SPHERE PACKING: BACH

BY RAFAEL LOZANO-HEMMER - SFMOMA'S EDITION

Version : 2023-09-13

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GENERAL IMPORTANT INFORMATION

This short section must be read for proper operation.

SPHERE PACKING: BACH (2018)

BY RAFAEL LOZANO-HEMMER

Technique

Aluminium and wood, 1,022 custom-made speakers, circuits, computer, display, patchbays, ethernet cabling.

Description

"Sphere Packing: Bach" is a 3m diameter sphere made out of aluminium and wood which supports an array of 1,022 loudspeakers each of which plays a different composition by Johann Sebastian Bach. The piece is designed to concentrate Bach's entire musical production in a dense multi-channel structure that visitors can enter.

At any given point, all compositions play-back simultaneously creating a polyvocal and complex sound environment focused in the centre of the sphere; from time to time the speakers are gradually silenced in waves to highlight one speaker playing a single composition.

All speakers have a small amber LED light which helps visitors get visual feedback on which speakers are operating. The piece includes a backstage where 11 km of cables connect to a bespoke patchbay controlled by custom software that activates the speakers in sequences of geometrical eclipses.

The piece is the culmination of the "Sphere Packing" series of sound sculptures that Rafael Lozano-Hemmer has been making since 2013. The fact that Bach was the most prolific of the 17 composers in the series, called for a room-like immersive environment instead of a sculpture. As a master of counterpoint, layering Bach's compositions, yields a particularly interesting experiment in musical turbulence.

Operation

Please refer to Appendix I - Installation for detailed system information and wiring diagram.

1. Connect the computer and the patchbays to electrical power. Use the supplied power cables. Use mechanical timers to apply power in a staggered fashion to the patch bays: giving power to the first patchbay, followed by the next patchbay 30 seconds after, and finally the last patchbay 30 seconds after the second.

2. To turn the piece ON, press the power button on the computer for one second, then release it. Important note: *please do not push the button again as this will shut down the piece*. Wait at least two minutes before pressing it again, as the computer might need this long to reboot. After two minutes (or less), you should see the piece. The app **bachSphere** will start automatically once the computer is done booting up.

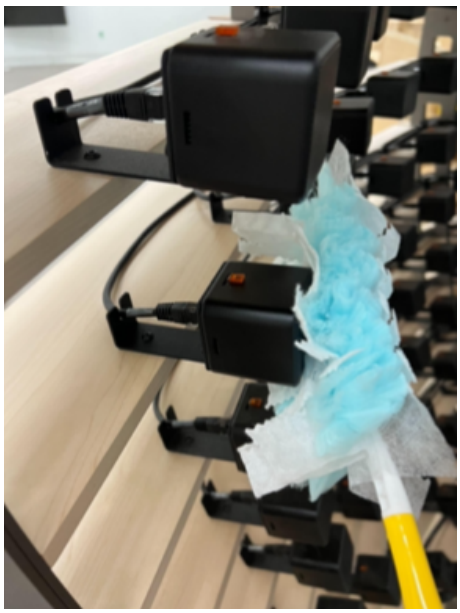
3. To turn the piece OFF, press the power button on the side of the small box, or the computer button.

4. If the piece doesn't start within two minutes, try turning on the piece again. If it still doesn't turn on, then hold the power button all the way down for 10 seconds. Then, wait at least three seconds, then press the power button all the way down for one second, and you should be up and running again.

Note: the artwork could be set so the computer automatically turns ON at a specific moment of the day and OFF at another time, via the macOS power scheduler.

Maintenance

A feather duster or a hand duster (like a Swiffer) is recommended for undusting the following components of the sphere: the speakers, their brackets and the ethernet cables.



We recommend undusting the wood slats and metal structure with a microfiber cloth as the edge of the slats are very fragile so no pressure should be applied. Slightly dampen said microfiber cloth to remove marks and residues from the wood slats and speakers.

Use a compressed-gas duster meant for computers to get the dust off the controllers and the end of the ethernet cables. **Warning:** do not use an industrial compressor because it can leak oil and water. Do not use a microfiber cloth or a duster as it could damage the pins on the circuit board.

It is easier to reach the controller with the compressed-gas duster from behind like shown in the picture below.

Finally, to clean the ethernet cables running between the sphere to the controllers, first use a vacuum cleaner to get the excess dust on the bundles. Then, you should use a compressed-gas duster to get in the spots the vacuum cannot reach.

We recommend cleaning the entire piece every two months at least.

It is also recommended to do a frequent inspection of the different components of the artwork to locate minor issues that should be corrected on the spot.

Check if any of the speakers were moved by visitors; the speakers should not point to the sphere's center, but should be perpendicular to the wooden tablet. Gently move the speakers and the brackets back into place, if they have been moved.

Check that none of the speakers' front grills have fallen off. If they did, simply glue them back into place with Krazy Glue.

Check that all of the speakers have their LEDs illuminated when in play mode. If not, re-adjust the LED, because it might have become loose.

Ensure that all of the speakers play the correct audio file. Refer to the preliminary troubleshooting steps for details on how to change microSD cards or the entire speaker.

Do not touch the electronics in the patch bay, as they are sensitive to electrostatic discharges.

We recommend cleaning the entire piece at least every two months.

Placement Instructions

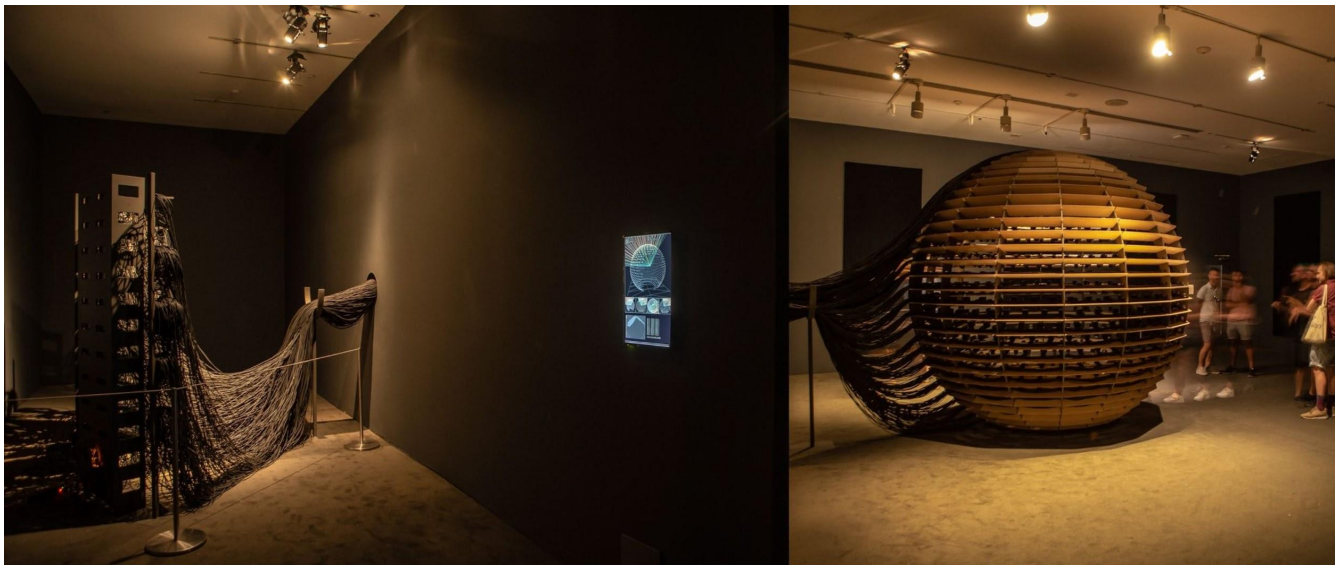
Please revise these general points before assembling or dismantling the piece:

- the corners of the shelves are fragile and can potentially get caught in fabric;
- add foam blocks on each shelf corner near centre of the sphere (backspine), where all the cables meet, so the weight of cabling doesn't press on and damage the shelves corners;
- do not pull on cables: always leave them loose to protect the speaker connector or patchbay connectors;
- make sure each cable is connected and engaged to their respective brackets;
- be gentle when unplugging the cables from the speakers: gently hold the front and back of each speaker before disconnecting the cable by pitching its locking tab;
- the connectors have a fragile plastic extension sticking out that has a tendency to get caught onto things. Be careful - if it breaks, you need to replace the entire cable. As a precautionary measure, we have incorporated a **transparent plastic tubing** onto them, which can be taken off only when the time comes to plug the cables to the patchbays.

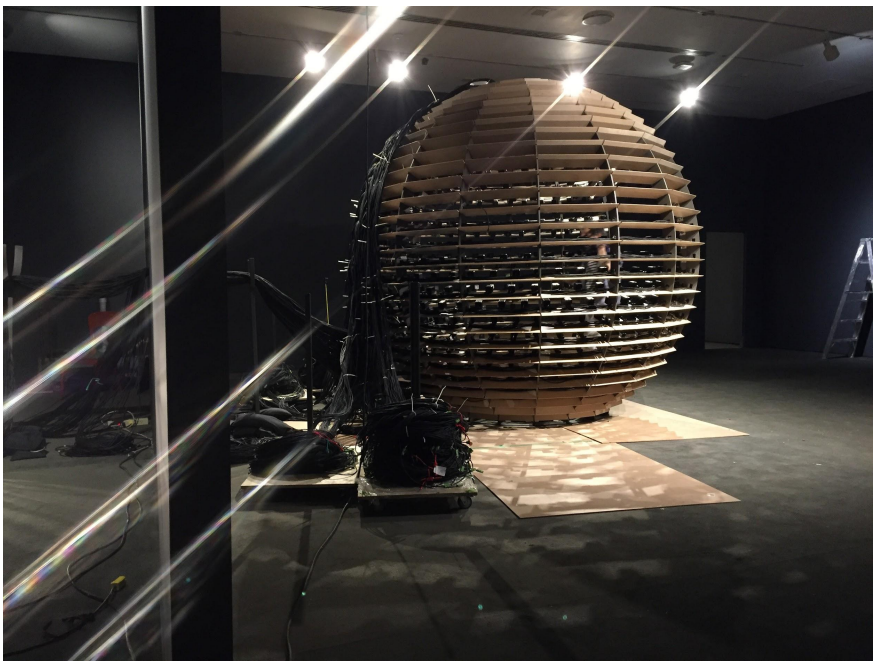
Detailed information about the assembly of the artwork can be retrieved in the APPENDIX IV - ASSEMBLY OF SPHERE.

Detailed information about the dismantling of the artwork can be retrieved in the APPENDIX V - DISMANTLING OF SPHERE.

The artwork is composed of two parts. The first part is the sphere itself and the second part includes the three patchbays. A wall separates these two parts and all cables pass through a hole in the wall. Such a wall between the sphere and the patchbays is optional.

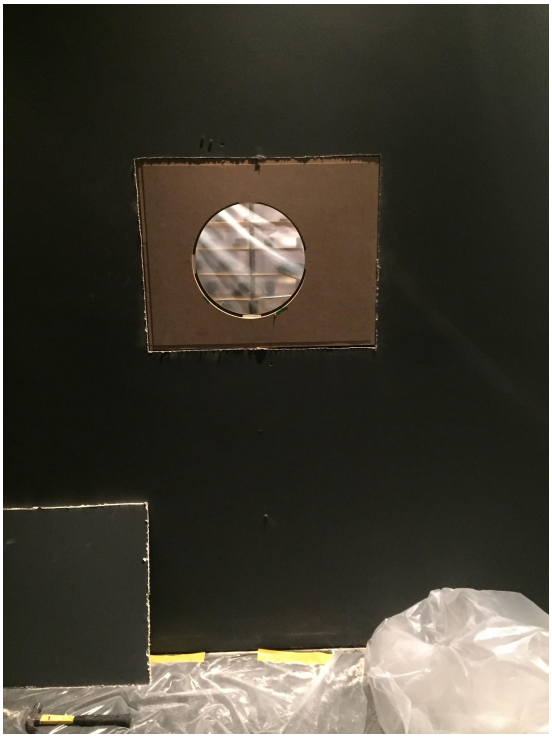


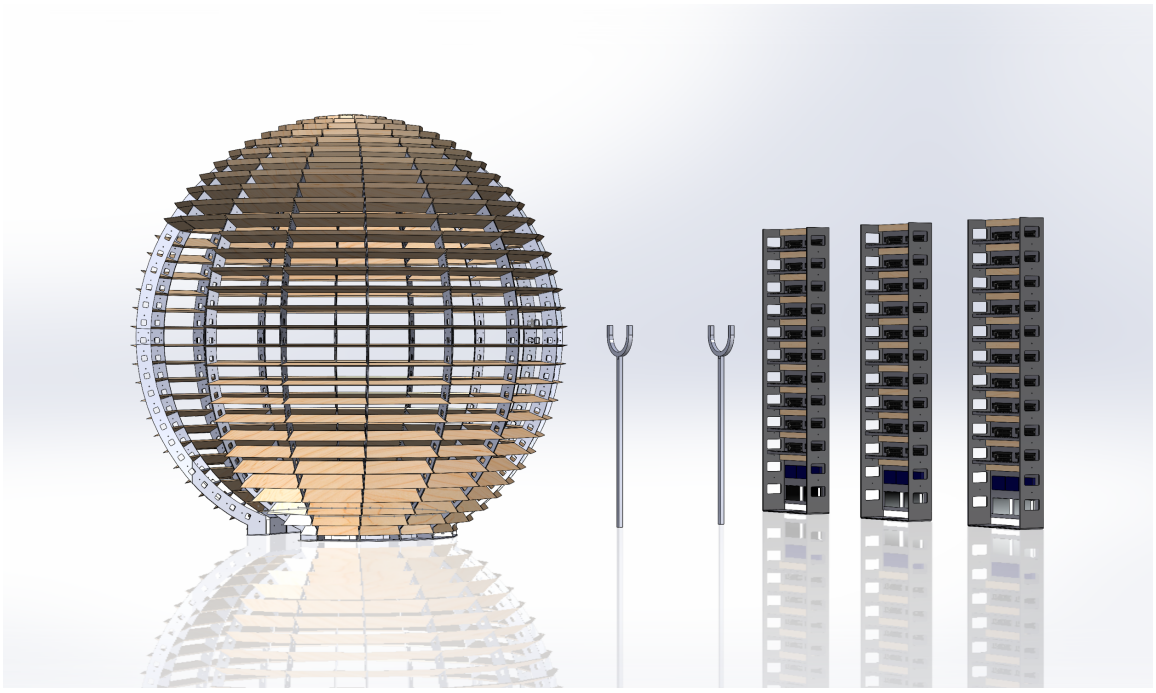
Positions of the elements at the Musée d'Art Contemporain de Montréal, Canada.

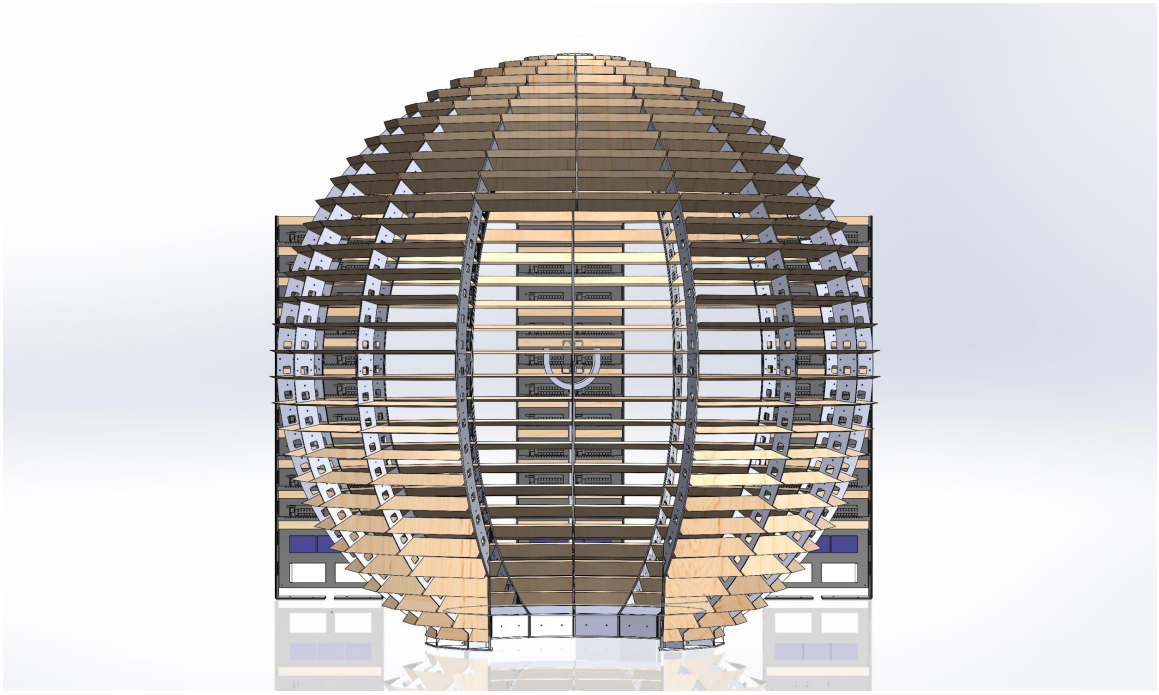


Sphere separated from patchbays by wall (during the WIP)

The hole's diameter is 35 cm (14 inches). The position of this hole is measured at **150 cm** from the center of the wall to the floor and is centered with the sphere. This is achieved simply by creating a masking tape line on the ground from the **center vertical aluminum part** of the sphere onto the wall.







Sequencing example of Sphere with patchbays. This configuration is without a wall, in which case, two cable holders would be needed. In the case of a separating wall, only one cable holder on the patch bay's side of the wall is necessary.

DETAILED TECHNICAL INFORMATION

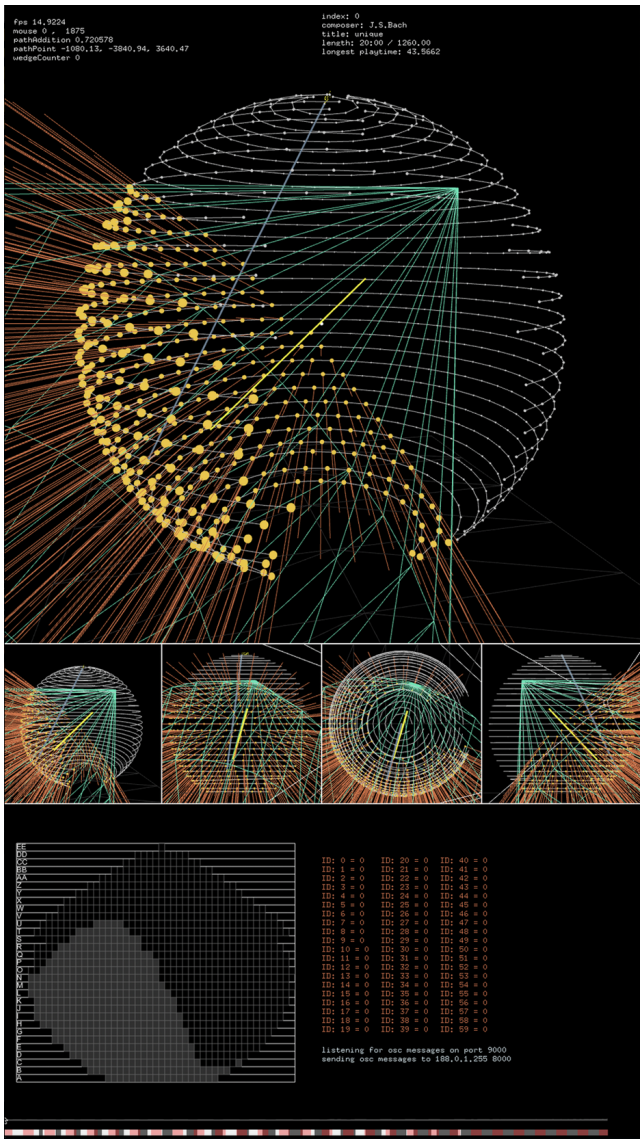
Normal Software Operation

When the software starts and the patch bays have power, all the speakers receive a reset command which will bring their audio tracks to the start position, ensuring that audio track #1 is selected and the volume is set to a default level.

Then, the volume will increase to almost maximum, while all speakers play back the music.

The LEDs on each speaker should be illuminated when the speakers are in play mode and the LEDs should be off when they are in pause mode.

Now the software will start in **wedge mode**. A wedge shaped 3D object appears on the screen and slowly pierces the 3D model of the sphere. All speakers on that sphere that are located inside the wedge will be set to play mode. All other speakers should be off.



The wedge slowly takes over the whole sphere until all speakers are in play mode. For a few seconds all speakers will be playing and then slowly the wedge will exit the sphere. Fewer and fewer speakers will be in play mode until only one speaker remains playing the music.

The software will go through five cycles of the wedge mode, taking about 45 seconds each. During the final cycle, when all speakers are playing music, a reset command will be sent to all speakers. This means that for a short moment, all speakers will stop playing music, and will reset to their start position and will slowly increase their volume.

After this reset, all the wedges will exit the sphere and switch to **spotlight mode**. In this mode, a long cuboid is intersecting with the 3D sphere, instead of the wedge. This will cause a small group of speakers to be in play mode.

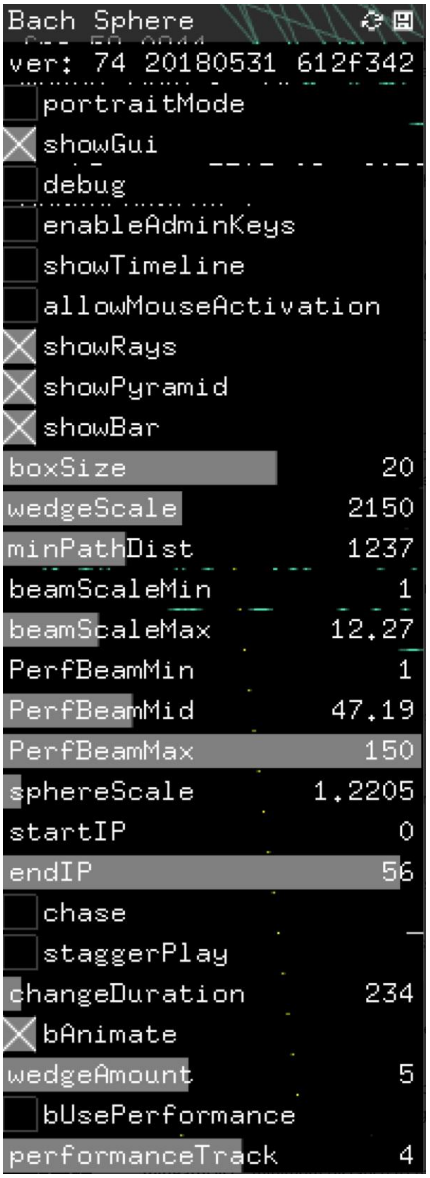
Over time, the cuboid will move around and highlight different sections of the sphere. It will also grow in size, then shrink again. Spotlight mode will take about one minute.

After this, the whole cycle starts again, starting with the wedge mode again.

During the normal operation of the artwork, each speaker plays a unique Bach composition. But when desired and as per discussed with studio's staff, the collection or exhibition staff can switch the artwork to **performance mode**. In this mode, all speakers will play the same audio track, only two wedge cycles are performed, and the spotlight ends with all speakers in play mode.

Manual Software Calibration

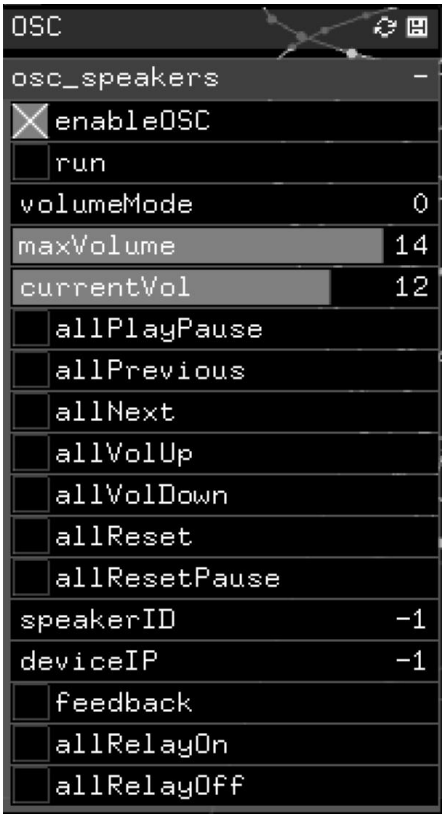
Pressing the **G key** will make the GUI appear and display the different settings used to run the artwork. These settings are typically modified only when the artwork is initially set up in its location. All GUI elements should remain as indicated below. Contact the studio prior to changing them.



ver: displays the software version number running of your computer
portraitMode: deselect this field if the artist wants the display to be mounted in landscape mode.
showGui: clicking this will make the menu disappear.
debug:Prints out extra information in the terminal.
enableAdminKeys: allows access to some "advanced" keyboard shortcuts.
showTimeline: Shows timeline of wedge animation illustrated as an adjustable curve with parameters.
allowMouseActivation: speakers can be set to play or pause mode by clicking on them in the 2D pyramid or 3D sphere view.
showRays: Illustrates rays of light when speakers are lit up.
showPyramid: do not touch
showBar: do not touch
boxSize: do not touch
wedgeScale: size of the 3D wedge objects that pierce the sphere. It needs to be large enough to encompass all speakers.
minPathDist: the minimum distance to the next speaker that gets picked as the next wedge destination.
beamScaleMin: the smallest size the spotlight can have.
beamScaleMax: the largest size of the spotlight.
sphereScale: only if **adminKe**y is selected, the scale of sphere will be changed.
startIP: sets the beginning of which PCB range will be affected by chasing or staggering.
endIP: sets the last IP for the chase or stagger range.
chase: speakers will turn on one at at time and turn off after playing for a moment
staggerPlay: speakers will turn on one at a time, and stay on.
changeDuration: the duration between each new chase or staggered step.
bAnimate: do not touch
wedgeAmount: determines how many wedge cycles are shown during normal mode.
bUsePerformance: activates Performance Mode
performanceTrack: selects track to be played in performance mode

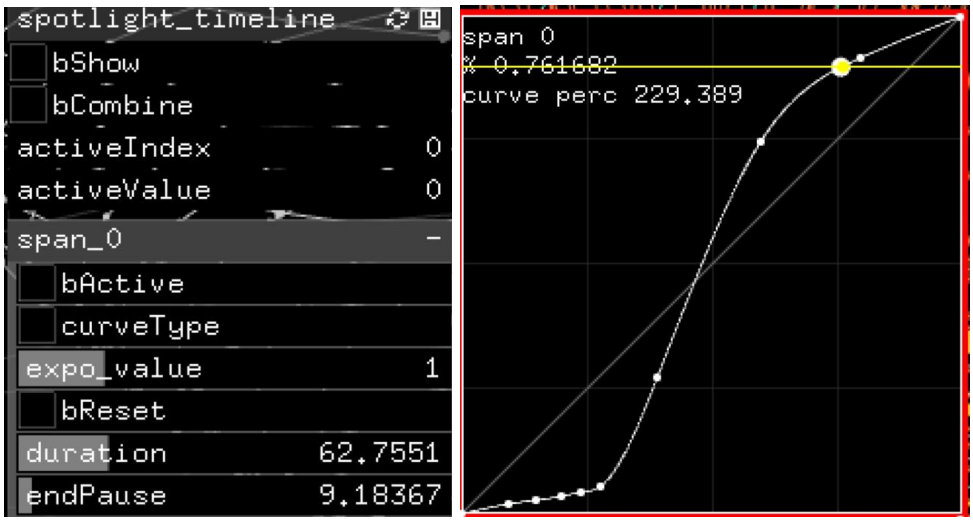
showMainCam: shows large sphere image.
showSideCam: shows smaller sphere on sidebar.
moveByMouse: allows mouse to move large sphere.
bLoadCamPos: loads the final sphere position.
bSaveCamPos: saves the current sphere position and uses it as default.

The app is communicating via **OSC** (open sound control) with all the PCBs. This is a UDP ethernet protocol.



enableOSC: messages will be sent to the PCBs only if checked.
run: do not use.
speakerID: if set to **-1,** all speakers on the selected PCB/IP will be affected by the bellow GUI elements. Otherwise, only one specific speaker per PCB is effected.
deviceIP: if set to **-1,** all PCBs will get the message from the bellow GUI element. Otherwise the PCB with the selected IP will react.
volumeMode: **1** = when a pause command is sent, the speaker actually only makes the volume fade, not pause. It's LED will stay on too. **0** = pause stops playback.
maxVolume: the speakers hardware default volume is 7, which it will have after a reset command. The software now presses the volume Up button 7 more times to bring it to 14.
currentVol - displays the current volume used
allPlayPause: sends a play/pause command to all speakers unless speakerID or speakerIP are not -1. If a speaker is currently in play mode it will switch to pause mode, or the other way around.
allPrevious: **back** button gets pressed.
allNext: **next** button gets pressed.
allVolUp: increases volume.
allVolDown: decreases volume.
allReset: holds down the **back** button long enough to cause the speakers' internal reset function.
allResetPause: the PCB will execute a **allReset** command, immediately after a pause command.
Feedback: requests all PCBs to send a feedback message to test communication.
allRelayOn: turns the power relay on the PCBs ON.
allRelayOff: turns the power relay on the PCBs OFF.

This is what one span looks like under spotlight mode. Over the duration of X seconds the white point travels from left to right: the resulting Y value refers to the location of the spotlight along the preset motion path. The curve has been calibrated to render specific reaction, please do not touch the settings.



Software Shortcuts

The following keyboard shortcuts allow you to trigger different modes or reactions.

Regular shortcuts	
G	Shows or hided the GUI
M	Hides the mouse cursor
F	Toggles the fullscreen mode
X	Tells all speakers to reset: this causes the speaker to automatically go to beginning of track #1, reset the volume to default level 7 and put the speaker in play mode. This can also be done on the speaker PCB by holding down the Back key for 2 seconds.
Z	Switches the software from Normal mode to Performance mode and vice versa.
Admin shortcuts	
1,2,3,4,5,6,7	Different 3D shapes will appear and intersect with the sphere, some of which are controlled by the mouse. Key 5 brings up the wedge.
0 (zero)	No 3D shape will be present. This mode is great for debugging.
N	Picks a new path for the wedge to travel on.
O	Increases the volume of all speakers by one increment.
P	Decreases the volume of all speakers by one increment.
S	Tries to sync all files. This is an experimental feature.

Network Settings

The controllers used by the artwork receive signals from the software via network communication. To allow this, the computer needs to be set with some specific network configurations for the Ethernet adapter.

Such configuration is done via: System Preferences -> Network -> Ethernet.

Parameter	Value
Configure IPv4	Manually
IP Address	188.0.1.250
Subnet Mask	255.255.255.0

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

A LED on one of the speakers is blinking or a speaker plays audio from a radio station

This means that the speaker is in **radio seek mode**. These speakers also have a FM radio function, and if the **play** button is held for too long by the controller PCB, it will enter the **radio mode**. A blinking LED light could also indicate that the speaker did not recognize the microSD card; either there is no card or the card is corrupted.

First, try to cycle the power on the speaker by unplugging and replugging the RJ45 connector on the back of the speaker. Wait a few moments to see if the software correctly turns the speaker on or off.

If the LED flashes **ON** 3 seconds, then **OFF** 3 seconds, the problem is the microSD card. Ensure the microSD card is present and inserted correctly and test again. If the issue still happens, replace the microSD with a new card with the correct sound files on it. Refer to the microSD Cards section for more information. To proceed to a microSD card swap, locate the card slot on the side of the speaker. With your finger nail, press on it slightly. The SD card should pop out. The card should have a label on it that matches the label on the cat5e cable. This label will help you locate the correct set of audio files that need to be copied onto a new microSD card.

If after replacing the microSD card you have the same issue, the speaker's card reader might be faulty, replacing the speaker itself might fix the issue.

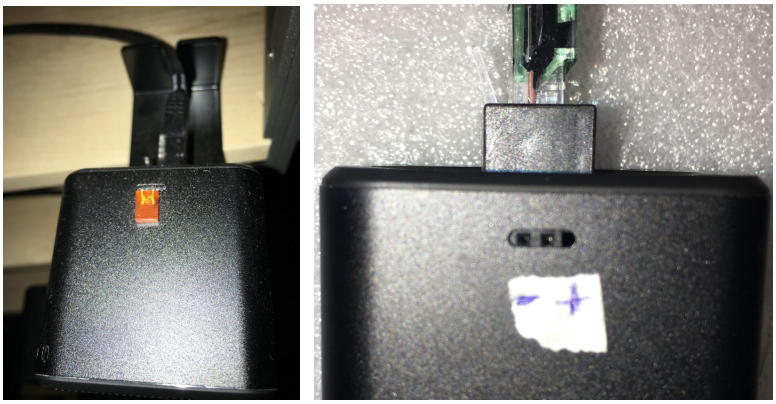
If after replacing the speaker for a new one, there's still an issue, disconnect and reconnect the cable on the speaker and make sure it clicks in, locate the other end of the cable and also disconnect and reconnect it from the controller board and make sure it clicks in.

A speaker plays audio from a radio station.

This is perhaps caused by the same reason described above.

A LED on top of a speaker is off all the time

The most likely reason for this is that the LED is loose. After making sure that the speaker is in **play mode**, try pushing the LED back into its socket. You can also try a new LED. Make sure to respect the polarity.



When looking at it from the front, the negative entry (-) is on the left and the positive (+) entry is on the right.

There is a glitch in one of the speaker's audio tracks

This means part of the audio file on the microSD card is corrupted. The only way to fix this is to use a new card with the correct audio files on it.

The software is not controlling the patchbay

All three patchbays should be daisy chained, meaning a series of networks cables should jump from one 24-port network switch to the next, and the final network switch should be connected to the computer.

Also, make sure that the computer's IP address for its ethernet connection is **188.0.1.250, Subnet Mask: 255.255.255.0**.

One-third of all the speakers are off

This means that one of the patch bays is not receiving power.

About 100 (18 x 6 or 18 x 7) consecutive speakers are off

This means that one of the three power supplies at the bottom of each bay is either not receiving power, or is broken, or its connection to the DC power terminal is loose.

A group of 24 consecutive speakers are off

This means that a controller board is either off or broken. To fix it, locate first the relevant board by finding it's ID of one of the faulty speakers (on the cable label), then in the software, hover mouse over the point of the speaker in the sphere 3D model: a popup will appear with info on the speaker. The controller index will be between 0 and 42.

First try cycling power: unplug and replug the barrel jack power connector on the left-most side of the faulty board. Once the board powers on, press the **play/pause** button to test that the speakers turn on and respond. If speakers do not respond, replace the Teensy board and test again. If the issue persists, replace the board.

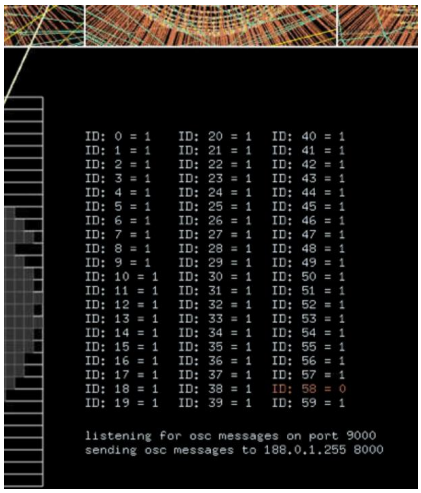
If speakers respond to pressing the physical button on the board but not to DMX messages, replace the ethernet cables connecting the board with other boards and test again. If issue persists, replace the board.

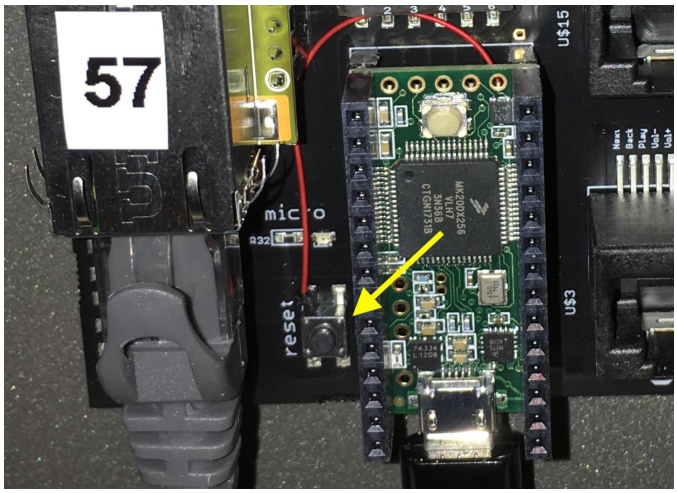
Part of one row is always ON or OFF

This means that the computer communication with one of the PCBs in the patchbay stopped working. Take a look at the artwork's screen. Here, you should see one of the IDs displayed in red, which means this specific PCB can't be communicated with. Find the patchbay that this PCB is housed in and either cycle the power for the whole bay, or cycle the power for this PCB only, or try pressing the reset button on the PCB.

Consult the photos below as reference.

Please note that the last three PCBs (57,58,59) are not used and act as spares. (So, the fact that in this photo **ID: 58** is red should not worry you.)





The front grill of a speaker fell off and is hanging by a wire

Add a small amount of crazy or super glue on the inside of the speaker body and press the grill back into place. Be careful to not pinch the cables soldered to the speaker.

A speaker is loose and is not mounted on its bracket

The speaker is fixed to the black metal bracket with double sided tape. If you need extra tape, please make sure it is not white or bright, otherwise the tape may be visible from the side.

A bracket holding a speaker in place is bent or is pointing in the wrong direction

Please rotate or carefully bend the whole bracket back into the right orientation. Be careful; the metal bracket is only attached to the wooden shelf with one wood screw. If this screw breaks out of the wood, it will be very difficult to repair.

One RJ45 port on the PCB is broken. Not all speaker functions work

It might be that one of the 18 ports on the PCB is broken. Each port is responsible for five different speaker functions: **volume up, volume down, next track, reset**, and **play+pause**. If the micro chip that connects to the RJ45 connector has a problem, or the RJ45 connecter itself has a loose connection, then one of these five functions might not reach the speaker.

In this case, you can unplug the cat5e cable from this port and use a port in one of the spare PCBs, such as PCB # 57, # 58, #59.

Next, you need to tell the software that the cable with this specific label is located in this new port. To do this, open **output.txt** inside the **bachSphere/bin/data** folder. Find the location for your specific label.

For example:
CC; 28; CC07-J1; J; 1006; 7; 13; -275.129; 1256.46; -150.339;55; 16

Make a copy of this line and leave this line as-is. There is no need to delete it.

Now scroll down to the bottom of the text file. There you will find 22 unused ports.

Depending on which unused port you plugged the cat5e cable into, you now need to edit the label and XYZ information in this section.

For example:
XX; 31; A14-K1; K; 1036; 14; 22; 0; 1292.93; 0; 57; 10
Will become:
XX; 31; CC07-J1; J; 1036; 14; -275.129; 1256.46; -150.339; 0; 57; 10

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 support for the piece, please feel free to call Lozano-Hemmer's studio in Canada:

Antimodular Research
4462 rue Saint-Denis
Montréal, Québec, Canada
H2J 2L1
Tel 1-514-597-0917
info@antimodular.com
www.antimodular.com

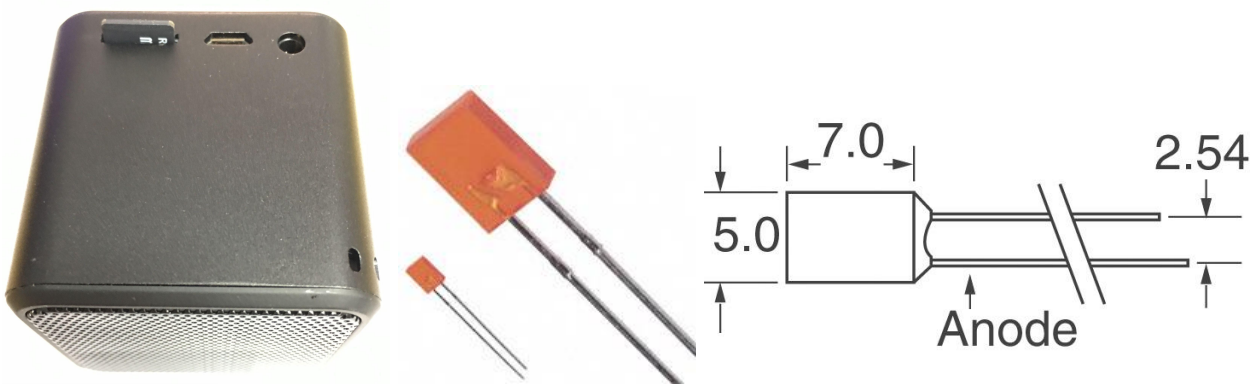
APPENDIX I - INSTALLATION

Description of Components

This artwork requires the following components:

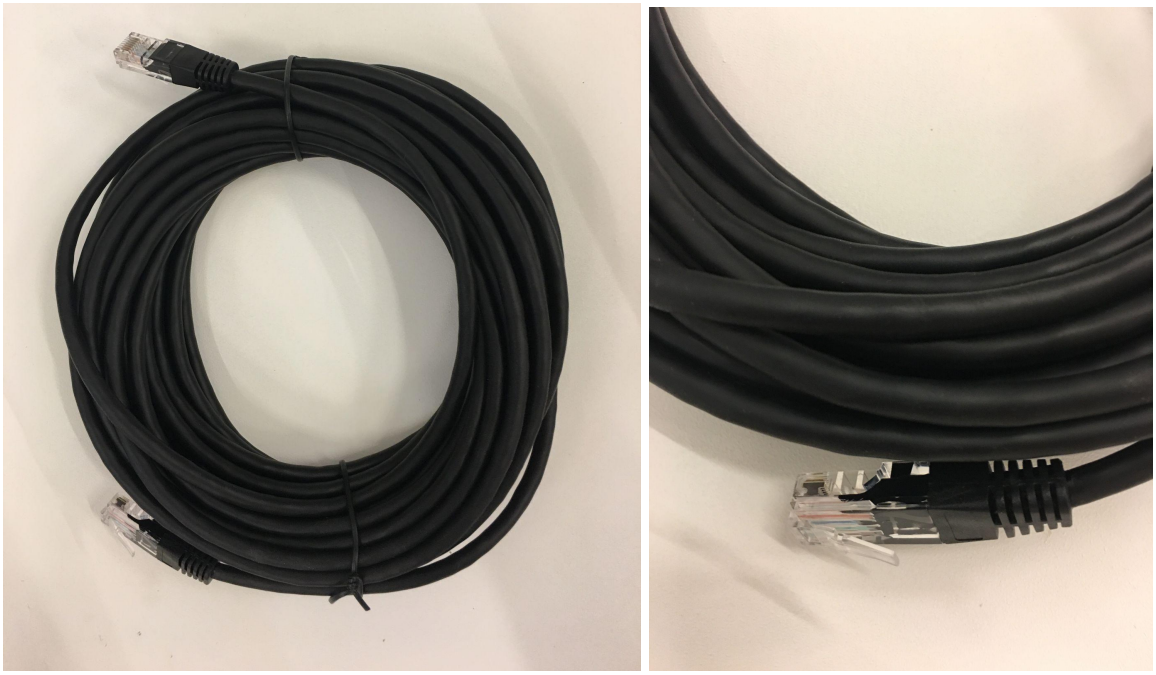
Component	Description
Metal skeleton	Frame for the sphere, hosting the wood slats.
Wood slat	Act as shelf for the speakers.
Speaker bracket	Attaches speaker to the wood slat.
Speaker with onboard LED	Custom-made speaker that plays back few compositions. Selection and play state depends on the software commands. A LED got added to visualize speaker's playback state.
microSD Card	Storing the different compositions specifically picked for a said speaker.
Ethernet cable	Carries power and signal from controller to speaker.
90 degrees Ethernet coupler	Used in some cases where the speaker has to be closer to the metal skeleton.
Controller board	Sends over the power and playback signals to the speakers.
Network Switch	Interconnects the computer with the controllers.
Computer	Apple MacMini that runs the software that controls the whole artwork rendition and sends signal the controllers via the network switches.
Monitor	Used to control and display the software. Monitor can be shown or hidden.
Video cable	Connects the computer to the display.
Keyboard	Used to control the computer.

Images of components, for consultation:

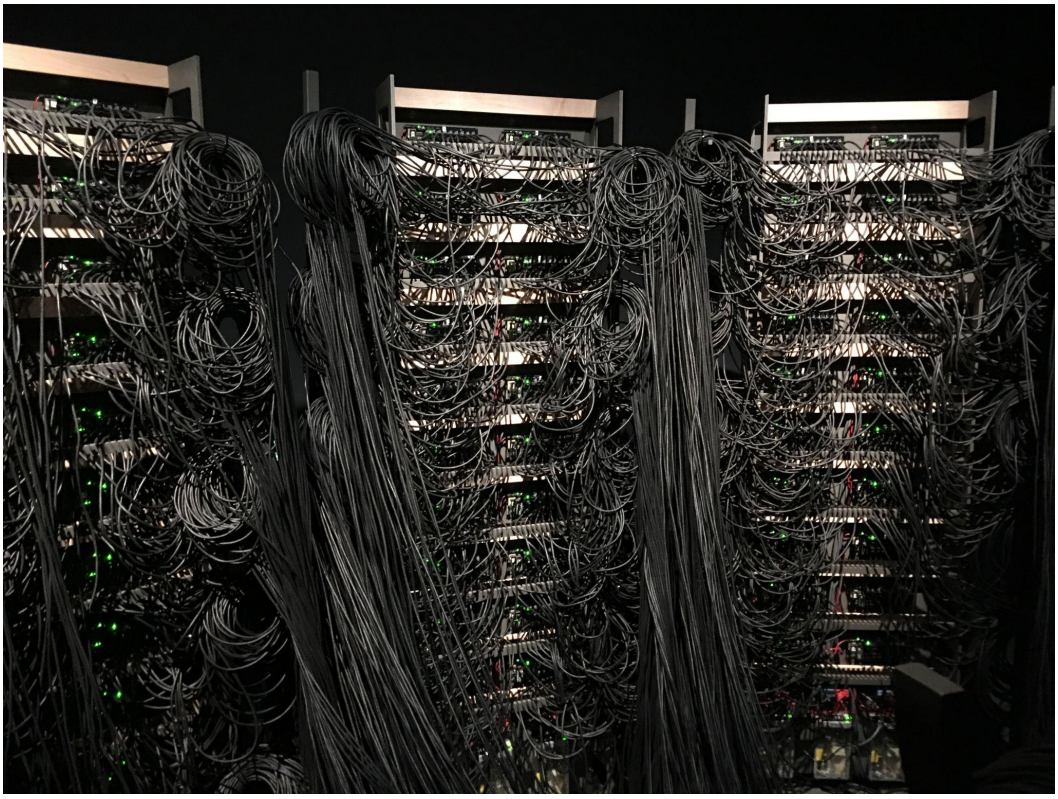


Speaker with LED

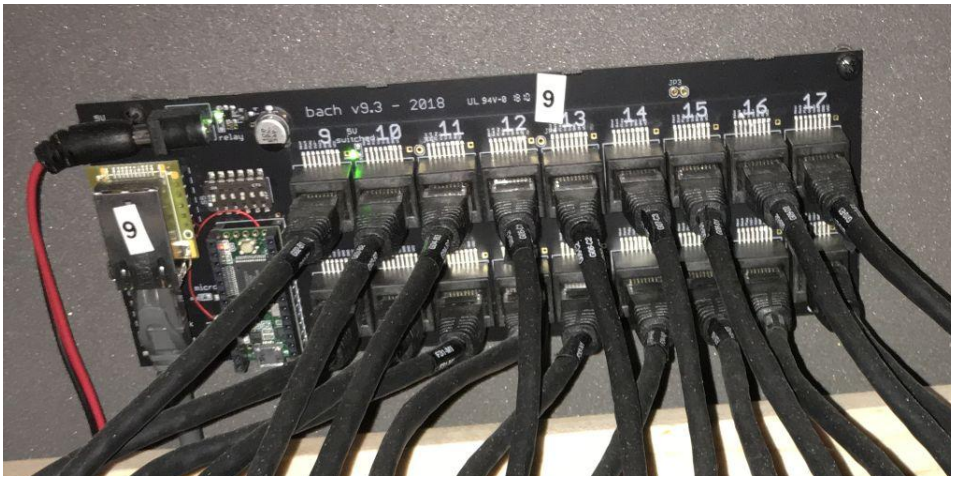
microSD Card



Ethernet Cable



Patch Bay



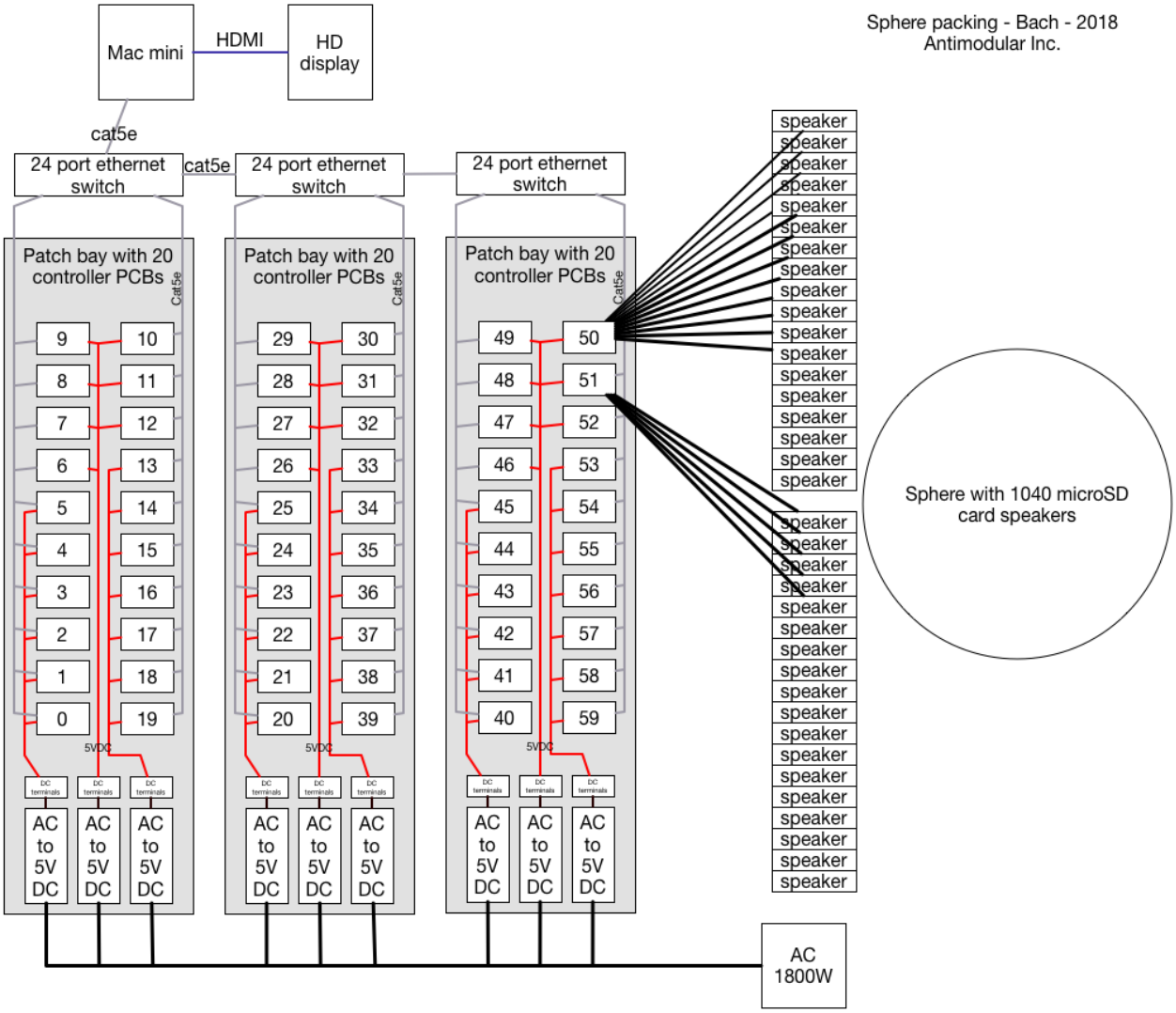
Controller Board

Network Switch

Computer, Apple Mac Mini, i5, 2.1 Ghz, 4GB RAM

Logitech wireless RF keyboard

Wiring Diagrams and Connections



APPENDIX II - TECHNICAL DATA SHEETS

Metal Skeleton

The metal structure forming the sphere's skeleton is made out from aluminum plates - assembled with screws and union plates - and gives the sphere its vertical strength. The base of the sphere also presents some cover plates to finish the assembly. Metal spokes can be inserted in such a base to act as a stanchion within the sphere.

Wood Slats

The wood slats are used as shelves for the speakers and they also provide horizontal structural strength to the sphere. Made out of maple and coated with clear satin epoxy, they are installed while being leveled towards the center of the sphere so that speakers point towards a person standing in the sphere.

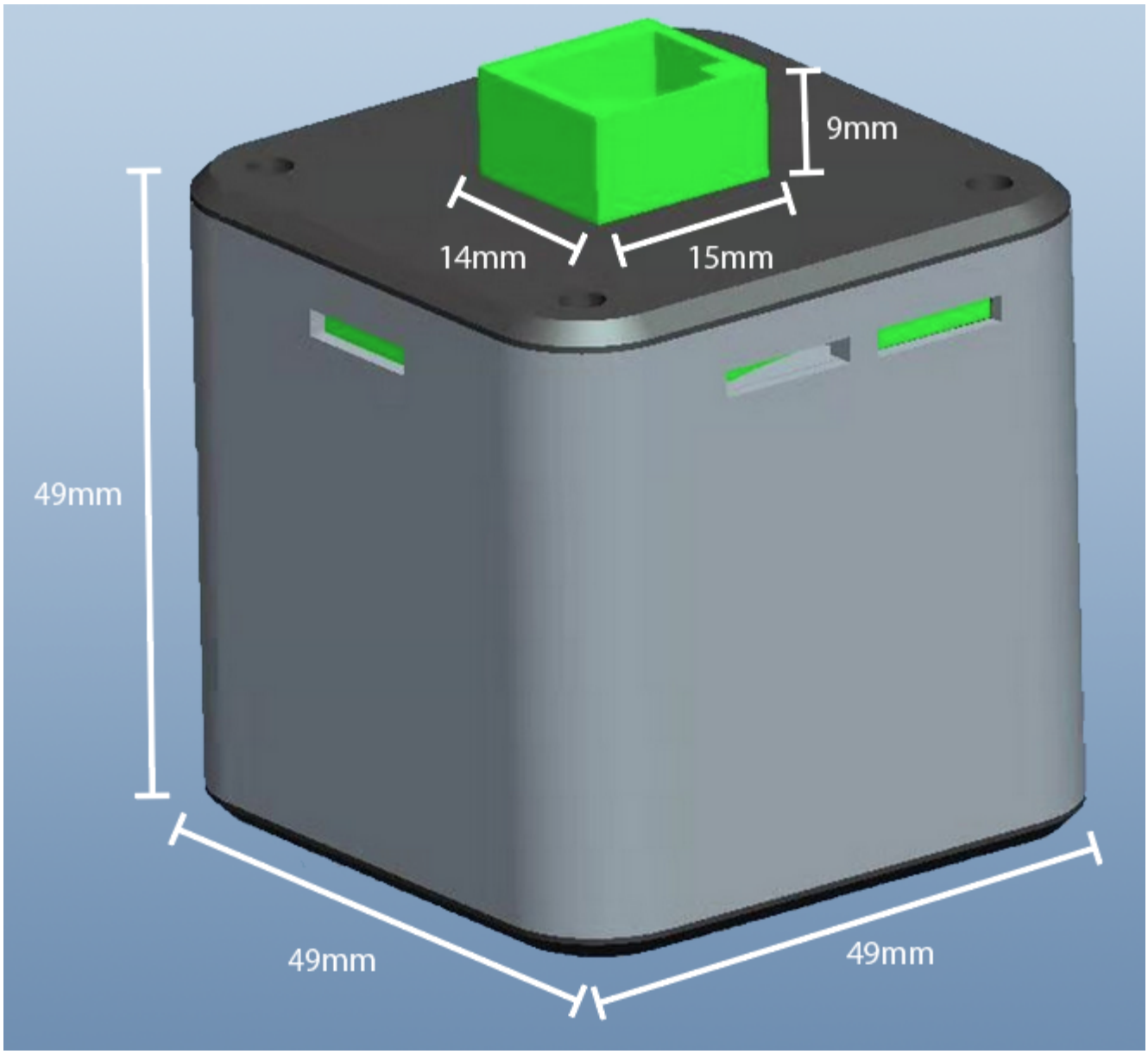
Speaker Brackets

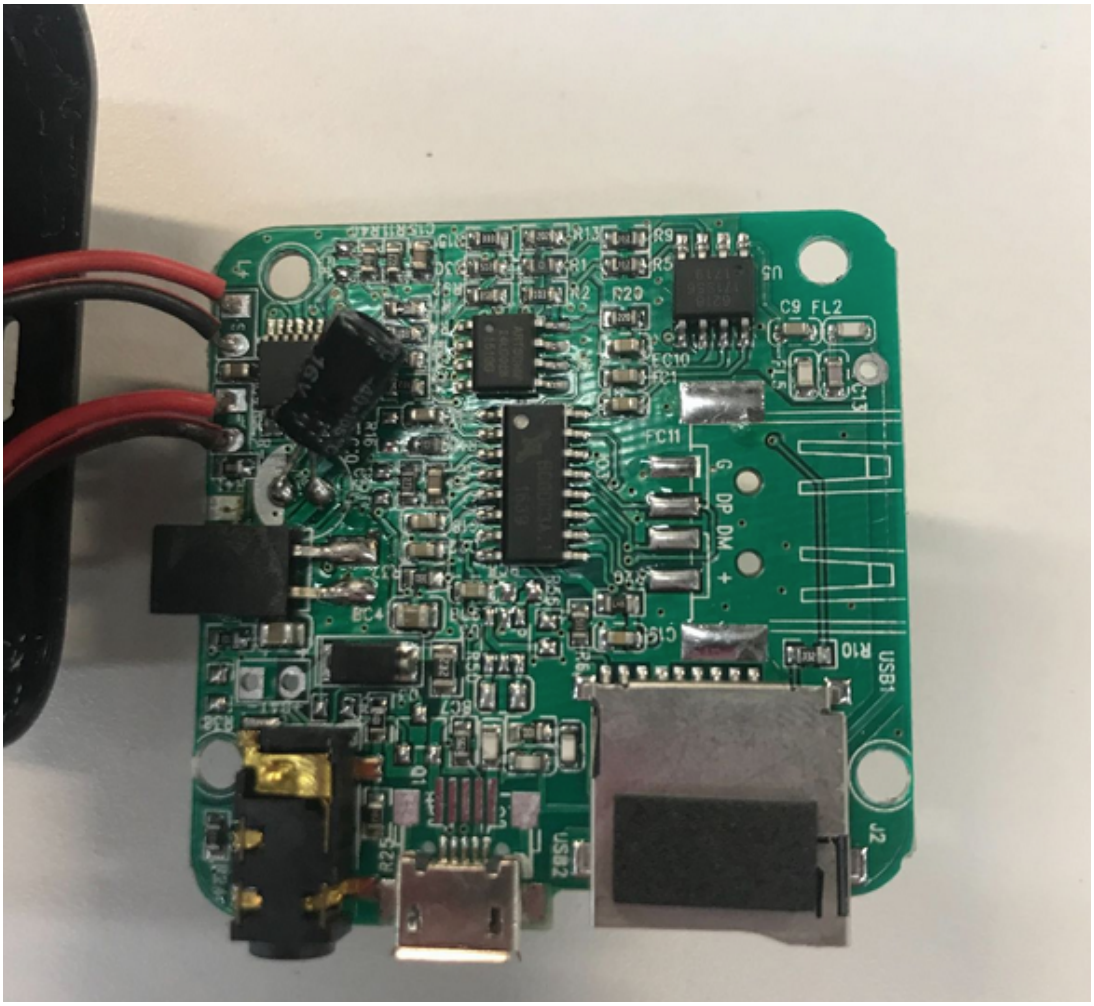
The speakers are glued to a L-shaped metal bracket with a double-sided tape. The metal bracket is being secured to the sphere with a Phillips screw, screwed into the wood slats. Some brackets have an angle to hold the speaker further from the skeleton.

Speakers

The speakers have been custom built for the studio by Junjiahao Company Limited. The units used in this installation are Speakers version 1.

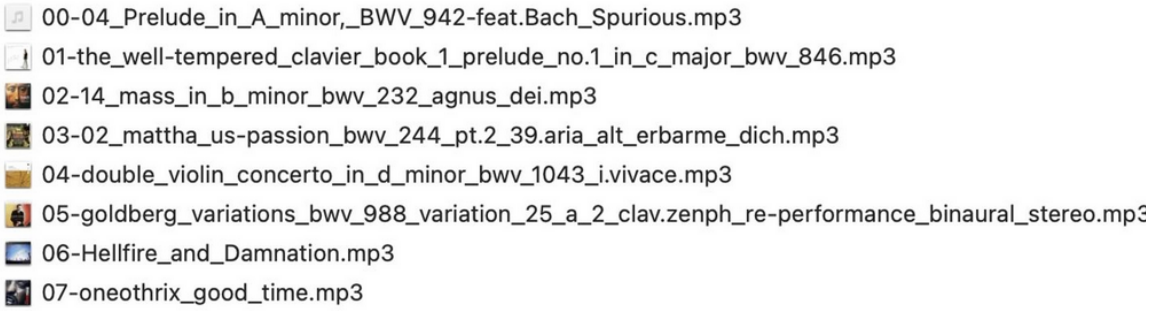
They receive 12V and signal from RJ45 connection and divert power to the LED. They read a microSD card to play audio files and can control volume up, volume down, play, pause, next, back, and reset. They also have a 1/8” AUX line for an external audio device connection.




R13
R9
R1
R5
R2
R20
C9
FL2
EC10
FC11
DP
DM
BC4
R10
USB1
J2
USB2
R25

microSD Cards

Each speaker contains an SD card. The cards used are industrial grade SLC microSD cards: they better protect the files from getting corrupted. Each SD card contains a specific and unique composition of Johann Sebastian Bach (filename starting with 00-...) and 7 files that are common to each SD card.



There is one microSD card for each Bach composition (1128 in total). Each speaker (total of 1022) hosts its own unique card and there are a total of 106 spare cards given with the artwork. Additionally, a second complete set of microSD cards has been populated as a spare set.

These microSD cards (256 MB to 1GB, SLC flash memory) need to be formatted in FAT16. While formatting with an OSX computer, ensure to keep the card's partition map schemes as Master Boot Record, not GUID or Apple Partition Map.

Ethernet Cables

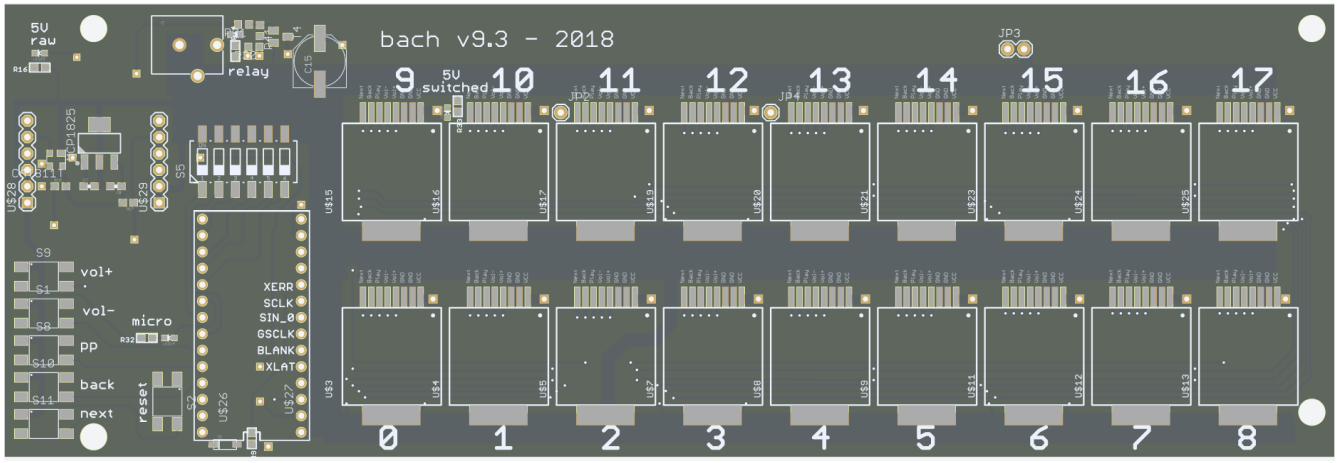
For the assembly of the sphere, CAT5E ethernet cables have been used. The cables have a matte black jacket without any printing on them and they have clear connectors. The typical cable length used is 10 meters.

PatchBays (controller boards and power supplies)

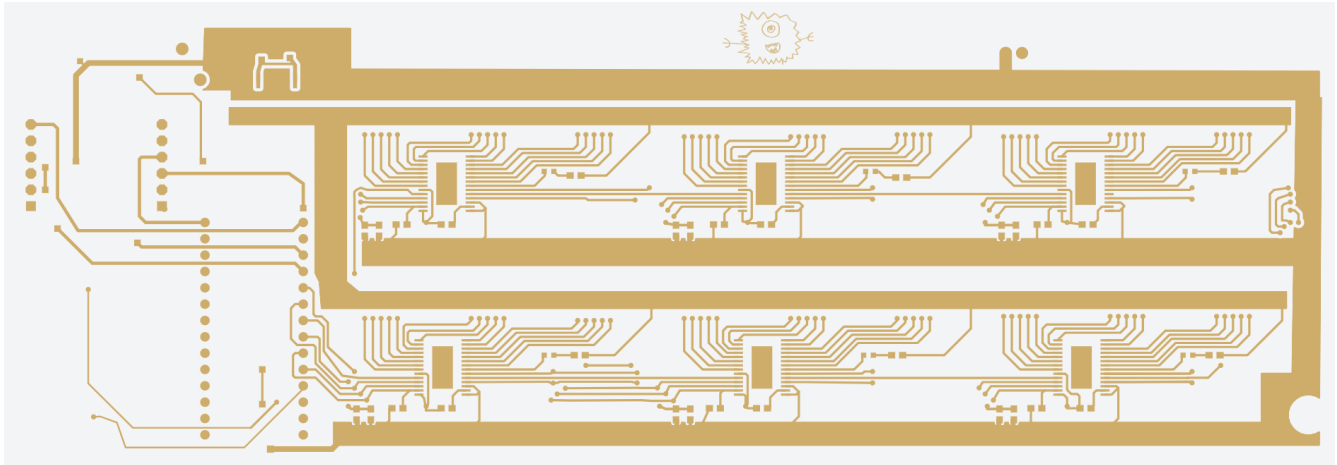
The patchbays are hosting the controller boards, their power supplies, and network switches that carry signals from the computer to the controllers.

Each patch bay has 3 power supplies feeding power to all controllers. A power supply outputs 5VDC, 40A, 200 W (part# LRS-200-5) and feed power to the controllers with red + black DC power cable Cable Assembly 2.1mm ID, 5.5mm OD, part# 10-01776.

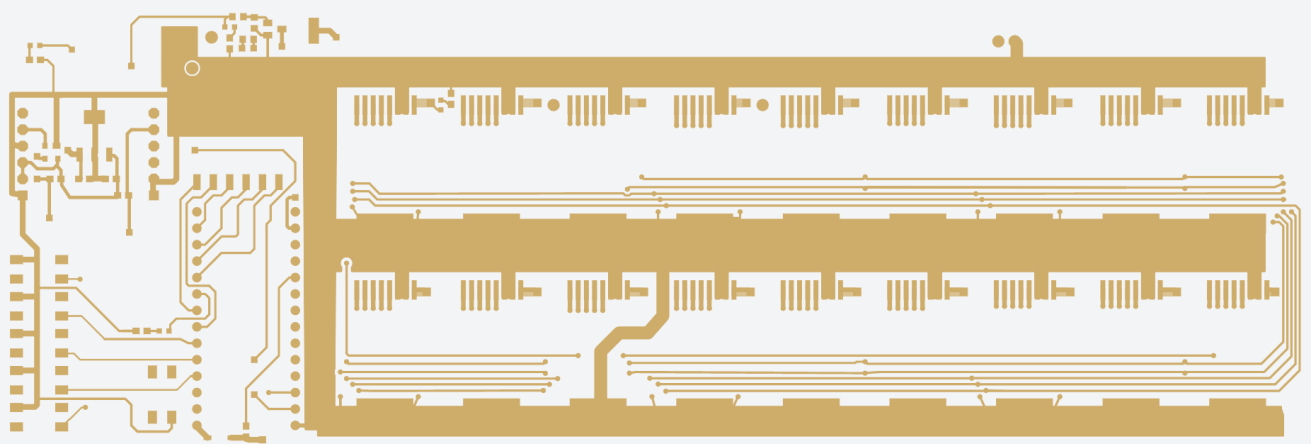
The controllers PCB are custom designed in studio and are addressed with a Dip switch. Several versions exist, but they all look and react in a similar way. Version 9.3 and 10.8 are using surface mount RJ45 connectors, while version 12.1 and 12.2 are having through hole RJ45 connectors.



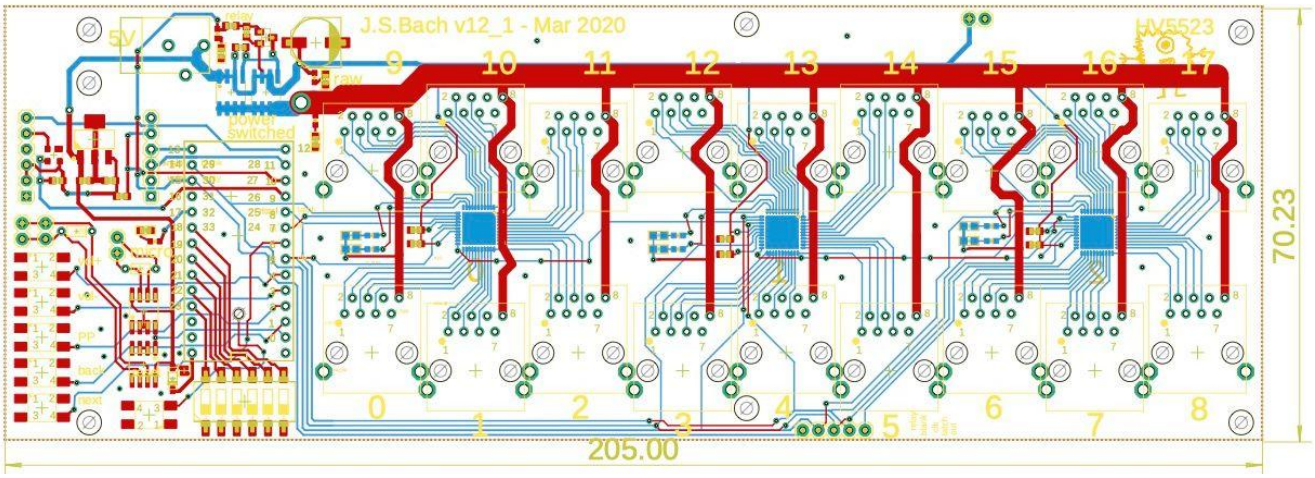
Top PCB face



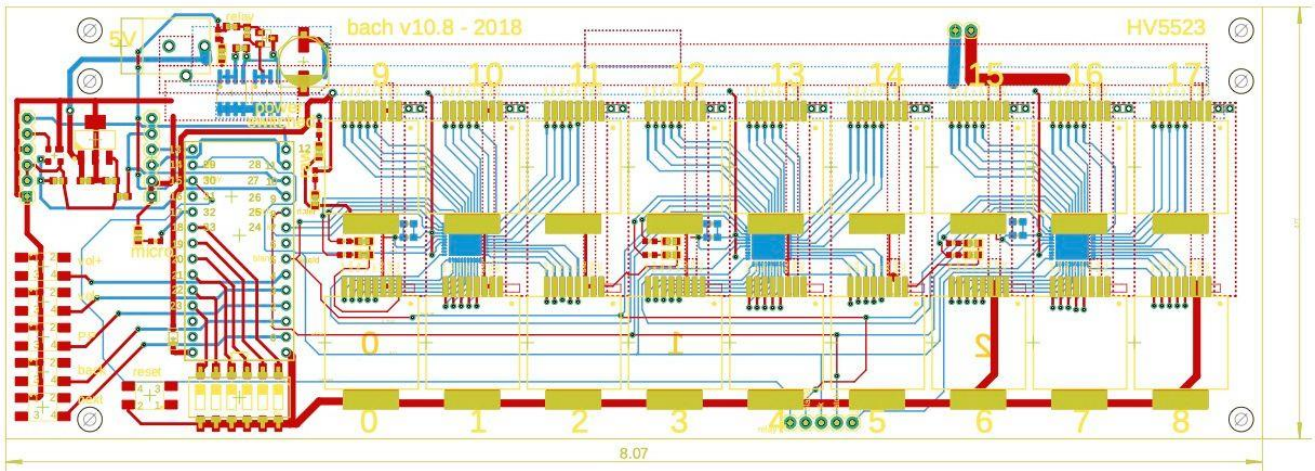
Bottom copper layer



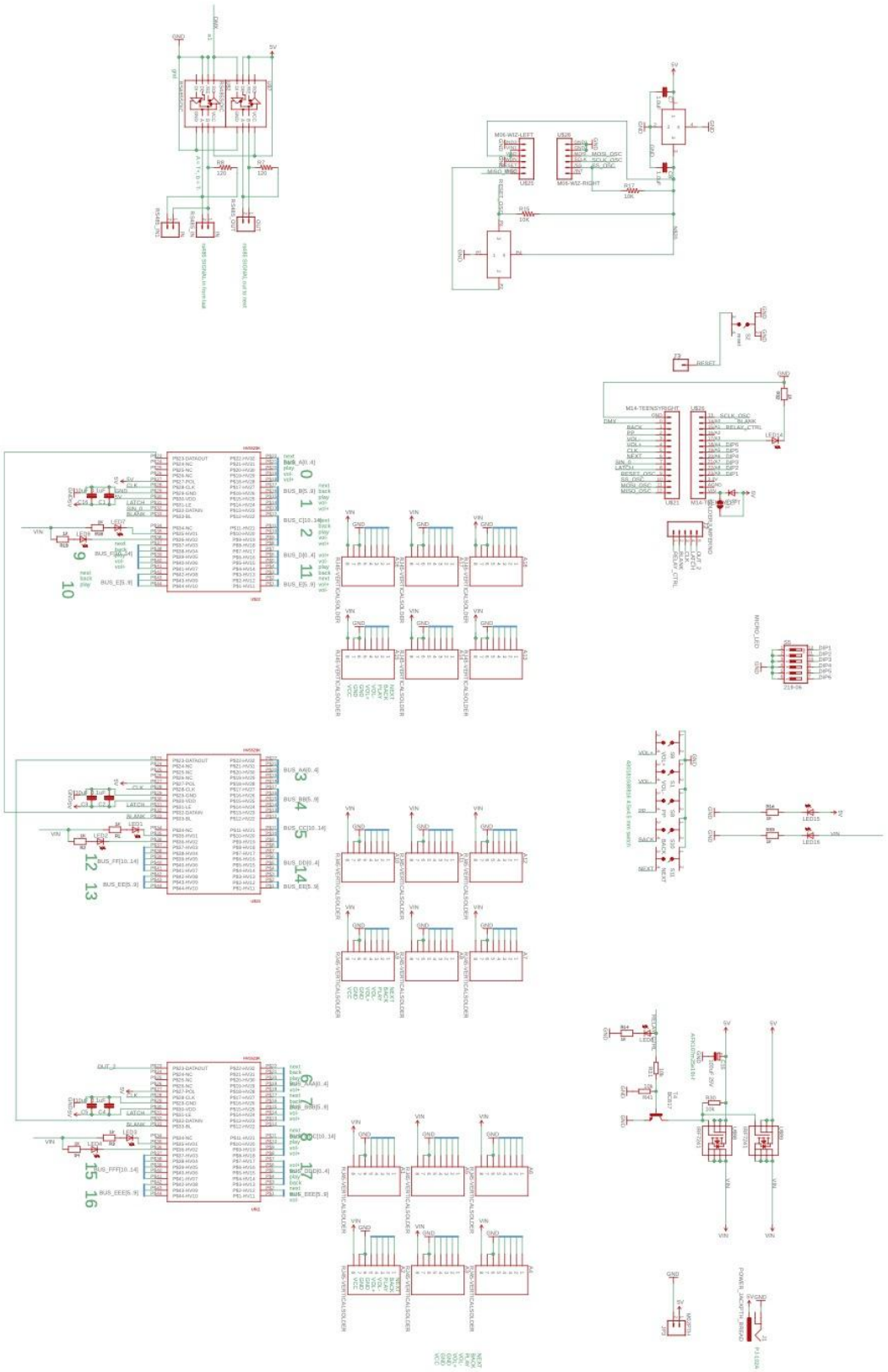
Top copper layer



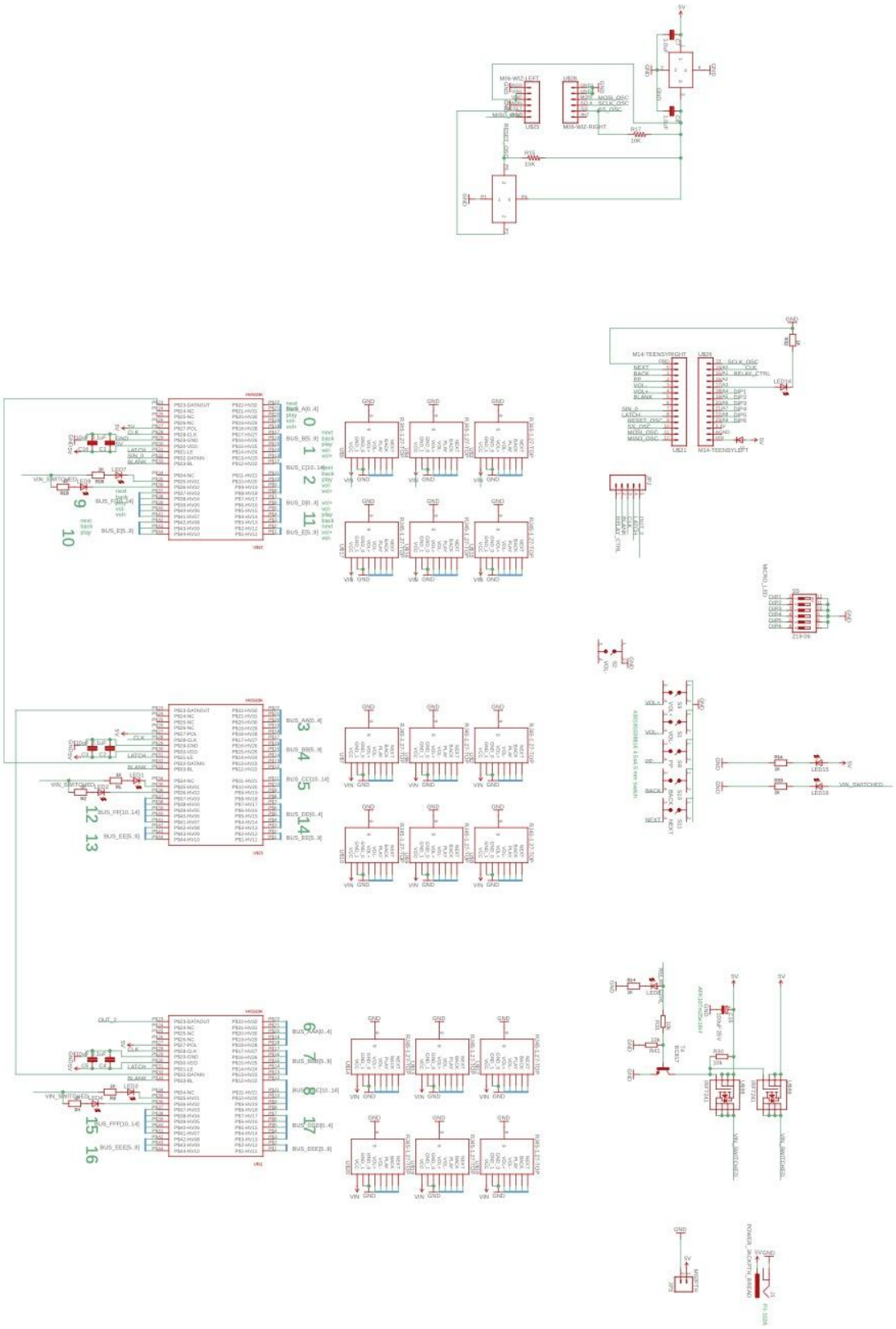
Board circuitry - v12.1



Board circuitry - v10.8



Schematics - v12.2



Schematics - v10.8

The Dip switch value to apply according to the PCB ID should go as per following.

As DMX is a **serial signal with a special protocol**, it is possible to **apply a certain start address to every system** in the line.

This calculation tool shall **help you in finding the right dip-switch settings for a certain DMX address**. The dip switches are set according to binary calculation meaning that every dip switch can feedback only the values 0 and 1. The calculation is comparably simple: Every dip switch has the value 2^n where n is the number of the dip switch. First dip switch is 0 (computers start counting from 0, not from 1), so when it's switched on it says $2^0 = 1$. Dip switch 2 has the value 1 if switched on, so it is $2^1 = 2$. Third dip switch has $2^2 = 4$, fourth $2^3 = 8$.

To Set a value you first have to find the highest number that fits the value, then you add up smaller values.

Example:
DMX512 value 11 shall be set:
1. Highest number that fits is $2^3 = 8$
2. Second highest number is $2^1 = 2$
3. third highest number that fits is $2^0 = 1$
So setting would be: 11010000

Extracted from this website:
https://www.laserworld.com/en/laserworld-toolbox/dmx-address-setting.html

Network Switch

Each patchbay hosts a 24 ports Gigabit network switch that connects to all controllers installed on said patchbay. The first patchbay's network switch also connects to the computer and the network is daisy chained from the first switch to the second and from the second to the third. This establishes the connection from the computer to all the controllers.

Computer and Software

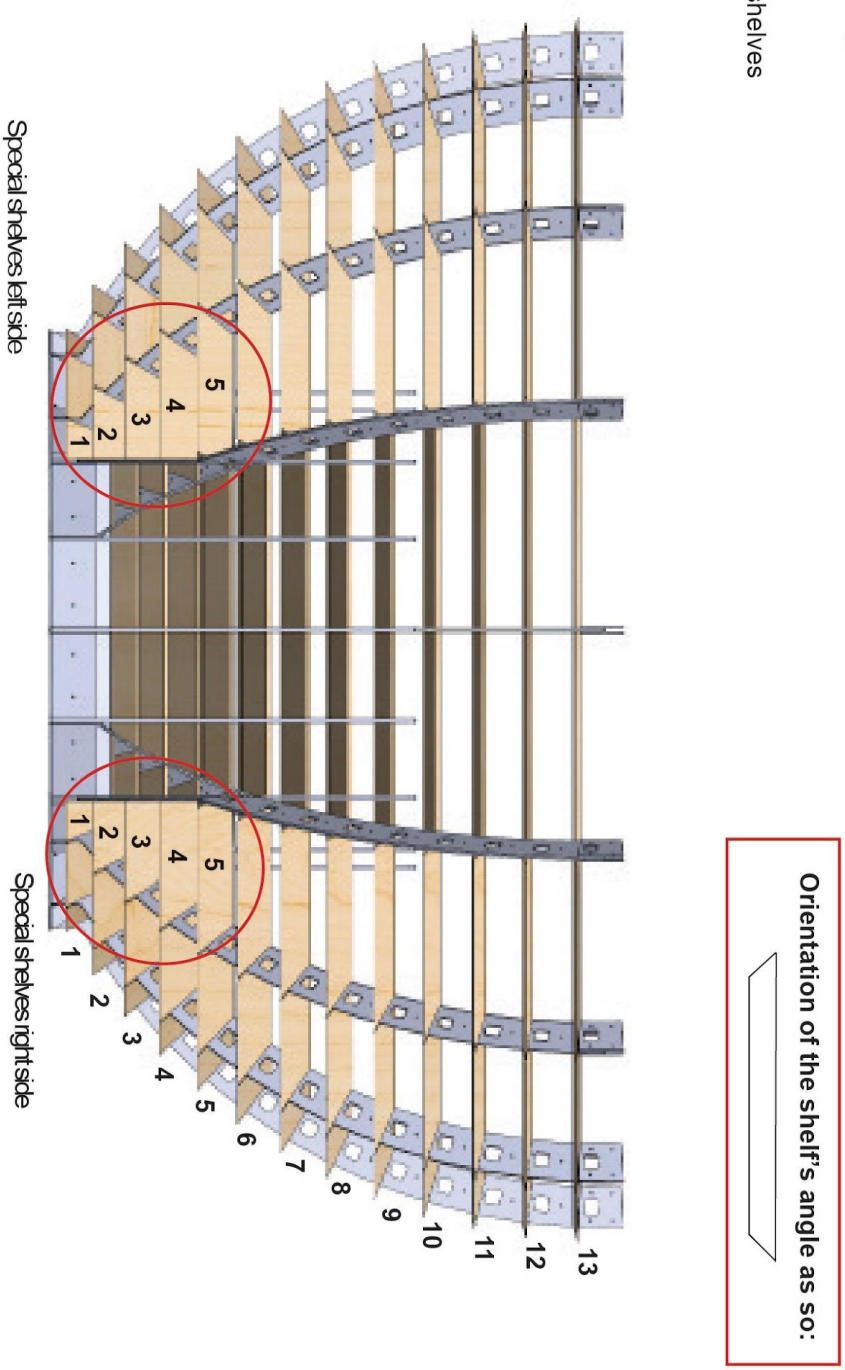
At the time of writing this manual, the software operating of the computer is coded under openFrameworks' platform. Software was initially released and tested on an Apple MacMini with an i7 3.0GHz processor, 16GB of RAM and 1TB of HDD.

The software bachSphere.app is launched by the custom-made software delayOpen.app that, as the name implies, delays the software launch to allow all system resources to be loaded prior to software.

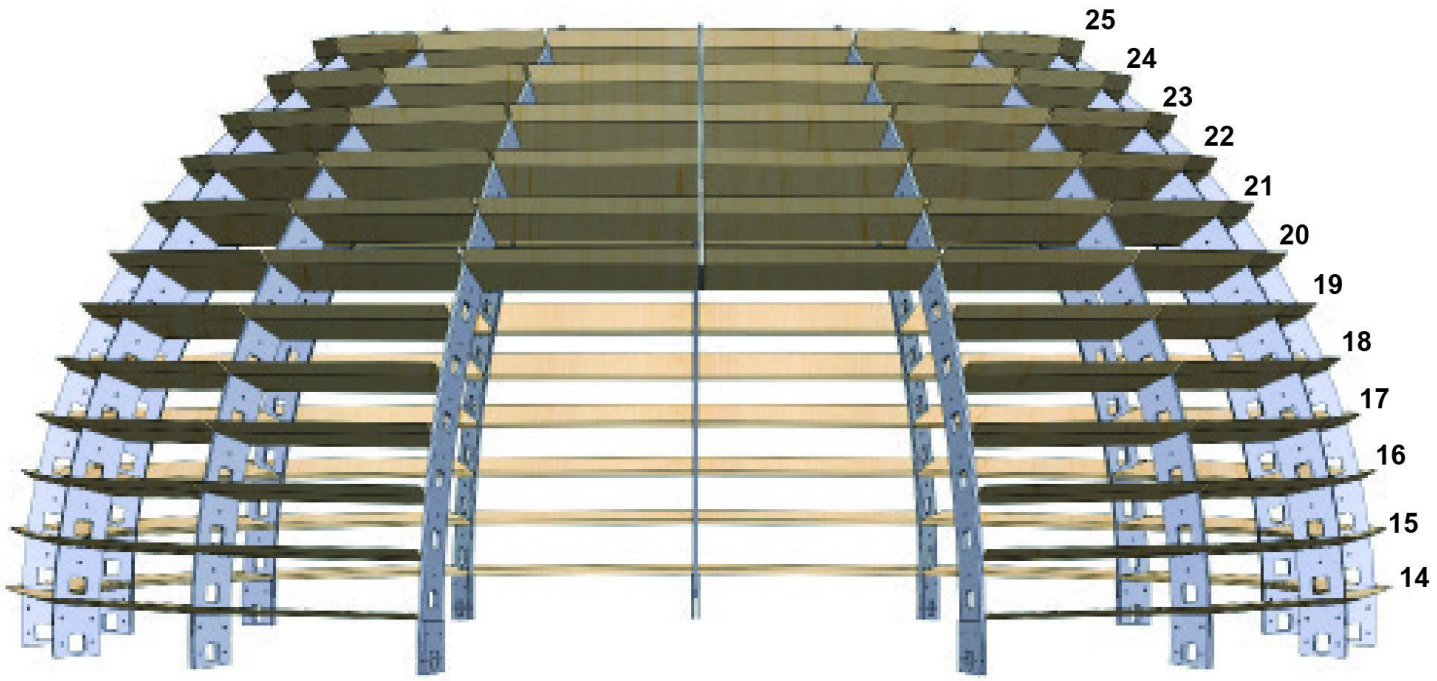
APPENDIX III - PLAN VIEWS: SPHERE AND COMPONENTS

General Dimensions

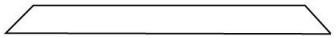
Nomenclature of the Sphere Sections



Bach sphere
Series 302
Level 2
Nomenclature of shelves

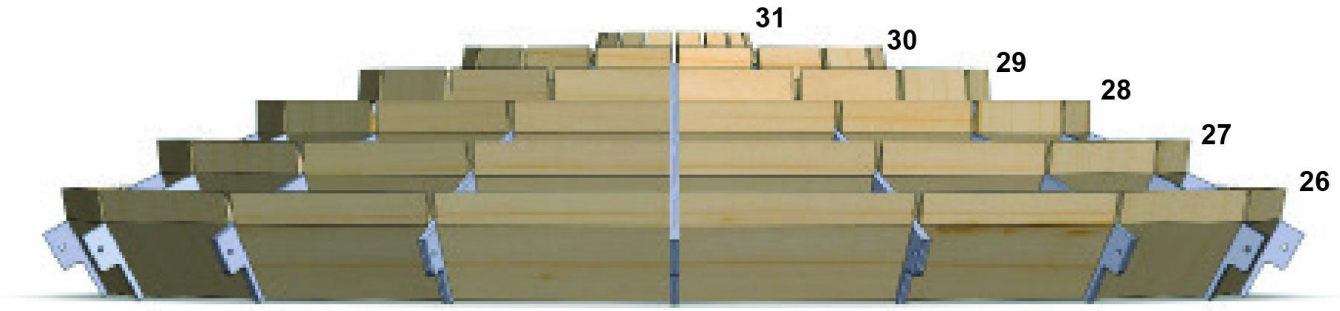


Orientation of the shelf's angle as so:

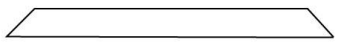


Bach sphere
Série 303
Level 3
Nomenclature of shelves

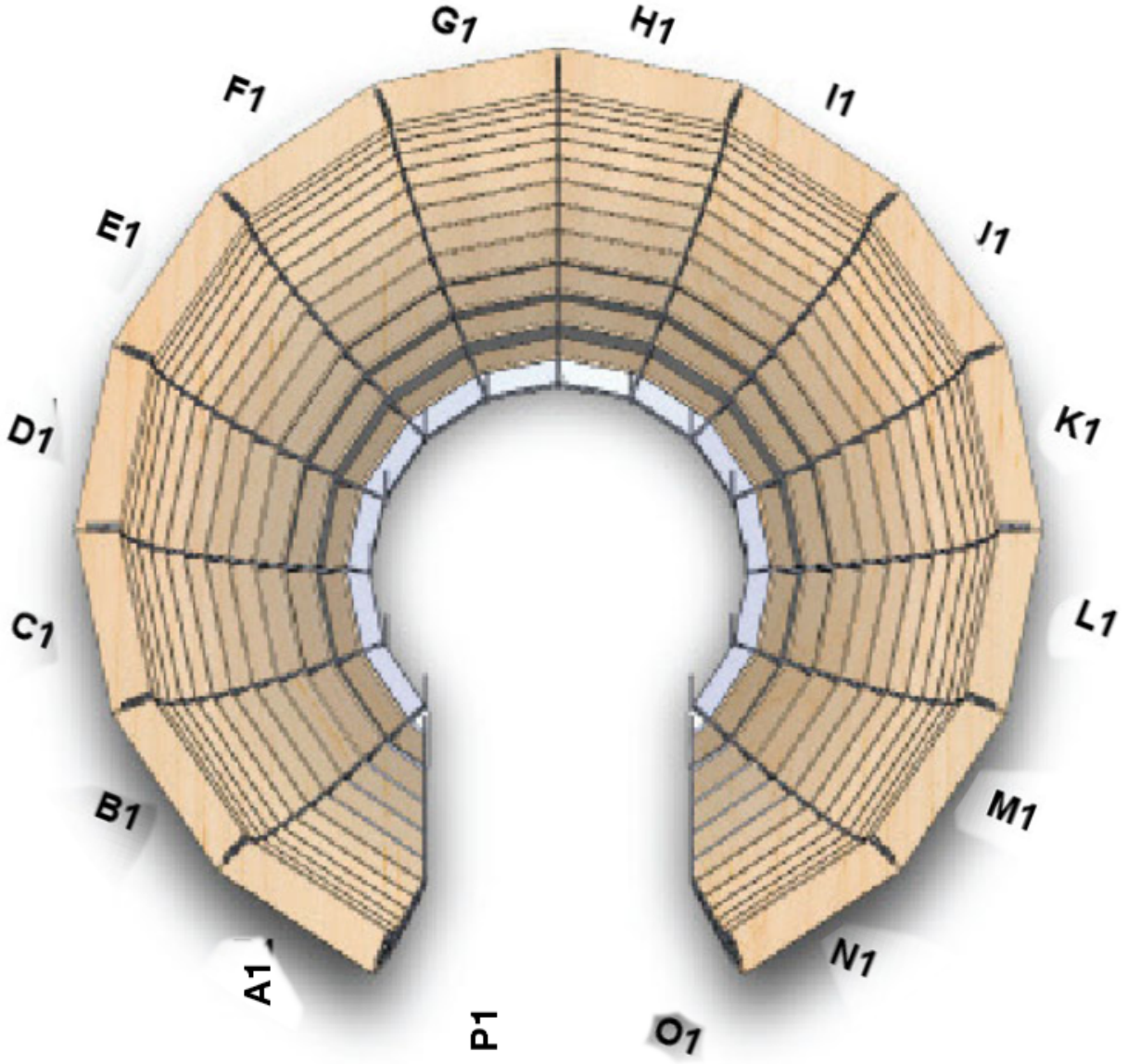
Dome



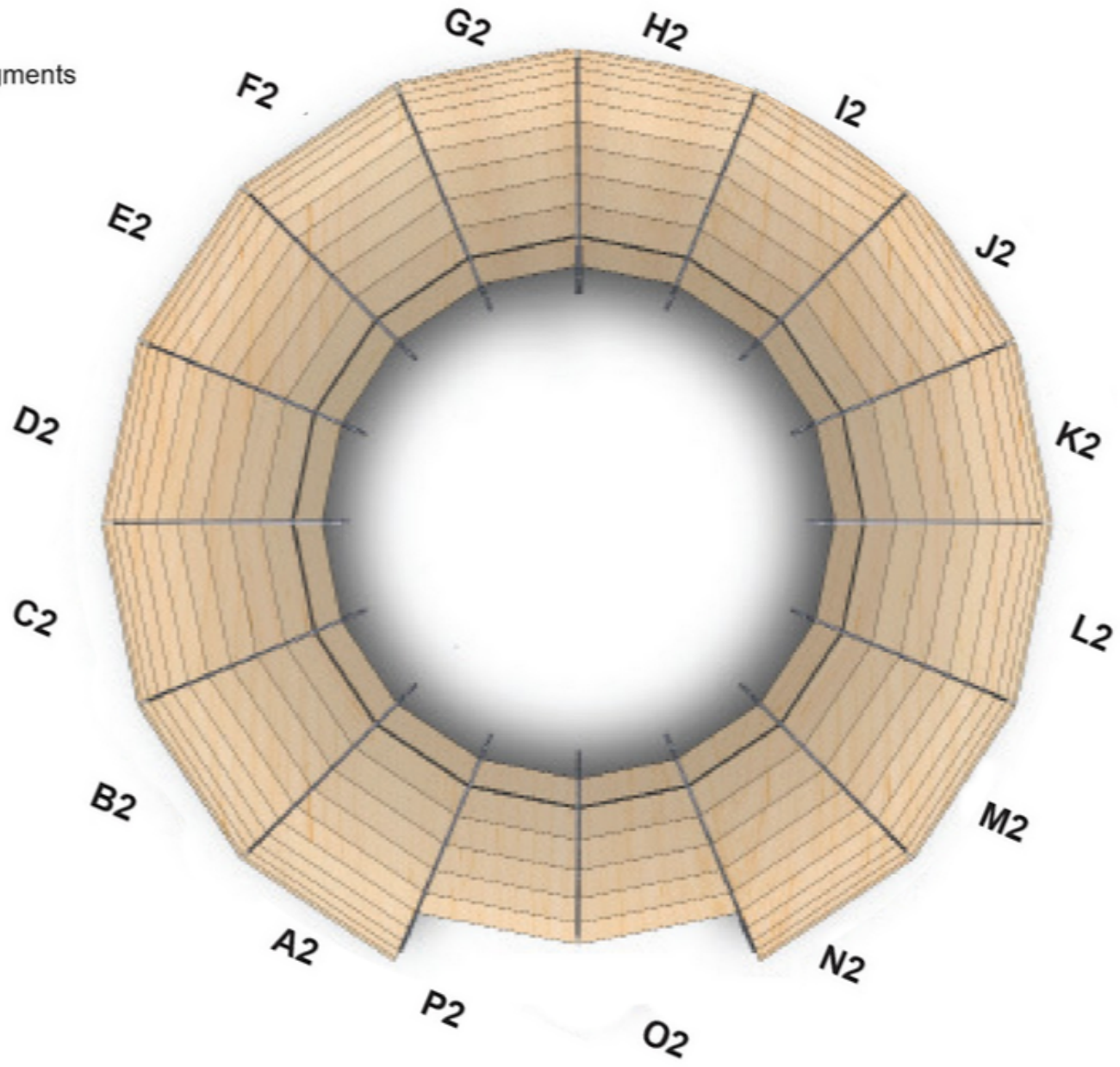
Orientation of the shelf's angle as so:



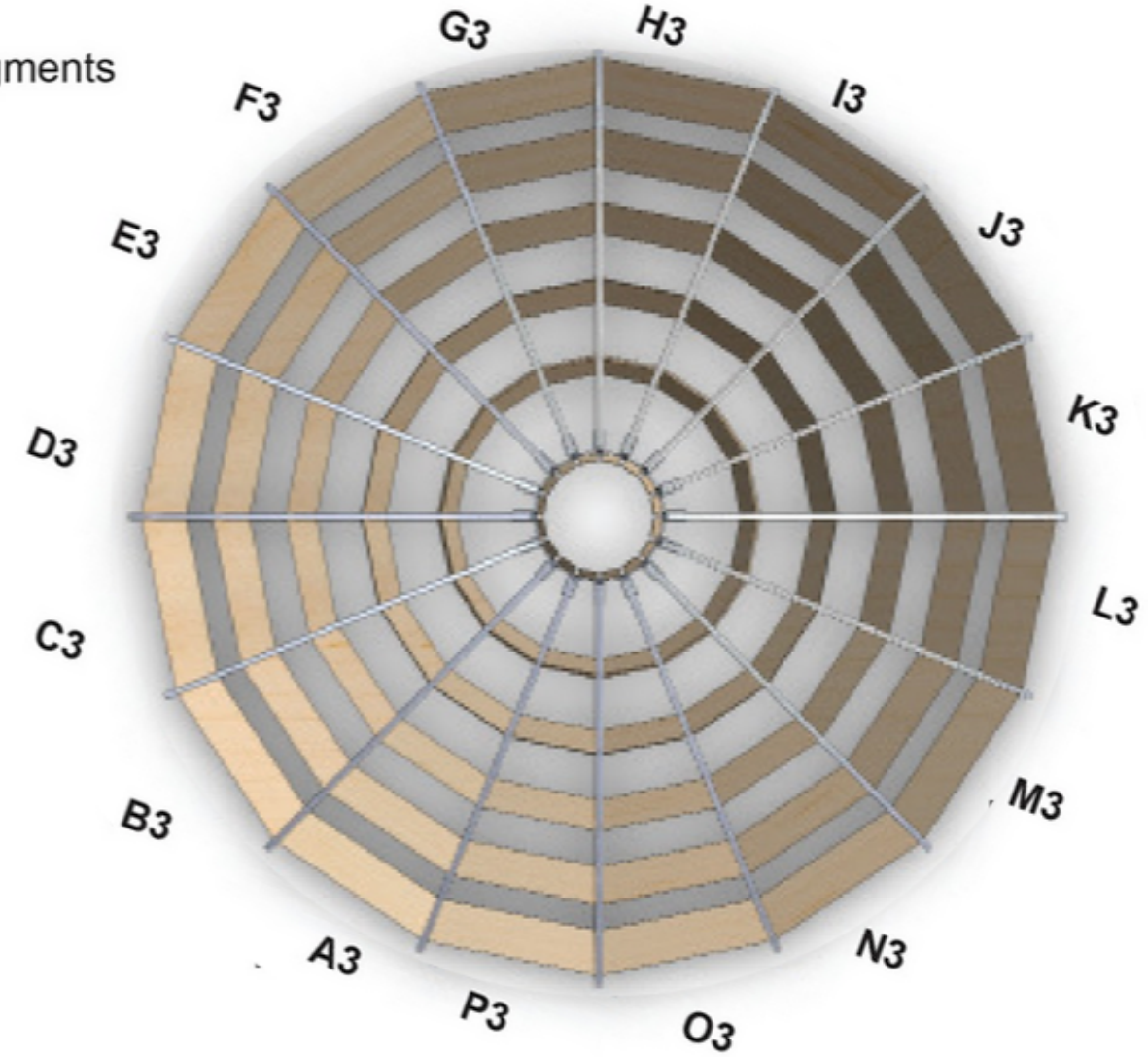
Bach sphere
Series 301
Level 1
Nomenclature of segments



Bach sphere
Series 302
Level 2
Nomenclature of segments

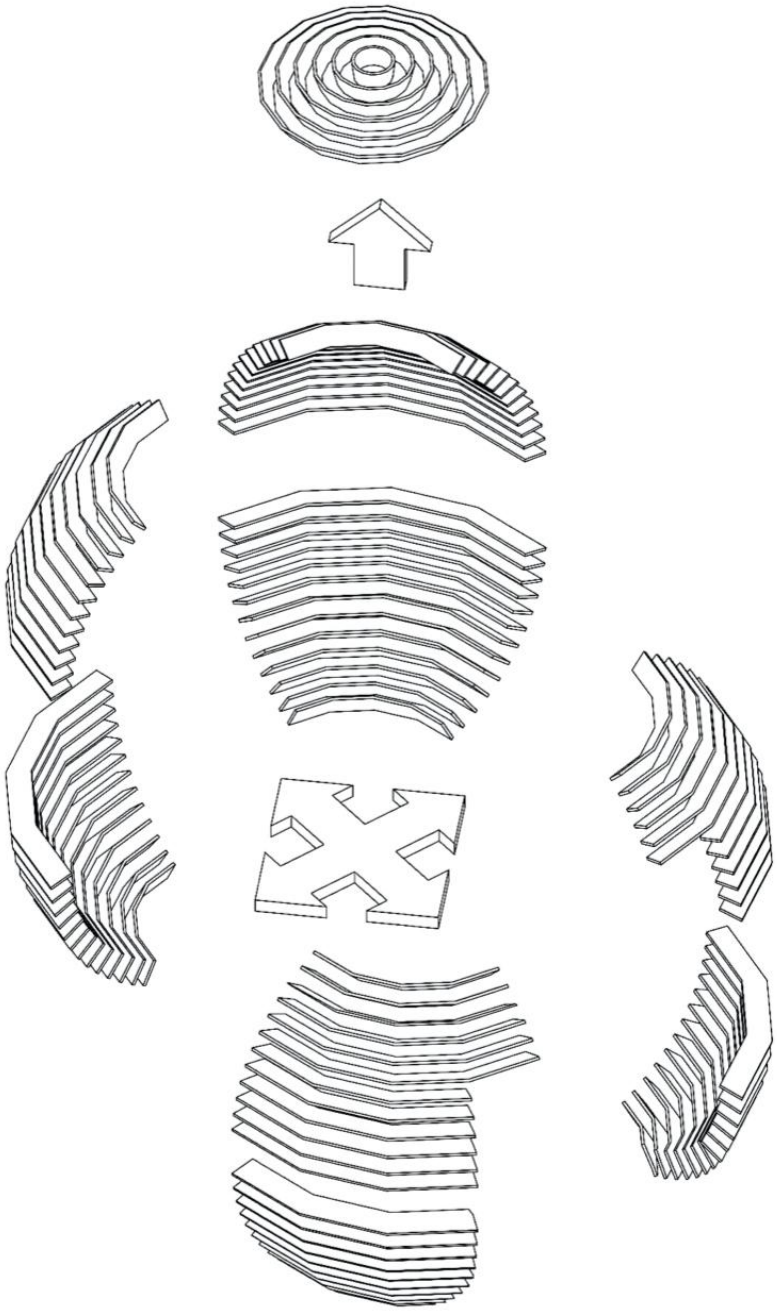


Bach sphere
Series 303
Level 3
Nomenclature of segments



Sphere Eighths and Dome

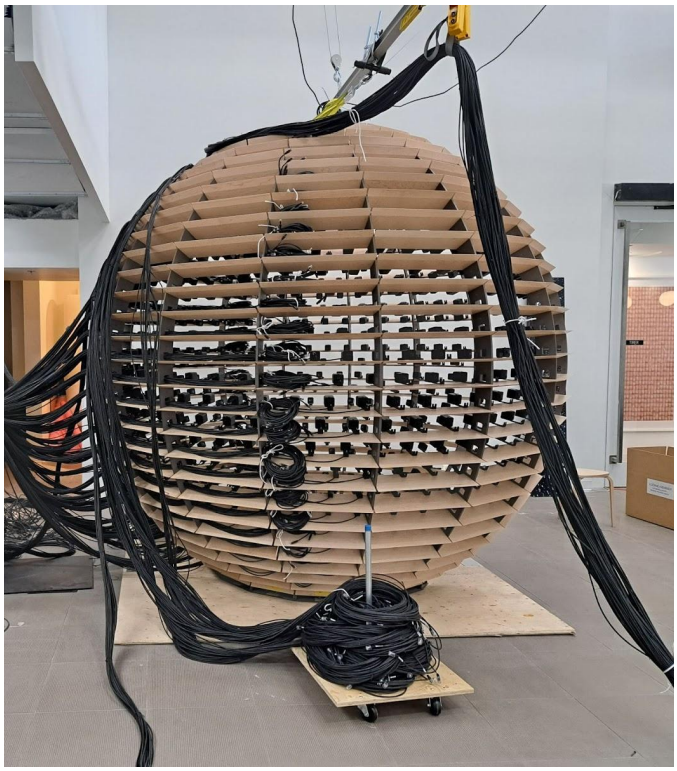
While the sphere has been built from plenty of wood slats and metal spines, it has been built to be easily disassembled into 9 parts, the dome (also called top part or top hat - row Z to EE) and the “eights”: lower left side back, lower left side front, lower right side back, lower right side front, top left side back, top left side front, top right side back, top right side front.

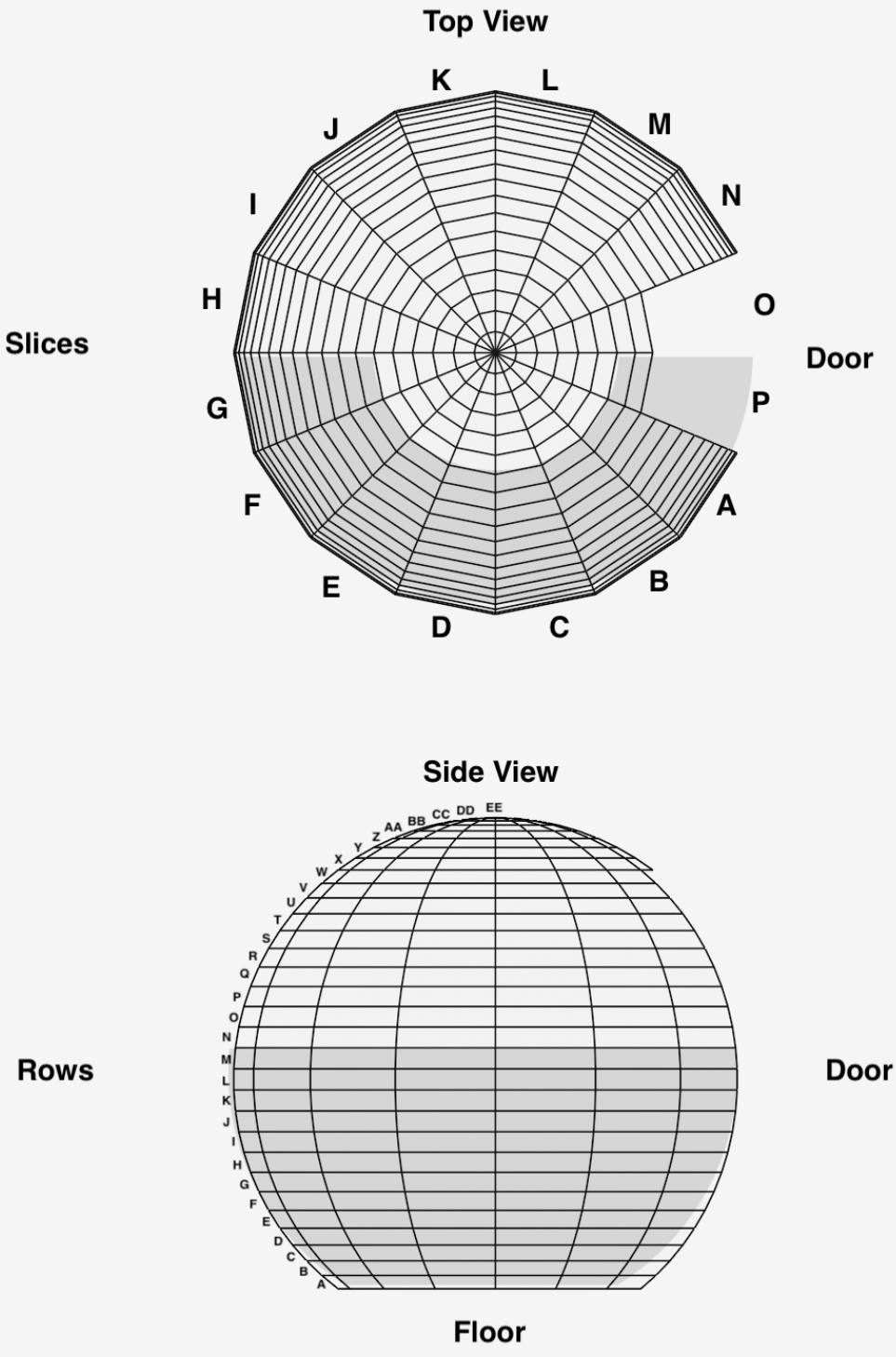


Dollies

While the sphere is dismantled in eights and dome, the cabling is organized per top hat and quarters. All cables are travelling disconnected from the patch bays. The speakers from the dome remained connected to their cable and the cable coils got packed within the dome crate. The speakers on the sphere's back eights remain connected to their cables while the speakers on the sphere's front eights get disconnected from their cables.

Dollies - a spoke centered on a plywood on wheel - are provided to group the cabling from each individual quarter: lower left side, lower right side, upper left side and upper right side. All the cables from the front eights have been coiled and attached on the last slice's shelf from the matching back eights.




Top View
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Slices
Door
Side View
EE
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CC
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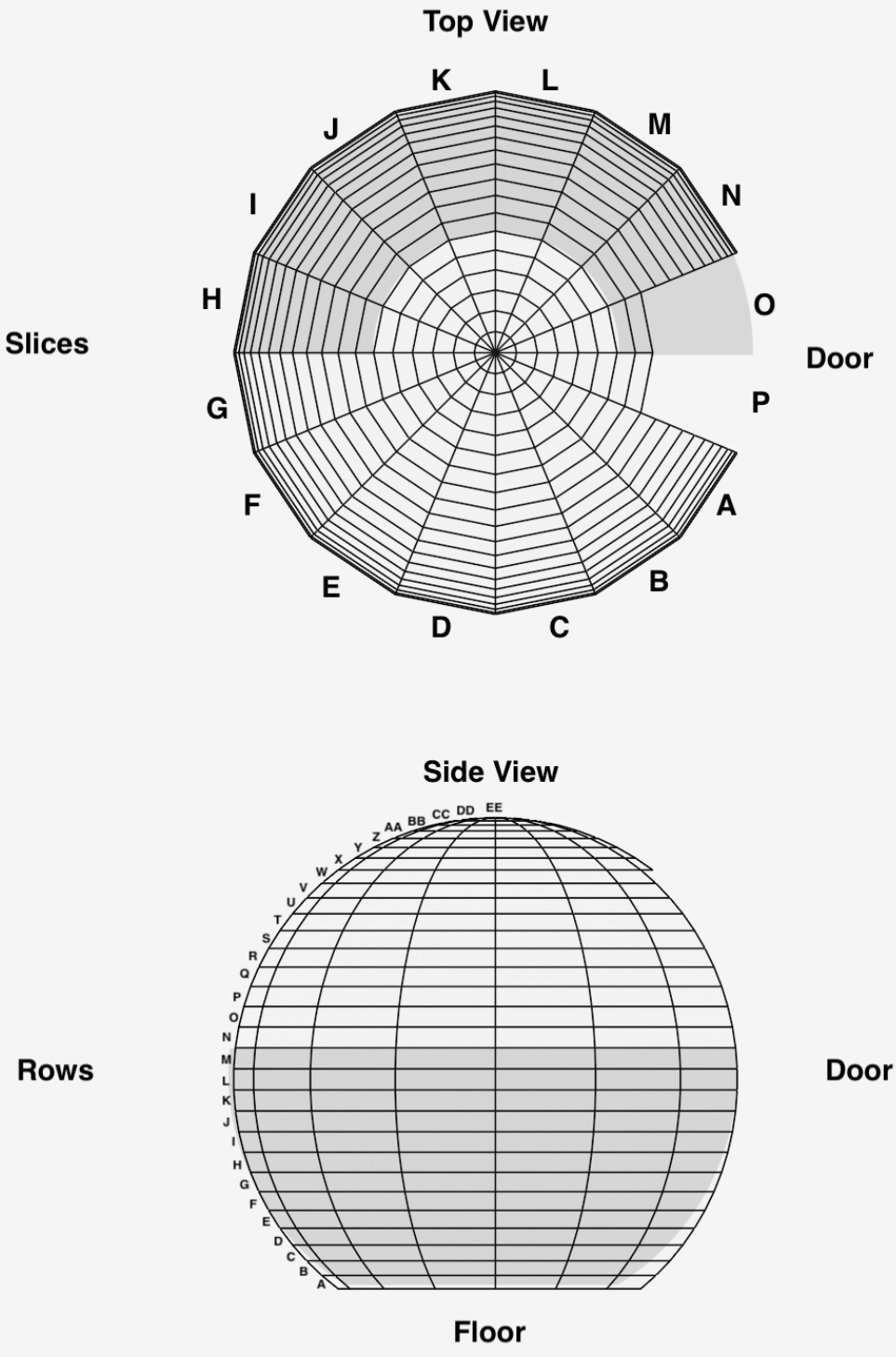
Rows
Door
Floor

LOWER LEFT


Top View
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Slices
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Side View
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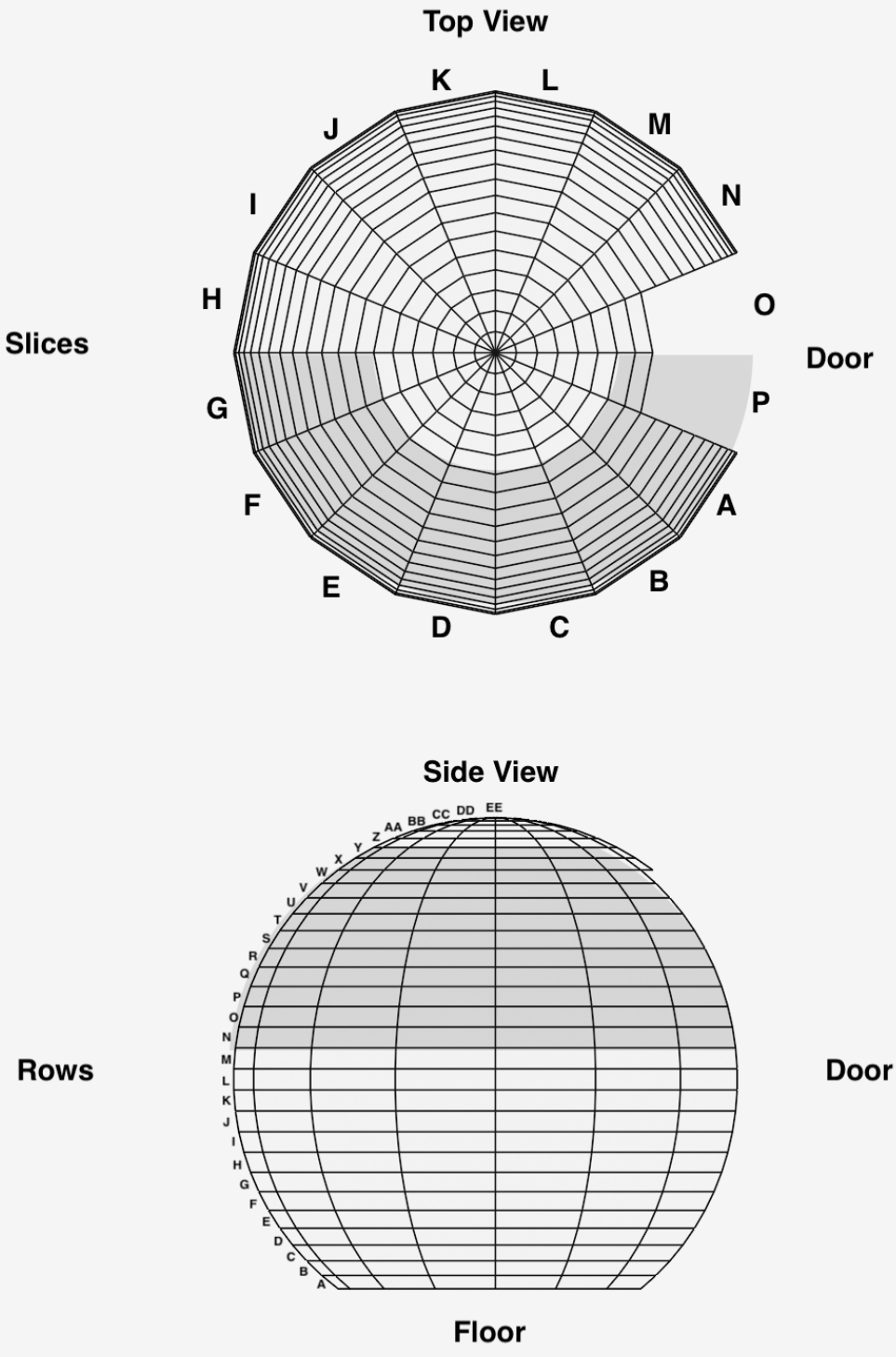
Door
Floor

LOWER RIGHT


Top View
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Slices
Door
Side View
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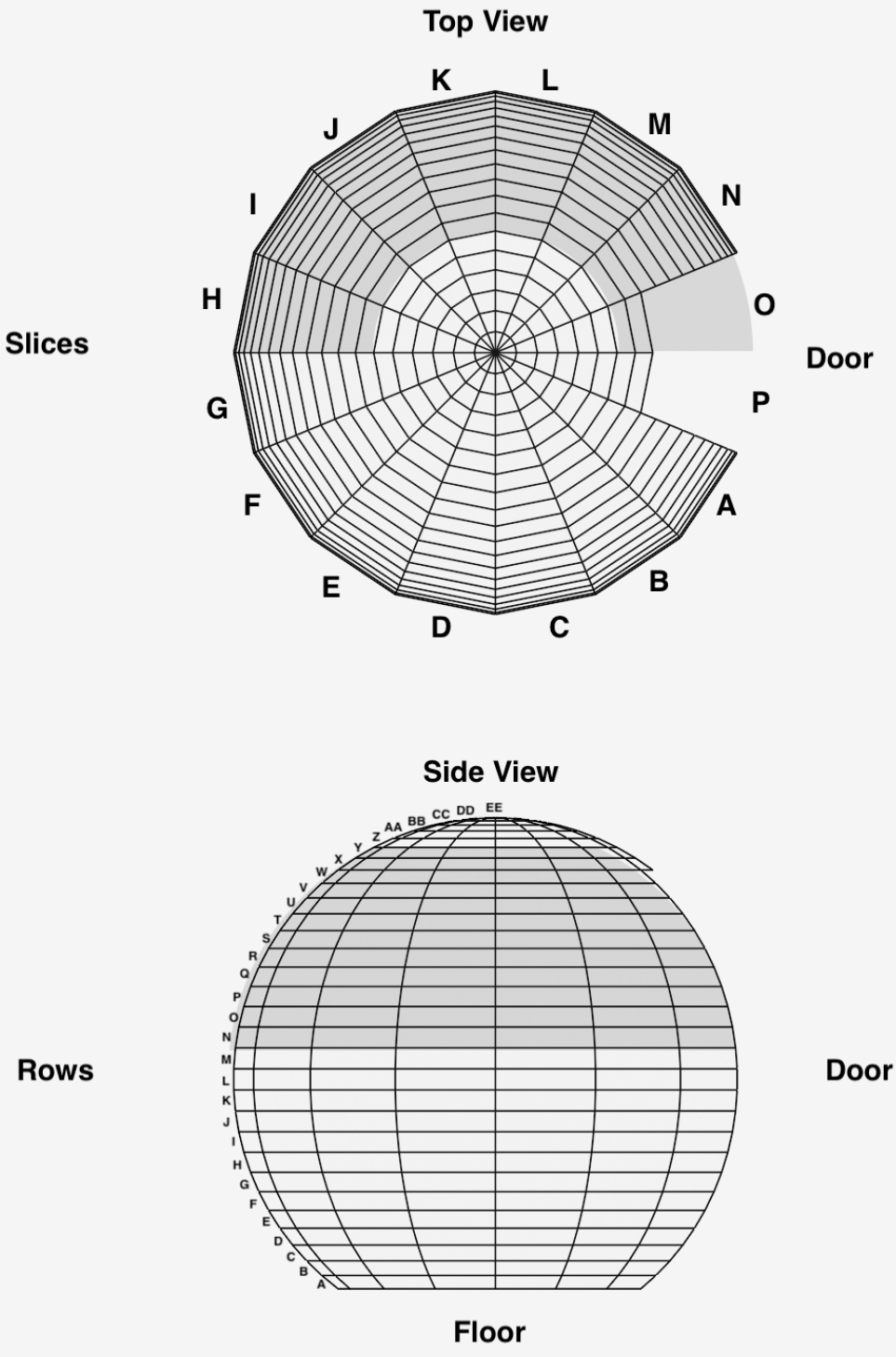
UPPER LEFT


Top View
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Slices
Door
Side View
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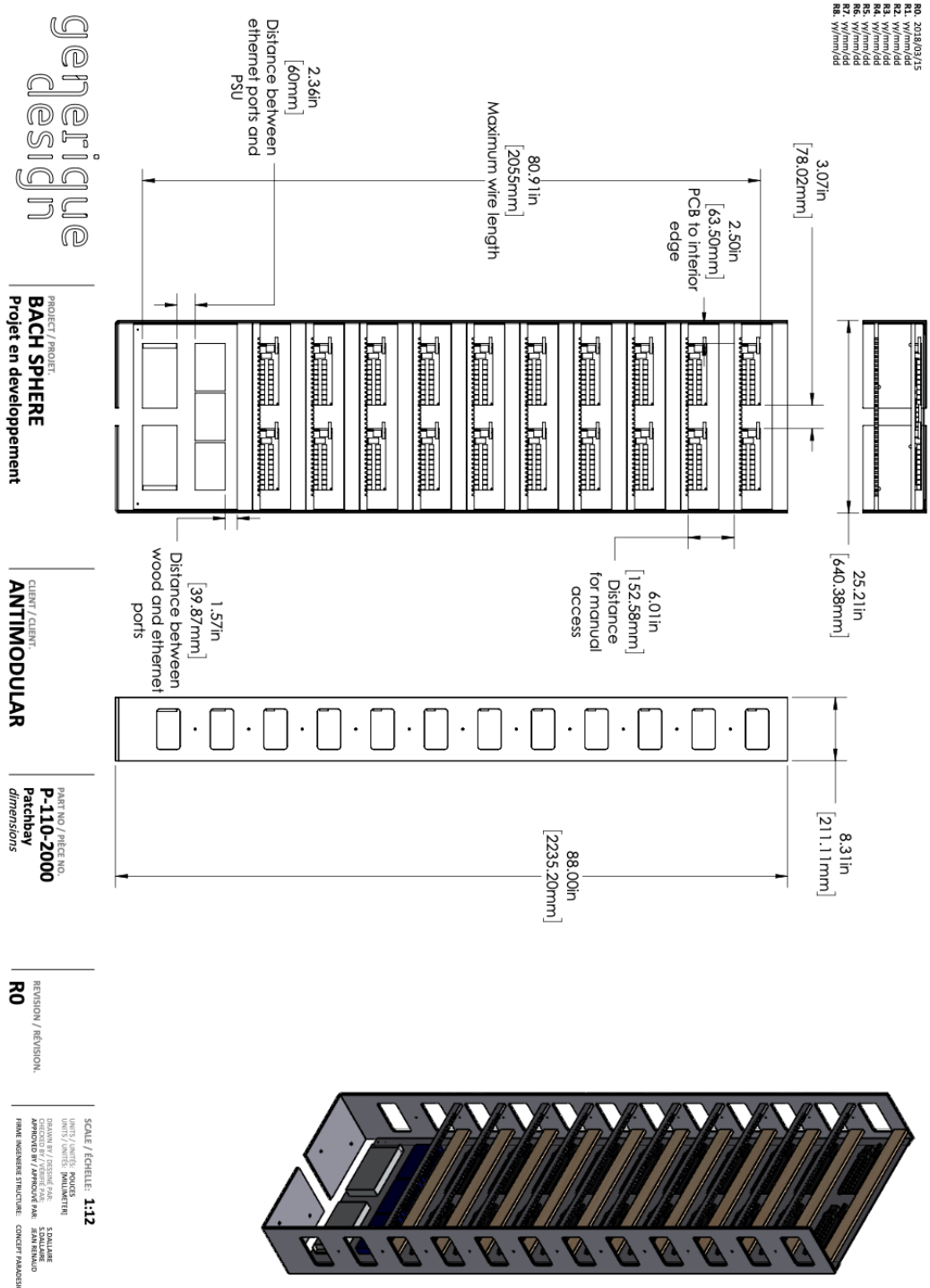
Floor

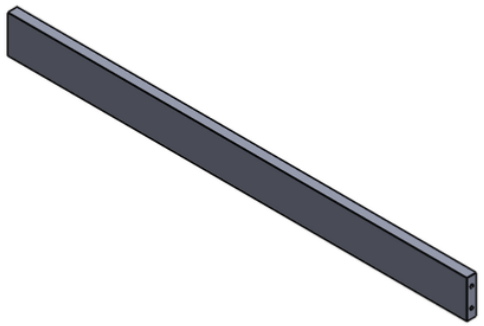
UPPER RIGHT

Patch Bays


REVISION HISTORY / HIST. RÉVISIONS
R0. 2018/03/15
R1. yy/mm/dd
R2. yy/mm/dd
R3. yy/mm/dd
R4. yy/mm/dd
R5. yy/mm/dd
R6. yy/mm/dd
R7. yy/mm/dd
R8. yy/mm/dd
3.07in [78.02mm]
2.50in [63.50mm] PCB to interior edge
80.91in [2055mm] Maximum wire length
2.36in [60mm] Distance between ethernet ports and PSU
25.21in [640.38mm]
6.01in [152.58mm] Distance for manual access
1.57in [39.87mm] Distance between wood and ethernet ports
8.31in [211.11mm]
88.00in [2235.20mm]
genetique design
PROJECT / PROJET.
BACH SPHERE
Projet en developpement
CLIENT / CLIENT.
ANTIMODULAR
PART NO / PIÈCE NO.
P-110-2000
Patchbay
dimensions
REVISION / RÉVISION.
R0
SCALE / ÉCHELLE: 1:12
UNITS / UNITÉS: POUCES
UNITS / UNITÉS: [MILLIMETER]
DRAWN BY / DESSINÉ PAR:
S.DALLAIRE
ELEVATION / ÉLÉVATION:
APPROVED BY / APPROUVÉ PAR:
JEAN RENAUD
FIRME INGÉNIERIE STRUCTURE:
CONCEPT PARADISION INC.
SHEET / FEUILLE: 1 of 1

REVISION HISTORY / HIST. RÉVISIONS

R0. 2018/03/20
R1. 2018/03/27
R2. yy/mm/dd
R3. yy/mm/dd
R4. yy/mm/dd
R5. yy/mm/dd
R6. yy/mm/dd
R7. yy/mm/dd
R8. yy/mm/dd

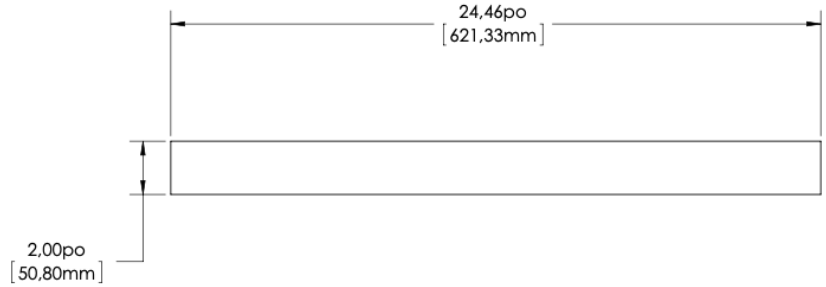


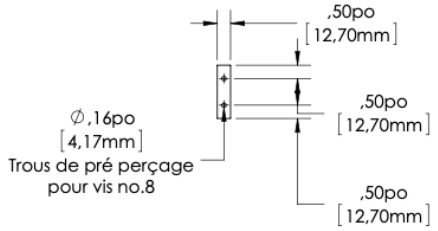
PROCÉDÉ / PROCESS
Découpe CNC ou banc de scie

MATÉRIEL / MATERIAL
Érable à sucre Épaisseur 1/2"

QUANTITÉS / QUANTITIES
32 X PROD

FINITION / FINISH
Vernis clair Base d'eau (idem à Bach Sphere)





generique design

PROJECT / PROJET.
BACH SPHERE
Projet en developpement

CLIENT / CLIENT.
ANTIMODULAR

PART NO / PIÈCE NO.
P-110-9006
Bois indicatif
dimensions

REVISION / RÉVISION.
R1

SCALE / ÉCHELLE: **1:4**
UNITS / UNITÉS: **POUCES**
UNITS / UNITÉS: **[MILLIMETER]**
DRAWN BY / DESSINÉ PAR: S.DALLAIRE
CHECKED BY / VÉRIFIÉ PAR: S.DALLAIRE
APPROVED BY / APPROUVÉ PAR: JEAN RENAUD
FIRME INGENIERIE STRUCTURE: CONCEPT PARADESIGN INC.

SHEET / FEUILLE: **1 of 1**

Speakers: Position in Sphere, Label, Controller Connection

Row	rowIndex	Label	Slice	Speaker Index	grpIndex	Amount	Controller ID	Channel
A	0	A00 B1	B	0	0	19	0	0
A	0	A01 B2	B	1	1	19	0	1
A	0	A02 C1	C	2	2	19	0	2
A	0	A03 D1	D	3	3	19	0	3
A	0	A04 D2	D	4	4	19	0	4
A	0	A05 E1	E	5	5	19	0	5
A	0	A06 F1	F	6	6	19	0	6
A	0	A07 F2	F	7	7	19	0	7
A	0	A08 G1	G	8	8	19	0	8
A	0	A09 G2	G	9	9	19	0	9
A	0	A10 H1	H	10	10	19	0	10
A	0	A11 I1	I	11	11	19	0	11
A	0	A12 I2	I	12	12	19	0	12
A	0	A13 J1	J	13	13	19	0	13
A	0	A14 K1	K	14	14	19	0	14
A	0	A15 K2	K	15	15	19	0	15
A	0	A16 L1	L	16	16	19	0	16
A	0	A17 M1	M	17	17	19	0	17
A	0	A18 M2	M	18	18	19	1	0
B	1	B01 A1	A	19	0	24	1	1
B	1	B01 B1	B	20	1	24	1	2
B	1	B02 B2	B	21	2	24	1	3
B	1	B03 C1	C	22	3	24	1	4
B	1	B04 C2	C	23	4	24	1	5
B	1	B05 D1	D	24	5	24	1	6
B	1	B06 E1	E	25	6	24	1	7
B	1	B07 E2	E	26	7	24	1	8
B	1	B08 F1	F	27	8	24	1	9
B	1	B09 F2	F	28	9	24	1	10
B	1	B10 G1	G	29	10	24	1	11
B	1	B11 G2	G	30	11	24	1	12
B	1	B12 H1	H	31	12	24	1	13
B	1	B13 H2	H	32	13	24	1	14

Row	rowIndex	Label	Slice	Speaker Index	grpIndex	Amount	Controller ID	Channel
B	1	B14 I1	I	33	14	24	1	15
B	1	B15I2	I	34	15	24	1	16
B	1	B16J1	J	35	16	24	1	17
B	1	B17J2	J	36	17	24	2	0
B	1	B18 K1	K	37	18	24	2	1
B	1	B19L1	L	38	19	24	2	2
B	1	B20 L2	L	39	20	24	2	3
B	1	B21 M1	M	40	21	24	2	4
B	1	B22 M2	M	41	22	24	2	5
B	1	B23 N1	N	42	23	24	2	6
C	2	C00 A1	A	43	0	27	2	7
C	2	C01 B1	B	44	1	27	2	8
C	2	C02 B2	B	45	2	27	2	9
C	2	C03 C1	C	46	3	27	2	10
C	2	C04 C2	C	47	4	27	2	11
C	2	C05 D1	D	48	5	27	2	12
C	2	C06 D2	D	49	6	27	2	13
C	2	C07 E1	E	50	7	27	2	14
C	2	C08 E2	E	51	8	27	2	15
C	2	C09 F1	F	52	9	27	2	16
C	2	C10 F2	F	53	10	27	2	17
C	2	C11 G1	G	54	11	27	3	0
C	2	C12 G2	G	55	12	27	3	1
C	2	C13 H1	H	56	13	27	3	2
C	2	C14 H2	H	57	14	27	3	3
C	2	C15 H3	H	58	15	27	3	4
C	2	C16I1	I	59	16	27	3	5
C	2	C17I2	I	60	17	27	3	6
C	2	C18 J1	J	61	18	27	3	7
C	2	C19 J2	J	62	19	27	3	8
C	2	C20 K1	K	63	20	27	3	9
C	2	C21 K2	K	64	21	27	3	10
C	2	C22L1	L	65	22	27	3	11
C	2	C23 L2	L	66	23	27	3	12

Row	rowIndex	Label	Slice	Speaker Index	grpIndex	Amount	Controller ID	Channel
C	2	C24 M1	M	67	24	27	3	13
C	2	C25 M2	M	68	25	27	3	14
C	2	C26 N1	N	69	26	27	3	15
D	3	D00 A1	A	70	0	30	3	16
D	3	D01 A2	A	71	1	30	3	17
D	3	D02 B1	B	72	2	30	4	0
D	3	D03 B2	B	73	3	30	4	1
D	3	D04 C1	C	74	4	30	4	2
D	3	D05 C2	C	75	5	30	4	3
D	3	D06 D1	D	76	6	30	4	4
D	3	D07 D2	D	77	7	30	4	5
D	3	D08 E1	E	78	8	30	4	6
D	3	D09 E2	E	79	9	30	4	7
D	3	D10 E3	E	80	10	30	4	8
D	3	D11F1	F	81	11	30	4	9
D	3	D12 F2	F	82	12	30	4	10
D	3	D13 G1	G	83	13	30	4	11
D	3	D14 G2	G	84	14	30	4	12
D	3	D15 H1	H	85	15	30	4	13
D	3	D16 H2	H	86	16	30	4	14
D	3	D17I1	I	87	17	30	4	15
D	3	D18I2	I	88	18	30	4	16
D	3	D19 J1	J	89	19	30	4	17
D	3	D20 J2	J	90	20	30	5	0
D	3	D21 J3	J	91	21	30	5	1
D	3	D22 K1	K	92	22	30	5	2
D	3	D23 K2	K	93	23	30	5	3
D	3	D24 L1	L	94	24	30	5	4
D	3	D25 L2	L	95	25	30	5	5
D	3	D26 M1	M	96	26	30	5	6
D	3	D27 M2	M	97	27	30	5	7
D	3	D28 N1	N	98	28	30	5	8
D	3	D29 N2	N	99	29	30	5	9
E	4	E00 A1	A	100	0	33	5	10

Row	rowIndex	Label	Slice	Speaker Index	grpIndex	Amount	Controller ID	Channel
E	4	E01 A2	A	101	1	33	5	11
E	4	E02 B1	B	102	2	33	5	12
E	4	E03 B2	B	103	3	33	5	13
E	4	E04 C1	C	104	4	33	5	14
E	4	E05 C2	C	105	5	33	5	15
E	4	E06 C3	C	106	6	33	5	16
E	4	E07 D1	D	107	7	33	5	17
E	4	E08 D2	D	108	8	33	6	0
E	4	E09 E1	E	109	9	33	6	1
E	4	E10E2	E	110	10	33	6	2
E	4	E11E3	E	111	11	33	6	3
E	4	E12F1	F	112	12	33	6	4
E	4	E13F2	F	113	13	33	6	5
E	4	E14 G1	G	114	14	33	6	6
E	4	E15 G2	G	115	15	33	6	7
E	4	E16 G3	G	116	16	33	6	8
E	4	E17H1	H	117	17	33	6	9
E	4	E18 H2	H	118	18	33	6	10
E	4	E19I1	I	119	19	33	6	11
E	4	E20I2	I	120	20	33	6	12
E	4	E21J1	J	121	21	33	6	13
E	4	E22J2	J	122	22	33	6	14
E	4	E23 J3	J	123	23	33	6	15
E	4	E24 K1	K	124	24	33	6	16
E	4	E25 K2	K	125	25	33	6	17
E	4	E26L1	L	126	26	33	7	0
E	4	E27L2	L	127	27	33	7	1
E	4	E28 L3	L	128	28	33	7	2
E	4	E29 M1	M	129	29	33	7	3
E	4	E30 M2	M	130	30	33	7	4
E	4	E31 N1	N	131	31	33	7	5
E	4	E32 N2	N	132	32	33	7	6
F	5	F00 A1	A	133	0	36	7	7
F	5	F01 A2	A	134	1	36	7	8

Row	rowIndex	Label	Slice	Speaker Index	grpIndex	Amount	Controller ID	Channel
F	5	F02 A3	A	135	2	36	7	9
F	5	F03 B1	B	136	3	36	7	10
F	5	F04 B2	B	137	4	36	7	11
F	5	F05 C1	C	138	5	36	7	12
F	5	F06 C2	C	139	6	36	7	13
F	5	F07 C3	C	140	7	36	7	14
F	5	F08 D1	D	141	8	36	7	15
F	5	F09 D2	D	142	9	36	7	16
F	5	F10E1	E	143	10	36	7	17
F	5	F11E2	E	144	11	36	8	0
F	5	F12E3	E	145	12	36	8	1
F	5	F13F1	F	146	13	36	8	2
F	5	F14F2	F	147	14	36	8	3
F	5	F15 G1	G	148	15	36	8	4
F	5	F16 G2	G	149	16	36	8	5
F	5	F17 G3	G	150	17	36	8	6
F	5	F18 H1	H	151	18	36	8	7
F	5	F19 H2	H	152	19	36	8	8
F	5	F20 H3	H	153	20	36	8	9
F	5	F21I1	I	154	21	36	8	10
F	5	F22I2	I	155	22	36	8	11
F	5	F23J1	J	156	23	36	8	12
F	5	F24 J2	J	157	24	36	8	13
F	5	F25 J3	J	158	25	36	8	14
F	5	F26 K1	K	159	26	36	8	15
F	5	F27 K2	K	160	27	36	8	16
F	5	F28L1	L	161	28	36	8	17
F	5	F29 L2	L	162	29	36	9	0
F	5	F30 L3	L	163	30	36	9	1
F	5	F31 M1	M	164	31	36	9	2
F	5	F32 M2	M	165	32	36	9	3
F	5	F33 N1	N	166	33	36	9	4
F	5	F34 N2	N	167	34	36	9	5
F	5	F35 N3	N	168	35	36	9	6

Row	rowIndex	Label	Slice	Speaker Index	grpIndex	Amount	Controller ID	Channel
G	6	G00 A1	A	169	0	37	9	7
G	6	G01 A2	A	170	1	37	9	8
G	6	G02 B1	B	171	2	37	9	9
G	6	G03 B2	B	172	3	37	9	10
G	6	G04 B3	B	173	4	37	9	11
G	6	G05 C1	C	174	5	37	9	12
G	6	G06 C2	C	175	6	37	9	13
G	6	G07 C3	C	176	7	37	9	14
G	6	G08 D1	D	177	8	37	9	15
G	6	G09 D2	D	178	9	37	9	16
G	6	G10 E1	E	179	10	37	9	17
G	6	G11E2	E	180	11	37	10	0
G	6	G12 E3	E	181	12	37	10	1
G	6	G13 F1	F	182	13	37	10	2
G	6	G14 F2	F	183	14	37	10	3
G	6	G15 F3	F	184	15	37	10	4
G	6	G16 G1	G	185	16	37	10	5
G	6	G17 G2	G	186	17	37	10	6
G	6	G18 H1	H	187	18	37	10	7
G	6	G19 H2	H	188	19	37	10	8
G	6	G20 H3	H	189	20	37	10	9
G	6	G21I1	I	190	21	37	10	10
G	6	G22I2	I	191	22	37	10	11
G	6	G23I3	I	192	23	37	10	12
G	6	G24 J1	J	193	24	37	10	13
G	6	G25 J2	J	194	25	37	10	14
G	6	G26 J3	J	195	26	37	10	15
G	6	G27 K1	K	196	27	37	10	16
G	6	G28 K2	K	197	28	37	10	17
G	6	G29 L1	L	198	29	37	11	0
G	6	G30 L2	L	199	30	37	11	1
G	6	G31 L3	L	200	31	37	11	2
G	6	G32 M1	M	201	32	37	11	3

Row	rowIndex	Label	Slice	Speaker Index	grpIndex	Amount	Controller ID	Channel
G	6	G33 M2	M	202	33	37	11	4
G	6	G34 M3	M	203	34	37	11	5
G	6	G35 N1	N	204	35	37	11	6
G	6	G36 N2	N	205	36	37	11	7
H	7	H00 A1	A	206	0	40	11	8
H	7	H01 A2	A	207	1	40	11	9
H	7	H02 A3	A	208	2	40	11	10
H	7	H03 B1	B	209	3	40	11	11
H	7	H04 B2	B	210	4	40	11	12
H	7	H05 B3	B	211	5	40	11	13
H	7	H06 C1	C	212	6	40	11	14
H	7	H07 C2	C	213	7	40	11	15
H	7	H08 C3	C	214	8	40	11	16
H	7	H09 D1	D	215	9	40	11	17
H	7	H10 D2	D	216	10	40	12	0
H	7	H11E1	E	217	11	40	12	1
H	7	H12 E2	E	218	12	40	12	2
H	7	H13 E3	E	219	13	40	12	3
H	7	H14 F1	F	220	14	40	12	4
H	7	H15 F2	F	221	15	40	12	5
H	7	H16 F3	F	222	16	40	12	6
H	7	H17 G1	G	223	17	40	12	7
H	7	H18 G2	G	224	18	40	12	8
H	7	H19 G3	G	225	19	40	12	9
H	7	H20 H1	H	226	20	40	12	10
H	7	H21 H2	H	227	21	40	12	11
H	7	H22 H3	H	228	22	40	12	12
H	7	H23I1	I	229	23	40	12	13
H	7	H24I2	I	230	24	40	12	14
H	7	H25I3	I	231	25	40	12	15
H	7	H26 J1	J	232	26	40	12	16
H	7	H27 J2	J	233	27	40	12	17
H	7	H28 J3	J	234	28	40	13	0

Row	rowIndex	Label	Slice	Speaker Index	grpIndex	Amount	Controller ID	Channel
H	7	H29 K1	K	235	29	40	13	1
H	7	H30 K2	K	236	30	40	13	2
H	7	H31L1	L	237	31	40	13	3
H	7	H32 L2	L	238	32	40	13	4
H	7	H33 L3	L	239	33	40	13	5
H	7	H34 M1	M	240	34	40	13	6
H	7	H35 M2	M	241	35	40	13	7
H	7	H36 M3	M	242	36	40	13	8
H	7	H37 N1	N	243	37	40	13	9
H	7	H38 N2	N	244	38	40	13	10
H	7	H39 N3	N	245	39	40	13	11
I	8	I00A1	A	246	0	42	13	12
I	8	I01A2	A	247	1	42	13	13
I	8	I02B1	B	248	2	42	13	14
I	8	I03B2	B	249	3	42	13	15
I	8	I04B3	B	250	4	42	13	16
I	8	I05C1	C	251	5	42	13	17
I	8	I06C2	C	252	6	42	14	0
I	8	I07C3	C	253	7	42	14	1
I	8	I08D1	D	254	8	42	14	2
I	8	I09D2	D	255	9	42	14	3
I	8	I10D3	D	256	10	42	14	4
I	8	I11E1	E	257	11	42	14	5
I	8	I12E2	E	258	12	42	14	6
I	8	I13E3	E	259	13	42	14	7
I	8	I14F1	F	260	14	42	14	8
I	8	I15F2	F	261	15	42	14	9
I	8	I16F3	F	262	16	42	14	10
I	8	I17G1	G	263	17	42	14	11
I	8	I18G2	G	264	18	42	14	12
I	8	I19G3	G	265	19	42	14	13
I	8	I20G4	G	266	20	42	14	14
I	8	I21H1	H	267	21	42	14	15
I	8	I22H2	H	268	22	42	14	16

Row	rowIndex	Label	Slice	Speaker Index	grpIndex	Amount	Controller ID	Channel
I	8	I23H3	H	269	23	42	14	17
I	8	I24I1	I	270	24	42	15	0
I	8	I25I2	I	271	25	42	15	1
I	8	I26I3	I	272	26	42	15	2
I	8	I27J1	J	273	27	42	15	3
I	8	I28J2	J	274	28	42	15	4
I	8	I29J3	J	275	29	42	15	5
I	8	I30K1	K	276	30	42	15	6
I	8	I31K2	K	277	31	42	15	7
I	8	I32K3	K	278	32	42	15	8
I	8	I33L1	L	279	33	42	15	9
I	8	I34L2	L	280	34	42	15	10
I	8	I35L3	L	281	35	42	15	11
I	8	I36 M1	M	282	36	42	15	12
I	8	I37 M2	M	283	37	42	15	13
I	8	I38 M3	M	284	38	42	15	14
I	8	I39N1	N	285	39	42	15	15
I	8	I40 N2	N	286	40	42	15	16
I	8	I41N3	N	287	41	42	15	17
J	9	J00 A1	A	288	0	42	16	0
J	9	J01 A2	A	289	1	42	16	1
J	9	J02 A3	A	290	2	42	16	2
J	9	J03 B1	B	291	3	42	16	3
J	9	J04 B2	B	292	4	42	16	4
J	9	J05 B3	B	293	5	42	16	5
J	9	J06 C1	C	294	6	42	16	6
J	9	J07 C2	C	295	7	42	16	7
J	9	J08 C3	C	296	8	42	16	8
J	9	J09 D1	D	297	9	42	16	9
J	9	J10 D2	D	298	10	42	16	10
J	9	J11 D3	D	299	11	42	16	11
J	9	J12E1	E	300	12	42	16	12
J	9	J13E2	E	301	13	42	16	13
J	9	J14 E3	E	302	14	42	16	14

Row	rowIndex	Label	Slice	Speaker Index	grpIndex	Amount	Controller ID	Channel
J	9	J15F1	F	303	15	42	16	15
J	9	J16F2	F	304	16	42	16	16
J	9	J17F3	F	305	17	42	16	17
J	9	J18 G1	G	306	18	42	17	0
J	9	J19 G2	G	307	19	42	17	1
J	9	J20 G3	G	308	20	42	17	2
J	9	J21H1	H	309	21	42	17	3
J	9	J22 H2	H	310	22	42	17	4
J	9	J23 H3	H	311	23	42	17	5
J	9	J24I1	I	312	24	42	17	6
J	9	J25I2	I	313	25	42	17	7
J	9	J26I3	I	314	26	42	17	8
J	9	J27J1	J	315	27	42	17	9
J	9	J28 J2	J	316	28	42	17	10
J	9	J29 J3	J	317	29	42	17	11
J	9	J30 K1	K	318	30	42	17	12
J	9	J31 K2	K	319	31	42	17	13
J	9	J32 K3	K	320	32	42	17	14
J	9	J33L1	L	321	33	42	17	15
J	9	J34 L2	L	322	34	42	17	16
J	9	J35 L3	L	323	35	42	17	17
J	9	J36 M1	M	324	36	42	18	0
J	9	J37 M2	M	325	37	42	18	1
J	9	J38 M3	M	326	38	42	18	2
J	9	J39 N1	N	327	39	42	18	3
J	9	J40 N2	N	328	40	42	18	4
J	9	J41 N3	N	329	41	42	18	5
K	10	K00 A1	A	330	0	43	18	6
K	10	K01 A2	A	331	1	43	18	7
K	10	K02 A3	A	332	2	43	18	8
K	10	K03 B1	B	333	3	43	18	9
K	10	K04 B2	B	334	4	43	18	10
K	10	K05 B3	B	335	5	43	18	11
K	10	K06 C1	C	336	6	43	18	12

Row	rowIndex	Label	Slice	Speaker Index	grpIndex	Amount	Controller ID	Channel
K	10	K07 C2	C	337	7	43	18	13
K	10	K08 C3	C	338	8	43	18	14
K	10	K09 D1	D	339	9	43	18	15
K	10	K10 D2	D	340	10	43	18	16
K	10	K11 D3	D	341	11	43	18	17
K	10	K12E1	E	342	12	43	19	0
K	10	K13 E2	E	343	13	43	19	1
K	10	K14 E3	E	344	14	43	19	2
K	10	K15F1	F	345	15	43	19	3
K	10	K16 F2	F	346	16	43	19	4
K	10	K17 F3	F	347	17	43	19	5
K	10	K18 G1	G	348	18	43	19	6
K	10	K19 G2	G	349	19	43	19	7
K	10	K20 G3	G	350	20	43	19	8
K	10	K21 H1	H	351	21	43	19	9
K	10	K22 H2	H	352	22	43	19	10
K	10	K23 H3	H	353	23	43	19	11
K	10	K24 H4	H	354	24	43	19	12
K	10	K25I1	I	355	25	43	19	13
K	10	K26I2	I	356	26	43	19	14
K	10	K27I3	I	357	27	43	19	15
K	10	K28 J1	J	358	28	43	19	16
K	10	K29 J2	J	359	29	43	19	17
K	10	K30 J3	J	360	30	43	20	0
K	10	K31 K1	K	361	31	43	20	1
K	10	K32 K2	K	362	32	43	20	2
K	10	K33 K3	K	363	33	43	20	3
K	10	K34 L1	L	364	34	43	20	4
K	10	K35 L2	L	365	35	43	20	5
K	10	K36 L3	L	366	36	43	20	6
K	10	K37 M1	M	367	37	43	20	7
K	10	K38 M2	M	368	38	43	20	8
K	10	K39 M3	M	369	39	43	20	9
K	10	K40 N1	N	370	40	43	20	10

Row	rowIndex	Label	Slice	Speaker Index	grpIndex	Amount	Controller ID	Channel
K	10	K41 N2	N	371	41	43	20	11
K	10	K42 N3	N	372	42	43	20	12
L	11	L00 A1	A	373	0	44	20	13
L	11	L01 A2	A	374	1	44	20	14
L	11	L02 A3	A	375	2	44	20	15
L	11	L03 B1	B	376	3	44	20	16
L	11	L04 B2	B	377	4	44	20	17
L	11	L05 B3	B	378	5	44	21	0
L	11	L06 C1	C	379	6	44	21	1
L	11	L07 C2	C	380	7	44	21	2
L	11	L08 C3	C	381	8	44	21	3
L	11	L09 D1	D	382	9	44	21	4
L	11	L10 D2	D	383	10	44	21	5
L	11	L11D3	D	384	11	44	21	6
L	11	L12E1	E	385	12	44	21	7
L	11	L13E2	E	386	13	44	21	8
L	11	L14E3	E	387	14	44	21	9
L	11	L15E4	E	388	15	44	21	10
L	11	L16F1	F	389	16	44	21	11
L	11	L17F2	F	390	17	44	21	12
L	11	L18F3	F	391	18	44	21	13
L	11	L19G1	G	392	19	44	21	14
L	11	L20 G2	G	393	20	44	21	15
L	11	L21 G3	G	394	21	44	21	16
L	11	L22 H1	H	395	22	44	21	17
L	11	L23 H2	H	396	23	44	22	0
L	11	L24 H3	H	397	24	44	22	1
L	11	L25I1	I	398	25	44	22	2
L	11	L26I2	I	399	26	44	22	3
L	11	L27I3	I	400	27	44	22	4
L	11	L28J1	J	401	28	44	22	5
L	11	L29 J2	J	402	29	44	22	6
L	11	L30 J3	J	403	30	44	22	7
L	11	L31 J4	J	404	31	44	22	8

Row	rowIndex	Label	Slice	Speaker Index	grpIndex	Amount	Controller ID	Channel
L	11	L32 K1	K	405	32	44	22	9
L	11	L33 K2	K	406	33	44	22	10
L	11	L34 K3	K	407	34	44	22	11
L	11	L35L1	L	408	35	44	22	12
L	11	L36 L2	L	409	36	44	22	13
L	11	L37 L3	L	410	37	44	22	14
L	11	L38 M1	M	411	38	44	22	15
L	11	L39 M2	M	412	39	44	22	16
L	11	L40 M3	M	413	40	44	22	17
L	11	L41 N1	N	414	41	44	23	0
L	11	L42 N2	N	415	42	44	23	1
L	11	L43 N3	N	416	43	44	23	2
M	12	M00 A1	A	417	0	45	23	3
M	12	M01 A2	A	418	1	45	23	4
M	12	M02 A3	A	419	2	45	23	5
M	12	M03 B1	B	420	3	45	23	6
M	12	M04 B2	B	421	4	45	23	7
M	12	M05 B3	B	422	5	45	23	8
M	12	M06 B4	B	423	6	45	23	9
M	12	M07 C1	C	424	7	45	23	10
M	12	M08 C2	C	425	8	45	23	11
M	12	M09 C3	C	426	9	45	23	12
M	12	M10 D1	D	427	10	45	23	13
M	12	M11 D2	D	428	11	45	23	14
M	12	M12 D3	D	429	12	45	23	15
M	12	M13 E1	E	430	13	45	23	16
M	12	M14 E2	E	431	14	45	23	17
M	12	M15 E3	E	432	15	45	24	0
M	12	M16 F1	F	433	16	45	24	1
M	12	M17 F2	F	434	17	45	24	2
M	12	M18 F3	F	435	18	45	24	3
M	12	M19 G1	G	436	19	45	24	4
M	12	M20 G2	G	437	20	45	24	5
M	12	M21 G3	G	438	21	45	24	6

Row	rowIndex	Label	Slice	Speaker Index	grpIndex	Amount	Controller ID	Channel
M	12	M22 G4	G	439	22	45	24	7
M	12	M23 H1	H	440	23	45	24	8
M	12	M24 H2	H	441	24	45	24	9
M	12	M25 H3	H	442	25	45	24	10
M	12	M26 I1	I	443	26	45	24	11
M	12	M27 I2	I	444	27	45	24	12
M	12	M28 I3	I	445	28	45	24	13
M	12	M29 J1	J	446	29	45	24	14
M	12	M30 J2	J	447	30	45	24	15
M	12	M31 J3	J	448	31	45	24	16
M	12	M32 K1	K	449	32	45	24	17
M	12	M33 K2	K	450	33	45	25	0
M	12	M34 K3	K	451	34	45	25	1
M	12	M35 L1	L	452	35	45	25	2
M	12	M36 L2	L	453	36	45	25	3
M	12	M37 L3	L	454	37	45	25	4
M	12	M38 M1	M	455	38	45	25	5
M	12	M39 M2	M	456	39	45	25	6
M	12	M40 M3	M	457	40	45	25	7
M	12	M41 M4	M	458	41	45	25	8
M	12	M42 N1	N	459	42	45	25	9
M	12	M43 N2	N	460	43	45	25	10
M	12	M44 N3	N	461	44	45	25	11
N	13	N00 A1	A	462	0	44	25	12
N	13	N01 A2	A	463	1	44	25	13
N	13	N02 A3	A	464	2	44	25	14
N	13	N03 B1	B	465	3	44	25	15
N	13	N04 B2	B	466	4	44	25	16
N	13	N05 B3	B	467	5	44	25	17
N	13	N06 C1	C	468	6	44	26	0
N	13	N07 C2	C	469	7	44	26	1
N	13	N08 C3	C	470	8	44	26	2
N	13	N09 D1	D	471	9	44	26	3
N	13	N10 D2	D	472	10	44	26	4

Row	rowIndex	Label	Slice	Speaker Index	grpIndex	Amount	Controller ID	Channel
N	13	N11 D3	D	473	11	44	26	5
N	13	N12 E1	E	474	12	44	26	6
N	13	N13 E2	E	475	13	44	26	7
N	13	N14 E3	E	476	14	44	26	8
N	13	N15 E4	E	477	15	44	26	9
N	13	N16 F1	F	478	16	44	26	10
N	13	N17 F2	F	479	17	44	26	11
N	13	N18 F3	F	480	18	44	26	12
N	13	N19 G1	G	481	19	44	26	13
N	13	N20 G2	G	482	20	44	26	14
N	13	N21 G3	G	483	21	44	26	15
N	13	N22 H1	H	484	22	44	26	16
N	13	N23 H2	H	485	23	44	26	17
N	13	N24 H3	H	486	24	44	27	0
N	13	N25I1	I	487	25	44	27	1
N	13	N26I2	I	488	26	44	27	2
N	13	N27I3	I	489	27	44	27	3
N	13	N28 J1	J	490	28	44	27	4
N	13	N29 J2	J	491	29	44	27	5
N	13	N30 J3	J	492	30	44	27	6
N	13	N31 J4	J	493	31	44	27	7
N	13	N32 K1	K	494	32	44	27	8
N	13	N33 K2	K	495	33	44	27	9
N	13	N34 K3	K	496	34	44	27	10
N	13	N35 L1	L	497	35	44	27	11
N	13	N36 L2	L	498	36	44	27	12
N	13	N37 L3	L	499	37	44	27	13
N	13	N38 M1	M	500	38	44	27	14
N	13	N39 M2	M	501	39	44	27	15
N	13	N40 M3	M	502	40	44	27	16
N	13	N41 N1	N	503	41	44	27	17
N	13	N42 N2	N	504	42	44	28	0
N	13	N43 N3	N	505	43	44	28	1
O	14	O00 A1	A	506	0	45	28	2

Row	rowIndex	Label	Slice	Speaker Index	grpIndex	Amount	Controller ID	Channel
O	14	O01 A2	A	507	1	45	28	3
O	14	O02 A3	A	508	2	45	28	4
O	14	O03 A4	A	509	3	45	28	5
O	14	O04 B1	B	510	4	45	28	6
O	14	O05 B2	B	511	5	45	28	7
O	14	O06 B3	B	512	6	45	28	8
O	14	O07 C1	C	513	7	45	28	9
O	14	O08 C2	C	514	8	45	28	10
O	14	O09 C3	C	515	9	45	28	11
O	14	O10 D1	D	516	10	45	28	12
O	14	O11 D2	D	517	11	45	28	13
O	14	O12 D3	D	518	12	45	28	14
O	14	O13 E1	E	519	13	45	28	15
O	14	O14 E2	E	520	14	45	28	16
O	14	O15 E3	E	521	15	45	28	17
O	14	O16 F1	F	522	16	45	29	0
O	14	O17 F2	F	523	17	45	29	1
O	14	O18 F3	F	524	18	45	29	2
O	14	O19 G1	G	525	19	45	29	3
O	14	O20 G2	G	526	20	45	29	4
O	14	O21 G3	G	527	21	45	29	5
O	14	O22 H1	H	528	22	45	29	6
O	14	O23 H2	H	529	23	45	29	7
O	14	O24 H3	H	530	24	45	29	8
O	14	O25 H4	H	531	25	45	29	9
O	14	O26 I1	I	532	26	45	29	10
O	14	O27 I2	I	533	27	45	29	11
O	14	O28 I3	I	534	28	45	29	12
O	14	O29 J1	J	535	29	45	29	13
O	14	O30 J2	J	536	30	45	29	14
O	14	O31 J3	J	537	31	45	29	15
O	14	O32 K1	K	538	32	45	29	16
O	14	O33 K2	K	539	33	45	29	17
O	14	O34 K3	K	540	34	45	30	0

Row	rowIndex	Label	Slice	Speaker Index	grpIndex	Amount	Controller ID	Channel
O	14	O35 L1	L	541	35	45	30	1
O	14	O36 L2	L	542	36	45	30	2
O	14	O37 L3	L	543	37	45	30	3
O	14	O38 M1	M	544	38	45	30	4
O	14	O39 M2	M	545	39	45	30	5
O	14	O40 M3	M	546	40	45	30	6
O	14	O41 N1	N	547	41	45	30	7
O	14	O42 N2	N	548	42	45	30	8
O	14	O43 N3	N	549	43	45	30	9
O	14	O44 N4	N	550	44	45	30	10
P	15	P00 A1	A	551	0	43	30	11
P	15	P01 A2	A	552	1	43	30	12
P	15	P02 A3	A	553	2	43	30	13
P	15	P03 B1	B	554	3	43	30	14
P	15	P04 B2	B	555	4	43	30	15
P	15	P05 B3	B	556	5	43	30	16
P	15	P06 C1	C	557	6	43	30	17
P	15	P07 C2	C	558	7	43	31	0
P	15	P08 C3	C	559	8	43	31	1
P	15	P09 D1	D	560	9	43	31	2
P	15	P10 D2	D	561	10	43	31	3
P	15	P11 D3	D	562	11	43	31	4
P	15	P12 D4	D	563	12	43	31	5
P	15	P13E1	E	564	13	43	31	6
P	15	P14 E2	E	565	14	43	31	7
P	15	P15 E3	E	566	15	43	31	8
P	15	P16F1	F	567	16	43	31	9
P	15	P17F2	F	568	17	43	31	10
P	15	P18 F3	F	569	18	43	31	11
P	15	P19 G1	G	570	19	43	31	12
P	15	P20 G2	G	571	20	43	31	13
P	15	P21 G3	G	572	21	43	31	14
P	15	P22 H1	H	573	22	43	31	15
P	15	P23 H2	H	574	23	43	31	16

Row	rowIndex	Label	Slice	Speaker Index	grpIndex	Amount	Controller ID	Channel
P	15	P24 H3	H	575	24	43	31	17
P	15	P25 I1	I	576	25	43	32	0
P	15	P26 I2	I	577	26	43	32	1
P	15	P27 I3	I	578	27	43	32	2
P	15	P28 J1	J	579	28	43	32	3
P	15	P29 J2	J	580	29	43	32	4
P	15	P30 J3	J	581	30	43	32	5
P	15	P31 K1	K	582	31	43	32	6
P	15	P32 K2	K	583	32	43	32	7
P	15	P33 K3	K	584	33	43	32	8
P	15	P34 L1	L	585	34	43	32	9
P	15	P35 L2	L	586	35	43	32	10
P	15	P36 L3	L	587	36	43	32	11
P	15	P37 M1	M	588	37	43	32	12
P	15	P38 M2	M	589	38	43	32	13
P	15	P39 M3	M	590	39	43	32	14
P	15	P40 N1	N	591	40	43	32	15
P	15	P41 N2	N	592	41	43	32	16
P	15	P42 N3	N	593	42	43	32	17
Q	16	Q00 A1	A	594	0	43	33	0
Q	16	Q01 A2	A	595	1	43	33	1
Q	16	Q02 A3	A	596	2	43	33	2
Q	16	Q03 B1	B	597	3	43	33	3
Q	16	Q04 B2	B	598	4	43	33	4
Q	16	Q05 B3	B	599	5	43	33	5
Q	16	Q06 C1	C	600	6	43	33	6
Q	16	Q07 C2	C	601	7	43	33	7
Q	16	Q08 C3	C	602	8	43	33	8
Q	16	Q09 D1	D	603	9	43	33	9
Q	16	Q10 D2	D	604	10	43	33	10
Q	16	Q11 D3	D	605	11	43	33	11
Q	16	Q12 E1	E	606	12	43	33	12
Q	16	Q13 E2	E	607	13	43	33	13
Q	16	Q14 E3	E	608	14	43	33	14

Row	rowIndex	Label	Slice	Speaker Index	grpIndex	Amount	Controller ID	Channel
Q	16	Q15 F1	F	609	15	43	33	15
Q	16	Q16 F2	F	610	16	43	33	16
Q	16	Q17 F3	F	611	17	43	33	17
Q	16	Q18 G1	G	612	18	43	34	0
Q	16	Q19 G2	G	613	19	43	34	1
Q	16	Q20 G3	G	614	20	43	34	2
Q	16	Q21 G4	G	615	21	43	34	3
Q	16	Q22 H1	H	616	22	43	34	4
Q	16	Q23 H2	H	617	23	43	34	5
Q	16	Q24 H3	H	618	24	43	34	6
Q	16	Q25I1	I	619	25	43	34	7
Q	16	Q26I2	I	620	26	43	34	8
Q	16	Q27I3	I	621	27	43	34	9
Q	16	Q28 J1	J	622	28	43	34	10
Q	16	Q29 J2	J	623	29	43	34	11
Q	16	Q30 J3	J	624	30	43	34	12
Q	16	Q31 K1	K	625	31	43	34	13
Q	16	Q32 K2	K	626	32	43	34	14
Q	16	Q33 K3	K	627	33	43	34	15
Q	16	Q34 L1	L	628	34	43	34	16
Q	16	Q35 L2	L	629	35	43	34	17
Q	16	Q36 L3	L	630	36	43	35	0
Q	16	Q37 M1	M	631	37	43	35	1
Q	16	Q38 M2	M	632	38	43	35	2
Q	16	Q39 M3	M	633	39	43	35	3
Q	16	Q40 N1	N	634	40	43	35	4
Q	16	Q41 N2	N	635	41	43	35	5
Q	16	Q42 N3	N	636	42	43	35	6
R	17	R00 A1	A	637	0	42	35	7
R	17	R01 A2	A	638	1	42	35	8
R	17	R02 A3	A	639	2	42	35	9
R	17	R03 B1	B	640	3	42	35	10
R	17	R04 B2	B	641	4	42	35	11
R	17	R05 B3	B	642	5	42	35	12

Row	rowIndex	Label	Slice	Speaker Index	grpIndex	Amount	Controller ID	Channel
R	17	R06 C1	C	643	6	42	35	13
R	17	R07 C2	C	644	7	42	35	14
R	17	R08 C3	C	645	8	42	35	15
R	17	R09 D1	D	646	9	42	35	16
R	17	R10 D2	D	647	10	42	35	17
R	17	R11 D3	D	648	11	42	36	0
R	17	R12E1	E	649	12	42	36	1
R	17	R13 E2	E	650	13	42	36	2
R	17	R14 E3	E	651	14	42	36	3
R	17	R15F1	F	652	15	42	36	4
R	17	R16 F2	F	653	16	42	36	5
R	17	R17 F3	F	654	17	42	36	6
R	17	R18 G1	G	655	18	42	36	7
R	17	R19 G2	G	656	19	42	36	8
R	17	R20 G3	G	657	20	42	36	9
R	17	R21 H1	H	658	21	42	36	10
R	17	R22 H2	H	659	22	42	36	11
R	17	R23 H3	H	660	23	42	36	12
R	17	R24I1	I	661	24	42	36	13
R	17	R25I2	I	662	25	42	36	14
R	17	R26I3	I	663	26	42	36	15
R	17	R27J1	J	664	27	42	36	16
R	17	R28 J2	J	665	28	42	36	17
R	17	R29 J3	J	666	29	42	37	0
R	17	R30 K1	K	667	30	42	37	1
R	17	R31 K2	K	668	31	42	37	2
R	17	R32 K3	K	669	32	42	37	3
R	17	R33 L1	L	670	33	42	37	4
R	17	R34 L2	L	671	34	42	37	5
R	17	R35 L3	L	672	35	42	37	6
R	17	R36 M1	M	673	36	42	37	7
R	17	R37 M2	M	674	37	42	37	8
R	17	R38 M3	M	675	38	42	37	9
R	17	R39 N1	N	676	39	42	37	10

Row	rowIndex	Label	Slice	Speaker Index	grpIndex	Amount	Controller ID	Channel
R	17	R40 N2	N	677	40	42	37	11
R	17	R41 N3	N	678	41	42	37	12
S	18	S00 A1	A	679	0	39	37	13
S	18	S01 A2	A	680	1	39	37	14
S	18	S02 B1	B	681	2	39	37	15
S	18	S03 B2	B	682	3	39	37	16
S	18	S04 B3	B	683	4	39	37	17
S	18	S05 C1	C	684	5	39	38	0
S	18	S06 C2	C	685	6	39	38	1
S	18	S07 C3	C	686	7	39	38	2
S	18	S08 D1	D	687	8	39	38	3
S	18	S09 D2	D	688	9	39	38	4
S	18	S10 D3	D	689	10	39	38	5
S	18	S11E1	E	690	11	39	38	6
S	18	S12E2	E	691	12	39	38	7
S	18	S13 E3	E	692	13	39	38	8
S	18	S14F1	F	693	14	39	38	9
S	18	S15 F2	F	694	15	39	38	10
S	18	S16 F3	F	695	16	39	38	11
S	18	S17 G1	G	696	17	39	38	12
S	18	S18 G2	G	697	18	39	38	13
S	18	S19 H1	H	698	19	39	38	14
S	18	S20 H2	H	699	20	39	38	15
S	18	S21 H3	H	700	21	39	38	16
S	18	S22I1	I	701	22	39	38	17
S	18	S23I2	I	702	23	39	39	0
S	18	S24I3	I	703	24	39	39	1
S	18	S25 J1	J	704	25	39	39	2
S	18	S26 J2	J	705	26	39	39	3
S	18	S27 J3	J	706	27	39	39	4
S	18	S28 K1	K	707	28	39	39	5
S	18	S29 K2	K	708	29	39	39	6
S	18	S30 K3	K	709	30	39	39	7
S	18	S31L1	L	710	31	39	39	8

Row	rowIndex	Label	Slice	Speaker Index	grpIndex	Amount	Controller ID	Channel
S	18	S32 L2	L	711	32	39	39	9
S	18	S33 L3	L	712	33	39	39	10
S	18	S34 M1	M	713	34	39	39	11
S	18	S35 M2	M	714	35	39	39	12
S	18	S36 M3	M	715	36	39	39	13
S	18	S37 N1	N	716	37	39	39	14
S	18	S38 N2	N	717	38	39	39	15
T	19	T00 A1	A	718	0	43	39	16
T	19	T01 A2	A	719	1	43	39	17
T	19	T02 A3	A	720	2	43	40	0
T	19	T03 B1	B	721	3	43	40	1
T	19	T04 B2	B	722	4	43	40	2
T	19	T05 C1	C	723	5	43	40	3
T	19	T06 C2	C	724	6	43	40	4
T	19	T07 C3	C	725	7	43	40	5
T	19	T08 D1	D	726	8	43	40	6
T	19	T09 D2	D	727	9	43	40	7
T	19	T10 D3	D	728	10	43	40	8
T	19	T11E1	E	729	11	43	40	9
T	19	T12E2	E	730	12	43	40	10
T	19	T13F1	F	731	13	43	40	11
T	19	T14 F2	F	732	14	43	40	12
T	19	T15 F3	F	733	15	43	40	13
T	19	T16 G1	G	734	16	43	40	14
T	19	T17 G2	G	735	17	43	40	15
T	19	T18 G3	G	736	18	43	40	16
T	19	T19 H1	H	737	19	43	40	17
T	19	T20 H2	H	738	20	43	41	0
T	19	T21 H3	H	739	21	43	41	1
T	19	T22I1	I	740	22	43	41	2
T	19	T23I2	I	741	23	43	41	3
T	19	T24I3	I	742	24	43	41	4
T	19	T25 J1	J	743	25	43	41	5
T	19	T26 J2	J	744	26	43	41	6

Row	rowIndex	Label	Slice	Speaker Index	grpIndex	Amount	Controller ID	Channel
T	19	T27 K1	K	745	27	43	41	7
T	19	T28 K2	K	746	28	43	41	8
T	19	T29 K3	K	747	29	43	41	9
T	19	T30 L1	L	748	30	43	41	10
T	19	T31 L2	L	749	31	43	41	11
T	19	T32 L3	L	750	32	43	41	12
T	19	T33 M1	M	751	33	43	41	13
T	19	T34 M2	M	752	34	43	41	14
T	19	T35 N1	N	753	35	43	41	15
T	19	T36 N2	N	754	36	43	41	16
T	19	T37 N3	N	755	37	43	41	17
T	19	T38 O1	O	756	38	43	42	0
T	19	T39 O2	O	757	39	43	42	1
T	19	T40 O3	O	758	40	43	42	2
T	19	T41P1	P	759	41	43	42	3
T	19	T42 P2	P	760	42	43	42	4
U	20	U00 A1	A	761	0	41	42	5
U	20	U01 A2	A	762	1	41	42	6
U	20	U02 B1	B	763	2	41	42	7
U	20	U03 B2	B	764	3	41	42	8
U	20	U04 B3	B	765	4	41	42	9
U	20	U05 C1	C	766	5	41	42	10
U	20	U06 C2	C	767	6	41	42	11
U	20	U07 D1	D	768	7	41	42	12
U	20	U08 D2	D	769	8	41	42	13
U	20	U09 D3	D	770	9	41	42	14
U	20	U10 E1	E	771	10	41	42	15
U	20	U11E2	E	772	11	41	42	16
U	20	U12F1	F	773	12	41	42	17
U	20	U13 F2	F	774	13	41	43	0
U	20	U14 F3	F	775	14	41	43	1
U	20	U15 G1	G	776	15	41	43	2
U	20	U16 G2	G	777	16	41	43	3
U	20	U17 G3	G	778	17	41	43	4

Row	rowIndex	Label	Slice	Speaker Index	grpIndex	Amount	Controller ID	Channel
U	20	U18 H1	H	779	18	41	43	5
U	20	U19 H2	H	780	19	41	43	6
U	20	U20I1	I	781	20	41	43	7
U	20	U21I2	I	782	21	41	43	8
U	20	U22I3	I	783	22	41	43	9
U	20	U23 J1	J	784	23	41	43	10
U	20	U24 J2	J	785	24	41	43	11
U	20	U25 K1	K	786	25	41	43	12
U	20	U26 K2	K	787	26	41	43	13
U	20	U27 K3	K	788	27	41	43	14
U	20	U28 L1	L	789	28	41	43	15
U	20	U29 L2	L	790	29	41	43	16
U	20	U30 M1	M	791	30	41	43	17
U	20	U31 M2	M	792	31	41	44	0
U	20	U32 M3	M	793	32	41	44	1
U	20	U33 N1	N	794	33	41	44	2
U	20	U34 N2	N	795	34	41	44	3
U	20	U35 O1	O	796	35	41	44	4
U	20	U36 O2	O	797	36	41	44	5
U	20	U37 O3	O	798	37	41	44	6
U	20	U38 P1	P	799	38	41	44	7
U	20	U39 P2	P	800	39	41	44	8
U	20	U40 P3	P	801	40	41	44	9
V	21	V00 A1	A	802	0	39	44	10
V	21	V01 A2	A	803	1	39	44	11
V	21	V02 B1	B	804	2	39	44	12
V	21	V03 B2	B	805	3	39	44	13
V	21	V04 B3	B	806	4	39	44	14
V	21	V05 C1	C	807	5	39	44	15
V	21	V06 C2	C	808	6	39	44	16
V	21	V07 D1	D	809	7	39	44	17
V	21	V08 D2	D	810	8	39	45	0
V	21	V09 D3	D	811	9	39	45	1
V	21	V10E1	E	812	10	39	45	2

Row	rowIndex	Label	Slice	Speaker Index	grpIndex	Amount	Controller ID	Channel
V	21	V11E2	E	813	11	39	45	3
V	21	V12F1	F	814	12	39	45	4
V	21	V13 F2	F	815	13	39	45	5
V	21	V14 G1	G	816	14	39	45	6
V	21	V15 G2	G	817	15	39	45	7
V	21	V16 G3	G	818	16	39	45	8
V	21	V17 H1	H	819	17	39	45	9
V	21	V18 H2	H	820	18	39	45	10
V	21	V19 H3	H	821	19	39	45	11
V	21	V20I1	I	822	20	39	45	12
V	21	V21I2	I	823	21	39	45	13
V	21	V22J1	J	824	22	39	45	14
V	21	V23 J2	J	825	23	39	45	15
V	21	V24 K1	K	826	24	39	45	16
V	21	V25 K2	K	827	25	39	45	17
V	21	V26 K3	K	828	26	39	46	0
V	21	V27L1	L	829	27	39	46	1
V	21	V28 L2	L	830	28	39	46	2
V	21	V29 M1	M	831	29	39	46	3
V	21	V30 M2	M	832	30	39	46	4
V	21	V31 M3	M	833	31	39	46	5
V	21	V32 N1	N	834	32	39	46	6
V	21	V33 N2	N	835	33	39	46	7
V	21	V34 O1	O	836	34	39	46	8
V	21	V35 O2	O	837	35	39	46	9
V	21	V36 P1	P	838	36	39	46	10
V	21	V37 P2	P	839	37	39	46	11
V	21	V38 P3	P	840	38	39	46	12
W	22	W00 A1	A	841	0	35	46	13
W	22	W01 A2	A	842	1	35	46	14
W	22	W02 B1	B	843	2	35	46	15
W	22	W03 B2	B	844	3	35	46	16
W	22	W04 B3	B	845	4	35	46	17
W	22	W05 C1	C	846	5	35	47	0

Row	rowIndex	Label	Slice	Speaker Index	grpIndex	Amount	Controller ID	Channel
W	22	W06 C2	C	847	6	35	47	1
W	22	W07 D1	D	848	7	35	47	2
W	22	W08 D2	D	849	8	35	47	3
W	22	W09 E1	E	850	9	35	47	4
W	22	W10 E2	E	851	10	35	47	5
W	22	W11 F1	F	852	11	35	47	6
W	22	W12 F2	F	853	12	35	47	7
W	22	W13 G1	G	854	13	35	47	8
W	22	W14 G2	G	855	14	35	47	9
W	22	W15 H1	H	856	15	35	47	10
W	22	W16 H2	H	857	16	35	47	11
W	22	W17 H3	H	858	17	35	47	12
W	22	W18I1	I	859	18	35	47	13
W	22	W19 I2	I	860	19	35	47	14
W	22	W20 J1	J	861	20	35	47	15
W	22	W21 J2	J	862	21	35	47	16
W	22	W22 K1	K	863	22	35	47	17
W	22	W23 K2	K	864	23	35	48	0
W	22	W24 L1	L	865	24	35	48	1
W	22	W25 L2	L	866	25	35	48	2
W	22	W26 L3	L	867	26	35	48	3
W	22	W27 M1	M	868	27	35	48	4
W	22	W28 M2	M	869	28	35	48	5
W	22	W29 N1	N	870	29	35	48	6
W	22	W30 N2	N	871	30	35	48	7
W	22	W31 O1	O	872	31	35	48	8
W	22	W32 O2	O	873	32	35	48	9
W	22	W33 P1	P	874	33	35	48	10
W	22	W34 P2	P	875	34	35	48	11
X	23	X00 A1	A	876	0	32	48	12
X	23	X01 A2	A	877	1	32	48	13
X	23	X02 B1	B	878	2	32	48	14
X	23	X03 B2	B	879	3	32	48	15
X	23	X04 C1	C	880	4	32	48	16

Row	rowIndex	Label	Slice	Speaker Index	grpIndex	Amount	Controller ID	Channel
X	23	X05 C2	C	881	5	32	48	17
X	23	X06 D1	D	882	6	32	49	0
X	23	X07 D2	D	883	7	32	49	1
X	23	X08 E1	E	884	8	32	49	2
X	23	X09 E2	E	885	9	32	49	3
X	23	X10F1	F	886	10	32	49	4
X	23	X11F2	F	887	11	32	49	5
X	23	X12 G1	G	888	12	32	49	6
X	23	X13 G2	G	889	13	32	49	7
X	23	X14 H1	H	890	14	32	49	8
X	23	X15 H2	H	891	15	32	49	9
X	23	X16I1	I	892	16	32	49	10
X	23	X17I2	I	893	17	32	49	11
X	23	X18J1	J	894	18	32	49	12
X	23	X19 J2	J	895	19	32	49	13
X	23	X20 K1	K	896	20	32	49	14
X	23	X21 K2	K	897	21	32	49	15
X	23	X22L1	L	898	22	32	49	16
X	23	X23 L2	L	899	23	32	49	17
X	23	X24 M1	M	900	24	32	50	0
X	23	X25 M2	M	901	25	32	50	1
X	23	X26 N1	N	902	26	32	50	2
X	23	X27 N2	N	903	27	32	50	3
X	23	X28 O1	O	904	28	32	50	4
X	23	X29 O2	O	905	29	32	50	5
X	23	X30 P1	P	906	30	32	50	6
X	23	X31 P2	P	907	31	32	50	7
Y	24	Y00 A1	A	908	0	28	50	8
Y	24	Y01 A2	A	909	1	28	50	9
Y	24	Y02 B1	B	910	2	28	50	10
Y	24	Y03 B2	B	911	3	28	50	11
Y	24	Y04 C1	C	912	4	28	50	12
Y	24	Y05 D1	D	913	5	28	50	13
Y	24	Y06 D2	D	914	6	28	50	14

Row	rowIndex	Label	Slice	Speaker Index	grpIndex	Amount	Controller ID	Channel
Y	24	Y07 E1	E	915	7	28	50	15
Y	24	Y08 E2	E	916	8	28	50	16
Y	24	Y09 F1	F	917	9	28	50	17
Y	24	Y10 F2	F	918	10	28	51	0
Y	24	Y11G1	G	919	11	28	51	1
Y	24	Y12 G2	G	920	12	28	51	2
Y	24	Y13 H1	H	921	13	28	51	3
Y	24	Y14I1	I	922	14	28	51	4
Y	24	Y15I2	I	923	15	28	51	5
Y	24	Y16J1	J	924	16	28	51	6
Y	24	Y17J2	J	925	17	28	51	7
Y	24	Y18 K1	K	926	18	28	51	8
Y	24	Y19 K2	K	927	19	28	51	9
Y	24	Y20L1	L	928	20	28	51	10
Y	24	Y21 M1	M	929	21	28	51	11
Y	24	Y22 M2	M	930	22	28	51	12
Y	24	Y23 N1	N	931	23	28	51	13
Y	24	Y24 N2	N	932	24	28	51	14
Y	24	Y25 O1	O	933	25	28	51	15
Y	24	Y26 O2	O	934	26	28	51	16
Y	24	Y27 P1	P	935	27	28	51	17
Z	25	Z00 A1	A	936	0	25	52	0
Z	25	Z01 A2	A	937	1	25	52	1
Z	25	Z02 B1	B	938	2	25	52	2
Z	25	Z03 C1	C	939	3	25	52	3
Z	25	Z04 C2	C	940	4	25	52	4
Z	25	Z05 D1	D	941	5	25	52	5
Z	25	Z06 E1	E	942	6	25	52	6
Z	25	Z07 E2	E	943	7	25	52	7
Z	25	Z08 F1	F	944	8	25	52	8
Z	25	Z09 G1	G	945	9	25	52	9
Z	25	Z10 G2	G	946	10	25	52	10
Z	25	Z11H1	H	947	11	25	52	11
Z	25	Z12 H2	H	948	12	25	52	12

Row	rowIndex	Label	Slice	Speaker Index	grpIndex	Amount	Controller ID	Channel
Z	25	Z13I1	I	949	13	25	52	13
Z	25	Z14J1	J	950	14	25	52	14
Z	25	Z15 J2	J	951	15	25	52	15
Z	25	Z16 K1	K	952	16	25	52	16
Z	25	Z17L1	L	953	17	25	52	17
Z	25	Z18 L2	L	954	18	25	53	0
Z	25	Z19 M1	M	955	19	25	53	1
Z	25	Z20 N1	N	956	20	25	53	2
Z	25	Z21 N2	N	957	21	25	53	3
Z	25	Z22 O1	O	958	22	25	53	4
Z	25	Z23 P1	P	959	23	25	53	5
Z	25	Z24 P2	P	960	24	25	53	6
AA	26	AA00 A1	A	961	0	21	53	7
AA	26	AA01 B1	B	962	1	21	53	8
AA	26	AA02 B2	B	963	2	21	53	9
AA	26	AA03 C1	C	964	3	21	53	10
AA	26	AA04 D1	D	965	4	21	53	11
AA	26	AA05 E1	E	966	5	21	53	12
AA	26	AA06 E2	E	967	6	21	53	13
AA	26	AA07 F1	F	968	7	21	53	14
AA	26	AA08 G1	G	969	8	21	53	15
AA	26	AA09 H1	H	970	9	21	53	16
AA	26	AA10 H2	H	971	10	21	53	17
AA	26	AA11 I1	I	972	11	21	54	0
AA	26	AA12 J1	J	973	12	21	54	1
AA	26	AA13 K1	K	974	13	21	54	2
AA	26	AA14 K2	K	975	14	21	54	3
AA	26	AA15 L1	L	976	15	21	54	4
AA	26	AA16 M1	M	977	16	21	54	5
AA	26	AA17 N1	N	978	17	21	54	6
AA	26	AA18 N2	N	979	18	21	54	7
AA	26	AA19 O1	O	980	19	21	54	8
AA	26	AA20 P1	P	981	20	21	54	9
BB	27	BB00 A1	A	982	0	17	54	10

Row	rowIndex	Label	Slice	Speaker Index	grpIndex	Amount	Controller ID	Channel
BB	27	BB01 B1	B	983	1	17	54	11
BB	27	BB02 C1	C	984	2	17	54	12
BB	27	BB03 D1	D	985	3	17	54	13
BB	27	BB04 E1	E	986	4	17	54	14
BB	27	BB05 F1	F	987	5	17	54	15
BB	27	BB06 G1	G	988	6	17	54	16
BB	27	BB07 H1	H	989	7	17	54	17
BB	27	BB08 I1	I	990	8	17	55	0
BB	27	BB09 J1	J	991	9	17	55	1
BB	27	BB10 K1	K	992	10	17	55	2
BB	27	BB11 L1	L	993	11	17	55	3
BB	27	BB12 M1	M	994	12	17	55	4
BB	27	BB13 N1	N	995	13	17	55	5
BB	27	BB14 O1	O	996	14	17	55	6
BB	27	BB15 O2	O	997	15	17	55	7
BB	27	BB16 P1	P	998	16	17	55	8
CC	28	CC00 A1	A	999	0	13	55	9
CC	28	CC01 C1	C	1000	1	13	55	10
CC	28	CC02 D1	D	1001	2	13	55	11
CC	28	CC03 E1	E	1002	3	13	55	12
CC	28	CC04 F1	F	1003	4	13	55	13
CC	28	CC05 G1	G	1004	5	13	55	14
CC	28	CC06 I1	I	1005	6	13	55	15
CC	28	CC07 J1	J	1006	7	13	55	16
CC	28	CC08 K1	K	1007	8	13	55	17
CC	28	CC09 L1	L	1008	9	13	56	0
CC	28	CC10 N1	N	1009	10	13	56	1
CC	28	CC11 O1	O	1010	11	13	56	2
CC	28	CC12 P1	P	1011	12	13	56	3
DD	29	DD00 A1	A	1012	0	9	56	4
DD	29	DD01 C1	C	1013	1	9	56	5
DD	29	DD02 E1	E	1014	2	9	56	6
DD	29	DD03 G1	G	1015	3	9	56	7
DD	29	DD04 H1	H	1016	4	9	56	8

Row	rowIndex	Label	Slice	Speaker Index	grpIndex	Amount	Controller ID	Channel
DD	29	DD05 J1	J	1017	5	9	56	9
DD	29	DD06 L1	L	1018	6	9	56	10
DD	29	DD07 N1	N	1019	7	9	56	11
DD	29	DD08 P1	P	1020	8	9	56	12
EE	30	EE00 Z0	Z	1021	0	0	56	13
//following speakers are not actually present but we use those ports and IP devices as spare								
//overwrite x y z location with the speaker you want to replace in the device and port you plugged the cable in to								
XX	31	A00 B1	B	1022	0	22	56	14
XX	31	A01 B2	B	1023	1	22	56	15
XX	31	A02 C1	C	1024	2	22	56	16
XX	31	A03 D1	D	1025	3	22	56	17
XX	31	A04 D2	D	1026	4	22	57	0
XX	31	A05 E1	E	1027	5	22	57	1
XX	31	A06 F1	F	1028	6	22	57	2
XX	31	A07 F2	F	1029	7	22	57	3
XX	31	A08 G1	G	1030	8	22	57	4
XX	31	A09 G2	G	1031	9	22	57	5
XX	31	A10 H1	H	1032	10	22	57	6
XX	31	A11 I1	I	1033	11	22	57	7
XX	31	A12 I2	I	1034	12	22	57	8
XX	31	N00 A1	A	1035	13	22	57	9
XX	31	A14 K1	K	1036	14	22	57	10
XX	31	A15 K2	K	1037	15	22	57	11
XX	31	A16 L1	L	1038	16	22	57	12
XX	31	A17 M1	M	1039	17	22	57	13
XX	31	A14 K1	K	1036	18	22	57	14
XX	31	A15 K2	K	1037	19	22	57	15
XX	31	A16 L1	L	1038	20	22	57	16
XX	31	A17 M1	M	1039	21	22	57	17

APPENDIX IV - ASSEMBLY OF SPHERE

For **assembly** please refer to installation videos accessible on the artwork webpage: https://www.lozano-hemmer.com/sphere_packing_bach.php for contextualised visual support.

Required tools

Forklift, a gantry crane or a 3 meter long beam above the sphere: for lifting each of the sphere's quarters, one at a time.

At least two lifting slings: to pull and guide the sphere sections.

Stand alone mobile structure: for hanging support of top quarter pieces and mainly to lift the dome to the top of the sphere

4'x8' masonite boards x 6 (4 minimum for underneath the structure): these are placed first to be able to manoeuvre and move the sphere slightly

Cotton gloves: to manipulate all parts while avoiding marking and leaving residues onto surfaces.

Important Notes Before Beginning Assembly

The sphere is assembled without being screwed into the floor. That is the last step.

With the help of 4 to 6 people, it is quite easy to gently move the sphere around across a hard surface. The room in which the sphere resides has carpeting which makes it very difficult to move it around for micro-adjustments once it is in place. That is why it is necessary to place masonite beneath the sphere.

Uncrating

Please keep in mind that the wooden slats have fragile edges and are fragile in general

There are 8 quarters of the sphere and one top part that we call the dome. The 8 pieces are held onto plywood structures. There are 4 parts that contain all the cables which are situated onto dollies.

To take off these quarters, the structures must be tipped over onto the ground, with the piece facing up. The brackets in each 4 corners have small handles that unscrew by hand.


GS-1530

Before placing the quarters onto the ground, it is important to place the masonite boards onto the ground in preparation for installation.

Installing Bottom 4 pieces

It is then important to secure a strap onto the two metal extremities of the top of the quarter to lift it from the plywood structure by using the skyjack. It is secured onto the forklift. On the bottom end, two people hand hold the part until it is vertical. Then, it can be moved onto the masonite.

We recommend beginning with the back bottom quarters containing the cables. Once It is in place, attach it using straps or the blockchain to the tall standalone structure.

Repeat the same process of unpacking and lifting with the front bottom (without speaker cables) part that connects to this back part. This part is attached to the forklift while the other is attached to the large stand alone structure. Bring them together and begin by screwing in the bottom.

The screw inserting and tightening process is to skip 1 one on the first round starting by the bottom and NOT tightening them fully. This lets the pieces fall into place. Then insert the screws into the holes that were skipped, loosely once again. Once all the screws are inserted and loosely fitted, tighten them using the same technique of skipping one hole and then passing through a second time to tighten them all.

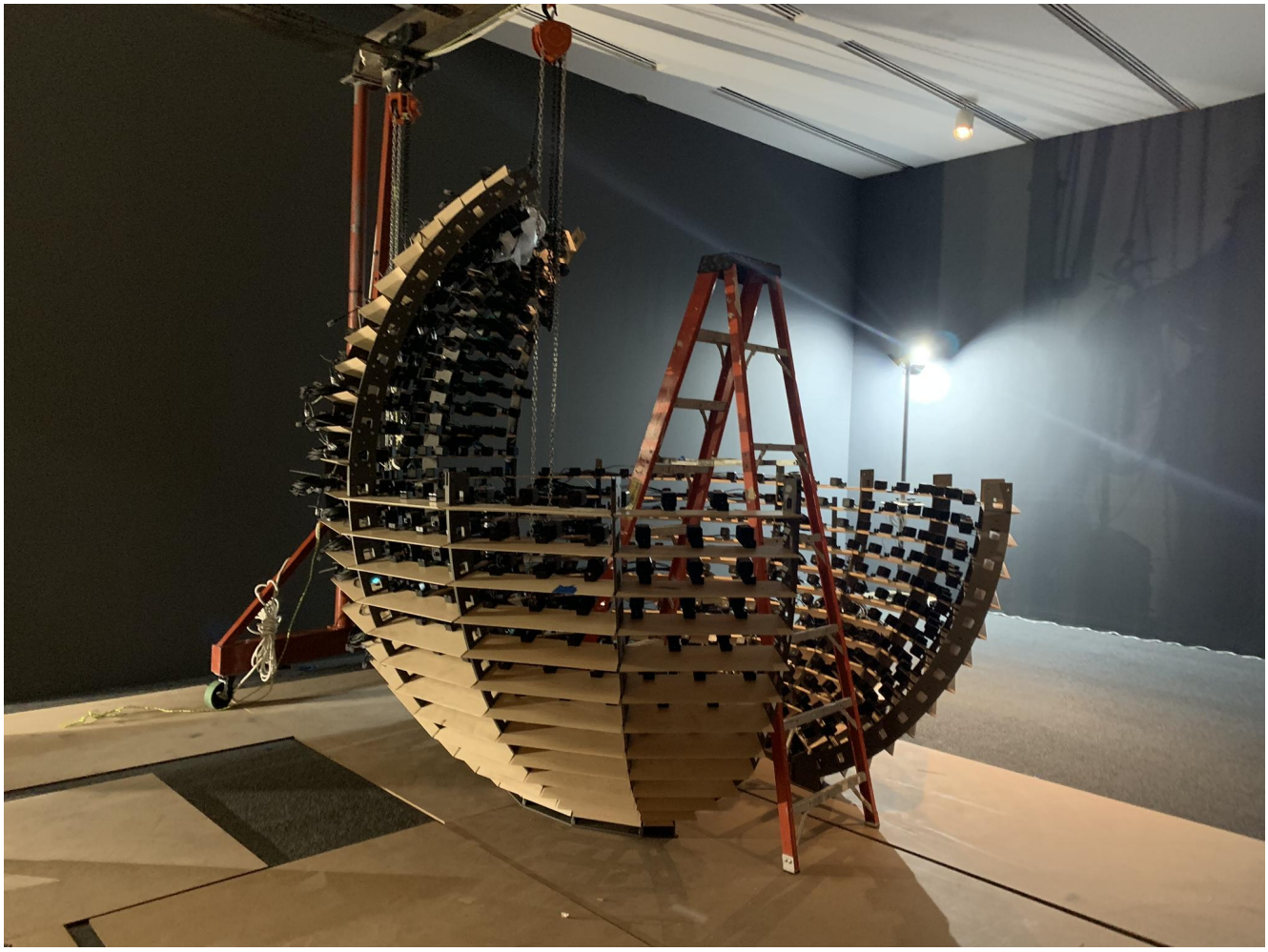
These two parts stand alone but it is important to secure them to the standalone structure before taking the front piece off the forklift.

Once you have a back piece and a front piece, add the other back bottom piece and front piece in the same way, always using a forklift to move and the standalone structure to keep them secured. Using the same screwing-in technique, secure the back part first to the two others and finally complete the bottom half with the front part without speakers.

At this point, you now have the bottom of the sphere's structure assembled.

Installing Top 4 pieces

Similar to the bottom pieces, the same steps of tipping over the plywood crates and releasing the extremities of the pieces, they are then lifted up by using straps and the forklift.



They are then brought over towards the completed structure. Once again, begin with a back quarter that contains a bundle of cables. These are by far the most difficult pieces as they have a heavy load attached to them.

Once you have moved the quarter up by using the forklift and moved it as close as possible to its position, while keeping it attached to the forklift attach it to the stand alone structure. The blockchain will be lifting the parts above the bottom half.

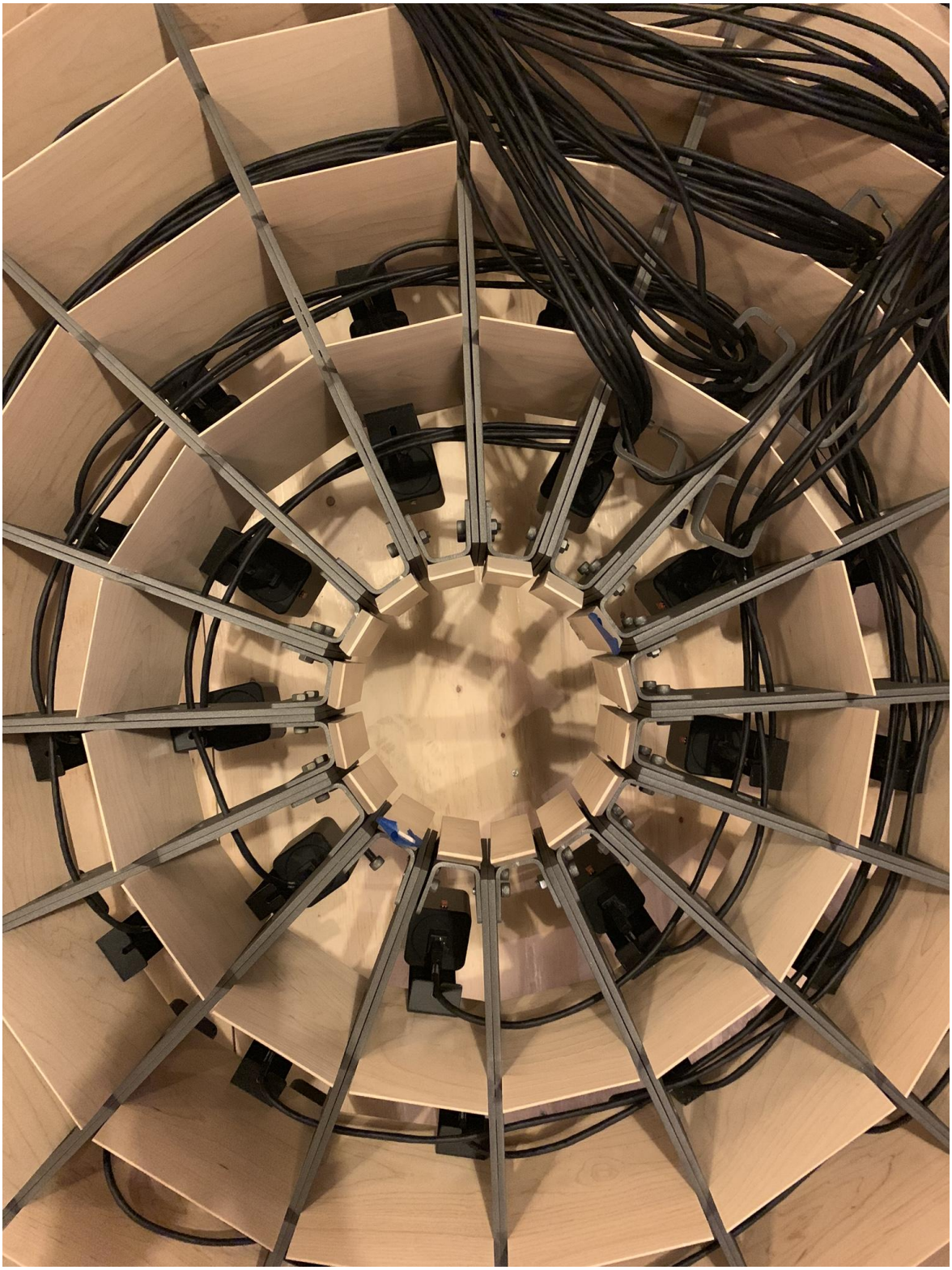
Once it is secured, 2-3 people on the bottom must help lift the structure while another person lifts the part on the blockchain. One person must be on a ladder on the inside of the sphere to help adjust the parts and help them fit within the brackets.

Install the other quarter containing cables and complete the top with the two front parts (without cables) last.

Use the same technique for screwing the sides together.

Dome

It is important to place moving blankets all around the sphere to not damage the wood.



The dome is the last part that needs to be installed onto the structure. It is lifted above the truncated sphere by using the standalone structure.

Place the open crate close to the sphere.

There is a circular plate with an eyelet in the center onto which the blockchain will be installed to lift the dome.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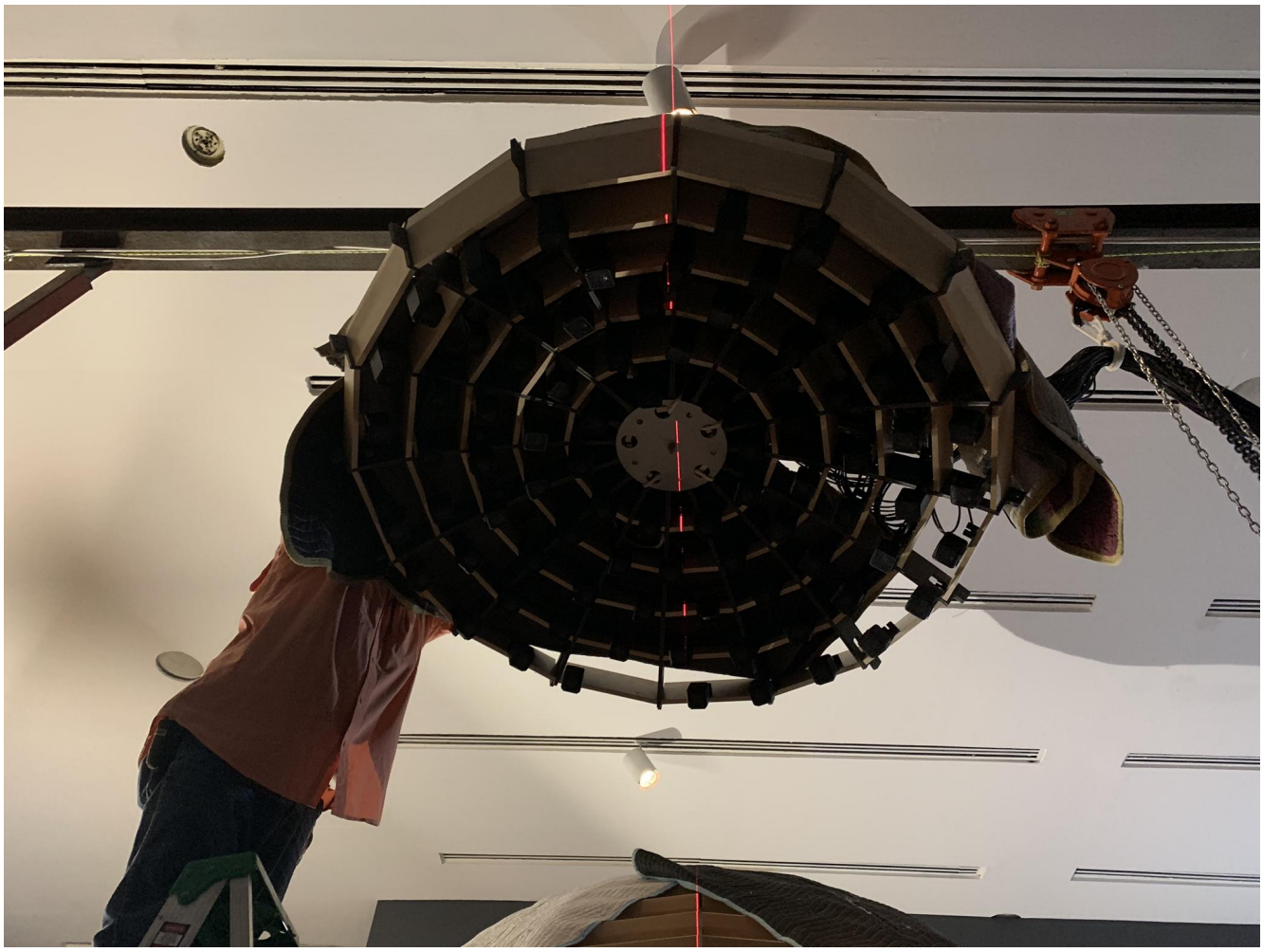
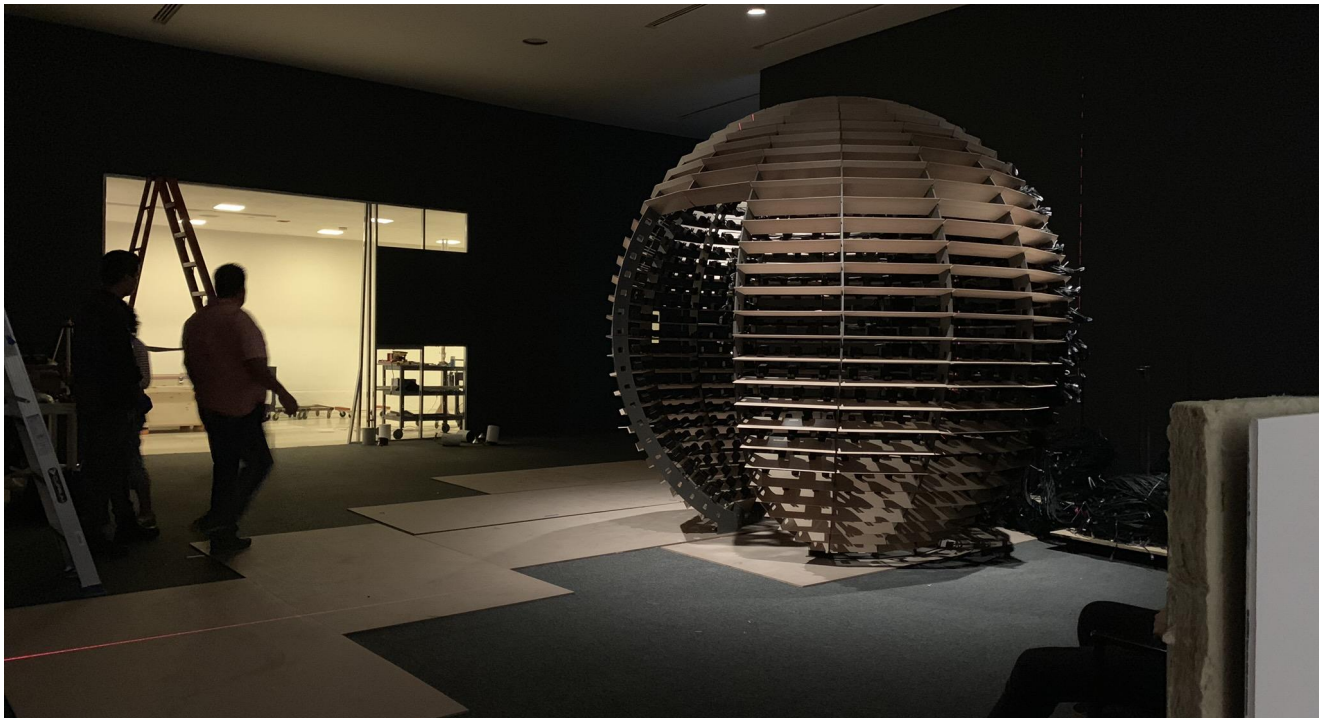
Protect the top of the dome with moving blankets as well.

Lift up the dome using the blockchain, always have 1 person on each side keeping it in balance.

It is important to attach the cables onto the moving structure as well. They have a significant weight and it is important they do not “scrape” the side of the sphere (fragile wood slats).

Have a person inside the sphere on a ladder that can come and receive the dome and make sure it fits within the brackets. Once it is in position, the person inside the sphere can insert screws loosely, and in the same fashion as for the other parts of the sphere, only tighten every screw once it is in place.





APPENDIX V - DISMANTLING OF SPHERE

Unplugging the patch bays

Unplug the patches starting from the last patch (#56 - it is the top row of the sphere / EE-Z).

Keep cables together according to the row they belong to on the sphere & divide in two at the centre (sections I,J,K,L & H, G, F, E, top 2 and bottom 1).

There are 4 bundles of wires that you place onto the 4 dollies. Use bungee cords to suspend the loose near the dolly so the wires don't get stuck in the wheels. Tie wires together near the sphere so they are easier to carry as you move.

The order of bundles is important: for example, the top bundles of the dome go first.

Tie wrap wires every meter and a half, use black metal string to keep the connectors together at their different lengths.

Tape every connector with frog tape to protect the plastic section that sticks out. don't tape too tight and don't hide labelling of the wires correction: put a plastic tube on.

Make bundles with wires and tie with rope. leave 2-3 meters of loose to make sure the wires don't pull on the speaker connectors.

Make sure to keep wire bundles in order of the rows.

Always make sure to not pull on the wires as it will pull onto and damage the speaker connectors.

Please do not step on the wires, they are fragile.

When you make bundles, follow the natural swing of the wires & tie them with rope. try and keep connectors on the inside so there is less chance of damaging them.

For packing: undo bottom and back metal plate + pack screws and nuts.

Ethernet cables, ethernet boxes, the computer go in separate boxes.

Maintain sphere to the ground

Disconnect speakers at sections A, B, C, D & M, N, O, P.

When you disconnect, make sure to hold the front and back of the speaker gently.

Pass the cables through the square brackets (be careful with the connector thingy sticking out as you do that, they often grab on to anything they can).

Bundle the unplugged wires onto section F, G & O, N with black wire string and tie the bundle with rope to the square bracket of each section. This makes sure the bundles will stay out of your way while mounting the sphere and during transportation.

Please make sure no connectors are sticking out and that bundle is the width of the shelves so they sit nice onto them.

List of x11 speakers to unscrew to add brackets for dismantling

- y12 g2- y05 d1- y26 o2- y19 k2
- m22 g4- n34 k3- n09 d1
- z20 n1
- a03 d1- a15 k2- a09 g2
- please keep speakers identified with tape and in a different box with its tools

Undo the dome

- make sure wires are suspended with loose so they don't pull on speaker connectors, use rope
- place metal plate inside dome, add the pulley and fix to the metal beam
- use rope at four angles with people that will help pull
- someone is also managing the wires
- one person inside the sphere unscrews and helps disconnect the junctions.
- keep suspended with enough space to undo other sections.
- please identify junctions with the letters they belong to, keep 2 long screws with each junction and place them into an identified box.

Undo top sections A,B,C,D 2 & M,N,O,P 2 (no cables)

- place clamps at top section , to the middle and bottom section near junctions
- unscrew at top and bottom, jump one screw and unscrew gently gradually, so it releases the tension gradually.

Undo top middle sections I,J,K,L 2 & H,G,F,E 2 (with cables)

- use rope to help maintain the structure and manage with weight and tension as you will remove parts with cables
- use rope to help lift the structure
- place clamps on top and bottom to help unscrew structure with less tension
- one person inside the sphere and two to 4 out to receive the structure and manage the cables.

- use genie lift
- align with brackets into box

Undo bottom sections B,C,D 1 & N,O,P 1
- unscrew from floor (material needed)
- unscrew sections and place onto brackets

Undo central bottom sections I,J,K.L 1 AND H,G,F,E 1 (with cables)
- unscrew bottom and unscrew center, place on rackets with dolly for cables

Packing
- add foam at the bottom of each dollies
- add foam on each angle of the shelves and maintain by taping vertically.
- add covers and plastic

APPENDIX VI - REPAIRS AND OTHER MANIPULATIONS

Removing a speaker from a slat

To replace a speaker from a slat, first unplug its ethernet cable. Then, unscrew the speaker bracket from the wood slat, for this, use a Phillips screwdriver matching the screw size. Once the bracket is free from the wood slat: the speaker can be unglued from the bracket.

To reinstall a speaker to the wood slat:

- use new double sided glue tape to attach a new speaker to the bracket in the same position as the previous speaker;
- put the speaker back in position on the sphere and screw its bracket back in same hole, do not over tighten the screw, simply tight it enough so the speaker does not rotate freely, in order to prevent damages to the wood slat;
- plug back the ethernet cable in the speaker.

Reconditioning a wood slat

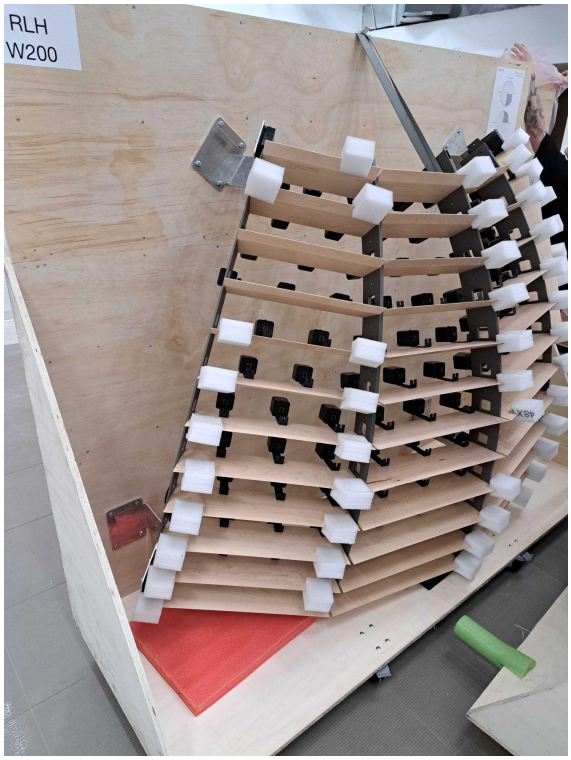
The wooden tablets of the sphere are mounted as shown above. Replacing a damaged slat is quite a laborious process since it requires dismantling a full slice of the sphere. To avoid doing this, if the tablet is only slightly damaged, patching it with wood filler is the best course of action.

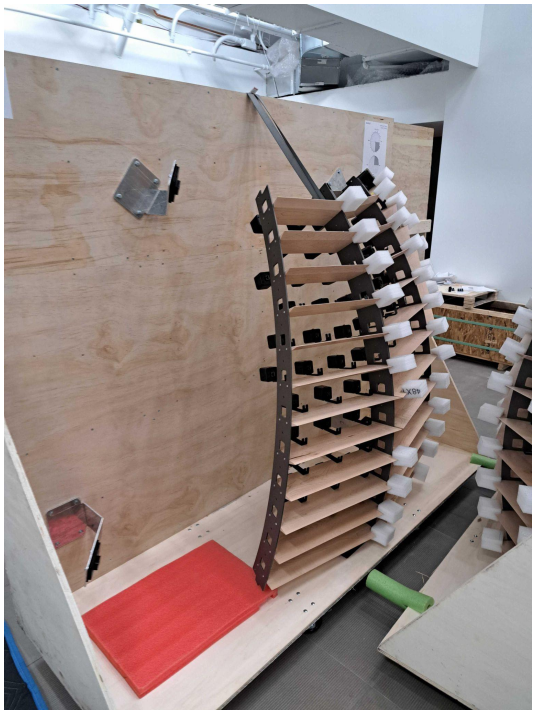
Replacing a wood slat

As mentioned in the previous section, replacing a damaged slat is quite a laborious process since it requires dismantling a full slice of the sphere to get access to the screws holding the wood slat in position. It is recommended to get in contact with the studio before going over this process.

The first step consists of ensuring that both the sphere eighth and the slice to be removed are held securely while removing the screws. The slices are connected together with few pairs of square metal plates that align and pressure the slices together in position. Simply disconnect the slice containing an affected wooden slat using an 4mm Allen bit and ratchet tool.

For example, in the scenario described in the following pictures, we strapped the sphere eighth to its crate and had two people hold the slice to be removed. It is important to avoid directly touching the wood slats; instead, hold onto the metal components while wearing cotton gloves.



Next, gently place the slice on its back, ensuring it rests on the provided foam cubes. It is crucial to avoid applying additional weight to the part to prevent damage to other wooden slats.

Proceed by removing the four screws that secure the affected slat using the Phillips head bit provided in the bit set. Ensure to hold onto the slat with cotton gloves to prevent it from accidentally falling or slipping during the removal process.


Each row of the sphere contains a different model of slat and each individual slats has unique speaker anchoring hole positions. Consequently, the provided spare slats do not have their brass inserts or holes premade.

This process should be carried out by a professional woodworker using the provided drill bit and a drill press. The drill bit has a specific shape to prevent chipping the wood. Care should be taken to only drill the holes deep enough for the inserts to sit flush with the surface of the slat.

Copy the hole positions from the slat that needs to be replaced onto the new slat: be diligent about the speakers positions as some speakers have straight brackets, while others have right or left offsets, as illustrated below. Carefully attach the speakers to the corresponding positions on the new slats, ensuring that their positions remain the same as before.

Mount the new wooden slat back onto the metal slice in the sphere, following the same process as when it was initially removed. Take care not to overtighten the wood screws, as excessive force damages the slat.

Once the wooden slat is securely in place, assemble the metal slice back into the sphere part using the same method as when it was removed. Pay attention to avoid stripping or cross threading any of the screws in the metal. Damaging the powder coating on the metal during repairs can be challenging to fix. Therefore, exercise caution while handling and fastening the screws.

Fixing a Ethernet cable RJ45 hook clip

If the plastic clip on an Ethernet cable breaks off, the cable could be either replaced or a quick fix would be to use an RJ clip. This is a plastic piece that is added to the connector and allows a secure connection again. These clips aren't provided with the artwork. If you acquire some, please purchase black ones to avoid affecting the aesthetic of the artwork.