal going to each speaker, so that that speaker alone is playing. Click on each rectangle, while the person in the gallery checks which speaker is playing. Rectangle **0** should be the Intercom speaker, rectangle **1** the speaker next to that, and so on.

If the order of the M Audios is correct, then there is nothing more to do. If the order is incorrect, then swap the red and white phono/RCA cables running from the M Audio units to the speakers. Click on a rectangle to isolate a speaker, while asking the person in the space to tell you which speaker is playing, and comparing this to the label you have attached to the M Audio end of the phono/RCA cable. Unplug and reassign the correct speaker to the correct M Audio output accordingly.

The cables are visible.

Use Gorilla Tape or other extra strong tape to secure the cables out of sight.

Troubleshooting Assistance

Prior to contacting the Antimodular Studio with a problem about your artwork, please ensure that you went through the preliminary troubleshooting steps outlined in the previous section.

The troubleshooting process will vary depending on the problem. In order to make the process easier, it is recommended that you collect and send the following information to the studio:

- Date and time when the problem first happened;
- Description of the problem;
- Actions taken so far and conclusions;
- Detailed photographs (or videos) displaying the problem;
- Detailed photographs (or videos) of the suspected faulty component;
- Detailed photographs (or videos) of the whole artwork and its surroundings;
- Personnel involved.

Support (Contact Us)

If you would like further support for the piece, please call Lozano-Hemmer's studio:

Antimodular Research
4060 St-Laurent, studio 107
Montréal, QC
H2W 1Y9 Canada
Tel 1-514-597-0917
Fax 1-514-597-2092
info@antimodular.com
www.antimodular.com

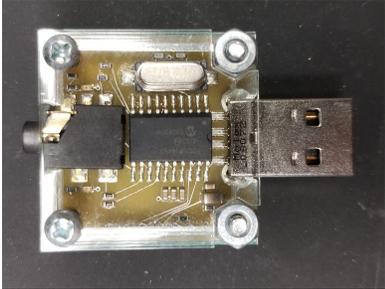
APPENDIX I - INSTALLATION

Description of Components

This artwork requires the following components:

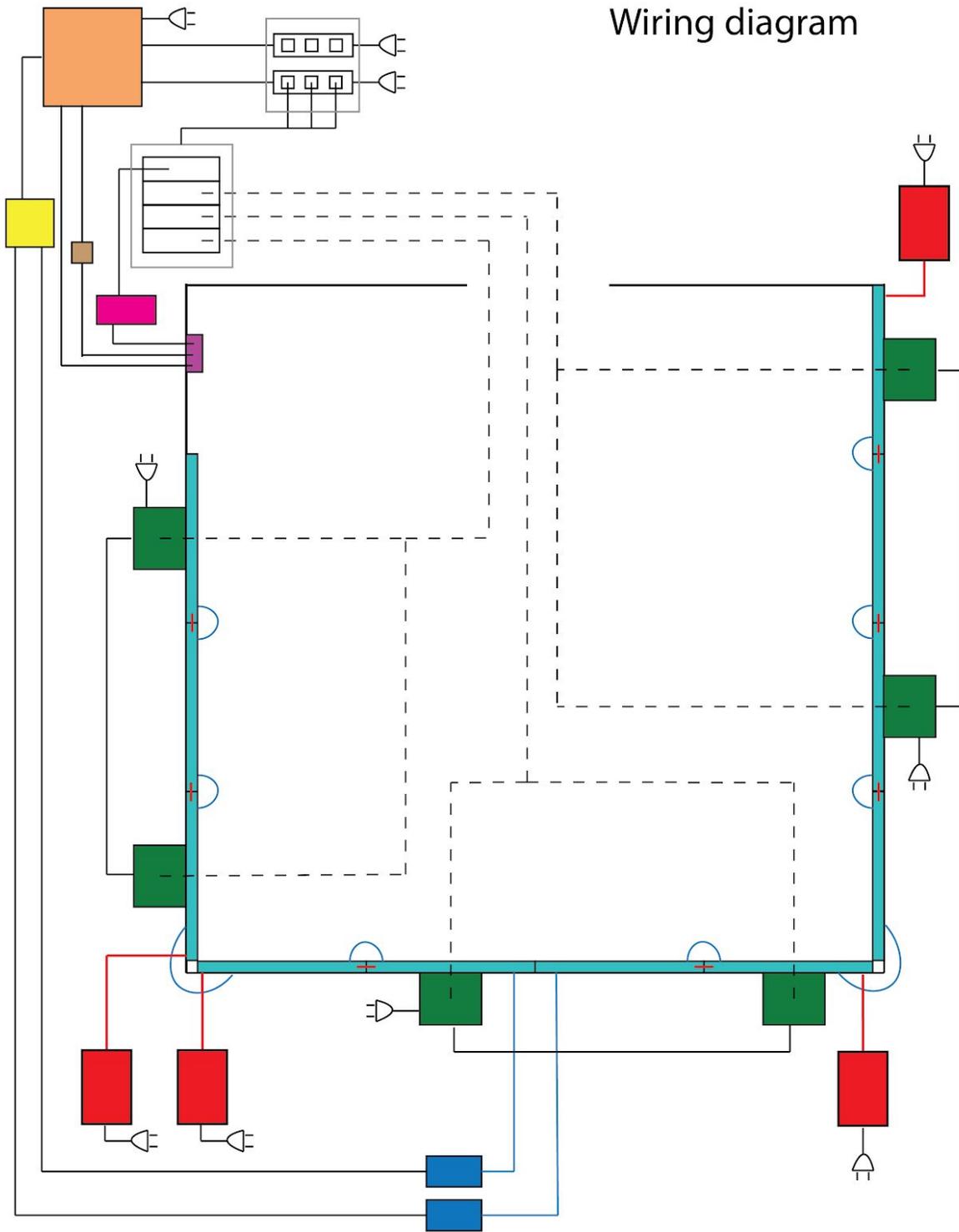
Component	Description	
Computer and Display	Mac mini and a display connected by an HDMI cable.	
Wireless Keyboard	Logitech wireless with an integrated trackpad.	
Speakers	AudioEngine 2	
Intercom	Intercom, custom-made casing.	
M-Audio	Fast track audio units.	

<p>Enttec OpenDMX Ethernet</p>	<p>2 units</p>	
<p>LED Strips</p>	<p>Custom-made with LEDs and electronics.</p>	
<p>USB Hubs</p>	<p>With power supplies.</p>	
<p>Power Supplies</p>	<p>24V</p>	
<p>Extron</p>	<p>MPA 122 amplifier</p>	

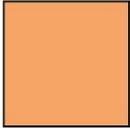
<p>One-button keyboard</p>	<p>USB</p>	
<p>Switch</p>	<p>Netgear</p>	
<p>Matrox</p>	<p>Thunderbolt hub</p>	

Wiring Diagram and Connections

Wiring diagram



Legend



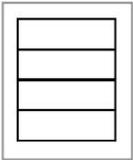
mac mini



LED strips



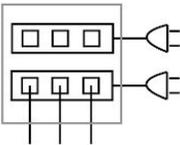
ethernet switch



M-Audio units



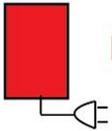
simulated keyboard



USB hubs



extron



24V power supplies



intercom



speakers



enttec openDMX ethernet

Voice Array with 30 battens (2 universes of with 15 battens)

