

Coati Console Project

Specific construction instructions based on our recommended component choices

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There are many ways that these consoles could be built while sticking to the same design specifications and maintaining interoperability between units. This document takes you through the the specific processes required to assemble a console based on components we have evaluated and now recommend for this purpose. If you need or wish to divert from our recommendations, you may well find our our general construction guidance is worth a read.

The components we are recommending have been chosen based on factors including value for money, availability, performance, compatibility and ease of use and assembly. Basically we have sought to provide a design based as much as possibly on plug-and-play modules that minimise soldering, speed up assembly time, and reduce the potential for error. However, the modular design means you are not necessarily limited to using our exact recommendations, if for example you find it easier or preferable to alternative components. However, obviously we can't guarantee alternative choices will work as you might hope.

Links to online sources of our recommended components can be found in the appendix. The links may become outdated so contact us if you need help locating something.

The basics

Each console consists of the following elements: inputs and outputs, signal routing and switching, and amplification.

An input from the venues PA system, the floor signal, is brought into the console through a dedicated port. We recommend a pair of RCA sockets for the purpose because it is easy to sum two stereo channels into a mono if the floor signal is stereo, and avoids possible complications from plugging stereo jacks in to mono socket. However, you could use a ¼" TRS jack if you prefer, or provide both. The floor input is then routed via a signal hub to two independent input channel selection switches. The floor signal is one of four signals routed to these switches from the hub. The other three are the language relay buses that enter the console via the connections for the interlink cables which will be used to daisy chain consoles together.

We recommend simple mechanical four way rotary switches for the input selection, ideally purpose built audio switching modules that are pre-assembled onto boards with JST connectors. They usually come with cables and RCA ports but you need two of these switches per console so will end up with twice as many RCA connectors as you'll need. That's no big deal but you can also buy just the switch although the saving is probably negligible.

The output of each of the two input selection switches is then routed to two headphone pre-amp modules using convenient JST cables. Our recommended headphone pre-amp modules have built in volume controls, however you can supply separate controls which makes it easier to locate the control where preferred on the console case.



We recommend separate volume controls for this reason. and they should be placed in the signal path before the pre-amps. This is easy if you purchase the volume potentiometers that come pre assembled on a board with two JST connectors. You can of course just buy the potentiometers and either place them on a small piece of PCB with JST connectors or alternatively cut a JST cable in half and soldering them direct to the pot.



After the pre-amps, the amplified output is routed to stereo headphone jacks built into the consoles enclosure. Again, for easy of assembly, we recommend a pcb mounted version with JST connectors but you could save some money and use standard (and probably better quality and more robust) chassis mount versions and just solder on a JST cable.



That's it for the input stages. The output stage starts with a microphone socket on the front of the console. We recommend a combination XLR/jack socket that provides the flexibility of accepting either option. We could not locate any with JST connectors already fitted so these will require soldering. You could solder direct to the terminals on the back of the socket but the pin spacing is compatible with prototyping PCBs and by using these you can add your own JST connectors and maintain the easy plug-and-play principle when it comes to future trouble shooting and repair.



These images show the pin layout and how you either solder a JST cable direct or how you could add a JST socket on a small piece of PCB.

From the mic socket the signal is taken by the shortest possible route to a microphone pre-amp. The module we would like to recommend is tiny and can actually be fitted directly behind the socket as shown in this [photo](#). This mic-preamp module features a compressor and noise gate. The compressor boosts quieter parts of speech and limits louder parts, essentially helping to maintaining more consistent levels and intelligibility. The noise gate cuts the signal when nobody is speaking, thus helping to reduce the potential for unwanted noise being outputted. Unfortunately the module does not come with pre-soldered connection pins so they do require soldering. We recommend using JSTs, either two sockets or one socket on the input board and one JST cable on the output (see [photo](#)). Another issue is that these modules require 3.5v to 5v while the headphone amp we recommend requires at least 6v. Since we are recommending 12v power supplies, use of this mic amp will require a 5v linear regulator. Any more than 5v and it is toast.

If you prefer, you can also use the same pre-amp module that we used for the headphones, thereby maintaining a single voltage requirement and a stoke of fewer different spare parts.

Our recommended mic pre-amp does not have a built in volume control, so a potentiometer must be added ([before or after?](#)). Even if you used a module with a built in volume control, it may be preferable to use an separate control as it provides greater freedom to locate it exactly where you need. Again, we recommend a potentiometer pre-assembled onto a board with JST sockets but if you are confident you can probably make up your own to save money, as mentioned earlier.

Experience has suggested that the mic volume control be positioned at the read of the console to reduce the chance of it being played with in error. We'll come to placement later.

After the preamp the signal goes into the input of a two (or three position) switch. The second input is the floor signal from the signal hub. The switch allows the user to choose which signal goes to the next stage, either the amplified mic signal or the floor signal. Using a three position switch gives a third option, no input signal, effectively providing a way to switch off the microphone if the microphone doesn't have it's down switch. Again, we



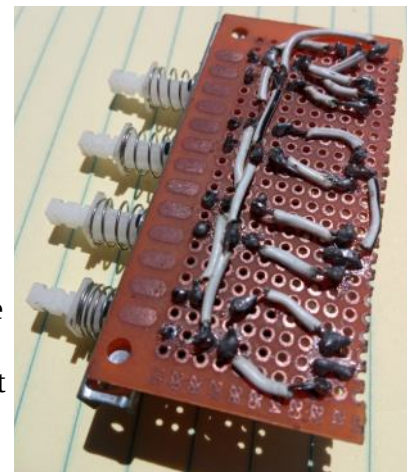
recommend those pre-assembled with JST connectors but you can easily make up your own. Given the chance of error, and the extra work involved, we'd recommend spending a little more on the pre-assembled versions, however if you want the 'mic off' function provided by using a three position switch then you will need to make your own as we have not located a pre-assembled version.

After this switch the signal goes to the output channel selection switch, but the signal is also diverted to the VU meter at this point in order to provide a visual indication of the audio levels and allow for adjustment if required. Note that this module needs power (3.5 to 16v) and there is a jumper connecting two pins which you need to remove. There is also a little trim pot on the board that we recommend you turn all the way clockwise.



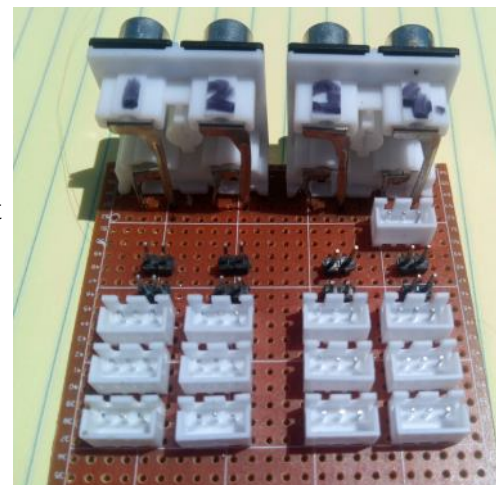
The output selection switch, as mentioned earlier, is a four position switch much like the two input selection switches mentioned earlier but this time there will be one input and four outputs. The switch we recommend will require soldering. You could use a rotary switch identical to those used for the input selection switches but we recommend the push button switch as it allows you to jump directly from one channel to another without 'passing through' the others. This prevents disturbance to other channels during switching so we strongly recommend this approach.

Three of the outputs from this switch will go via the signal hub to both of the interlink cable connections, and they also go to a separate set of four audio outputs that are used for transmission of signals to the people needing to hear the interpreters. The fourth of these connectors is not connected to the hub, instead it is directly connected to the fourth output on the output selection switch as the forth bus is local only and not shared to the other consoles via the interlink cable.



The signal hub has been mentioned several times. This represents to routing of the signals paths in an organised fashion. The hub deals with four signals, the floor and three shared buses. All of them have a path to input selection switches, the console interlink connectors and output transmission ports, and all but the floor signal are also connected to the output select switch. The floor signal must also get routed to the two or three way 'mic/floor' switch and it might as well do this via the hub too (hub photo needs updating to reflect this).

There are many ways this 'hub' function could be achieved but the goal is to avoid a confusing tangled mass of wires requiring loads of soldering and creating a head fuck when it comes to figuring out what should go where. Our signal hub PCB approach uses JST connectors and requires soldering, however it is relatively easy and checking for mistakes after construction is also easy. In this photo you can see we have incorporated the output channel RCA connectors onto the hub board, which helps to reduce the number of cables to squeeze inside the consoles. However, doing this required us to piss around bending the PCB pins on the RCA connector as the spacing did not match the holes in the board. For this reason we do not recommend this approach, instead use RCA connectors with JSTs and add a fourth row of JST connectors on the hub.



We have not used three pin JST header sockets for the connections between the signal hub and the RJ45s used for the interlink cables between consoles. This is because the RJ45s have two pins per signal rather than three. Throughout our console we effectively have stereo components despite only needing and wanting mono. We have done this because such components are more common and it allows us to take this plug and play options with the design. However it does also create some additional complications. For the most part, we simply shove identical signals into both the left and right channels, and arguably this might provide some redundancy in the event of some faults. Where the floor signal enters the console, it should be mono in most cases, and we want to split that signal and send it down both out left and right channels. The mic input is the same situation as both the microphone and the mic-preamp are mono, so we split the output from the pre-amp down both the left and the right channel. This is not stereo, it's still mono, just with more wires than necessary

The console could certainly be designed to avoid this, and perhaps we will do so. But for now it enables us to make use of convenient off the shelf parts, and follow the plug and play philosophy.

So lets return to the RJ45 connectors. These have 8 pins for the eight wires in the standard ethernet CAT5e Cat6 or Cat7 cables we will use to daisy chain the consoles together and provide the shared floor and language buses. That means two wires, (one twisted pair), per channel and so we have to ditch our three wire system at the hub at this point. We take either the left or right side, plus the common, and connect those to the RSJ. We solder header pins in the appropriate places on the hub PCB and can then use ribbon cables or similar to connect between the hub and the 8 pin JST on the two RJ45 boards. The boards we recommend are shielded and there is a ninth point on the board put no pin installed.

Power

We briefly mentioned the power required by the three amplifier modules. Ideally all our modules would have the same voltage requirements and be supplied with a single external power supply. We choose to use external 12v power supplies because the Coati collective has hundreds of these things already as they are used to power our transmitters and the spiders. Its very convenient to use the same power supply for everything. Whether you fit a power switch is up to you, there are arguments for an against.

The case

That's it, basically the entire inside of the console. Obviously it needs something to be built into, a case into which the components will be assembled. The various connectors and switches also need to be fitted in the case and laid out in a sensible fashion. We would suggest the headphone and microphone sockets should be on the front face of the console. It makes sense to have the headphone sockets on the far left and right and place the microphone in the centre. The connectors for the console interlink cable, and the transmission output ports, should be at the back, either the back face or the very back of the top panel. The power socket and switch could also be on the back but we recommend putting them on one the side panels, towards the back.

The headphone volume controls should be placed near the headphone sockets. They could be placed on the front face but we'd recommend against that and suggest the top panel is a much better place. Also placed on the top panel should be the two input selection switches, each placed in close proximity to the related headphone volume control on the left and right sides of the console.

The output related elements should be placed in the centre of the top face of the console: the output channel selection switch and two or three way floor/mic send switch. The VU meter can also be placed somewhere along this centre line. One notable exception is the microphone level control. Logically it make most sense to place it near the microphone socket, however our experience suggests that steps should be taken to discourage interpreters from playing with this control, and therefore we'd recommend either having some method to recess it or distinguish it from the headphone controls etc.. or perhaps place it out of the way at the back somewhere. This way it will hopefully only be adjusted by somebody who knows what they are doing.

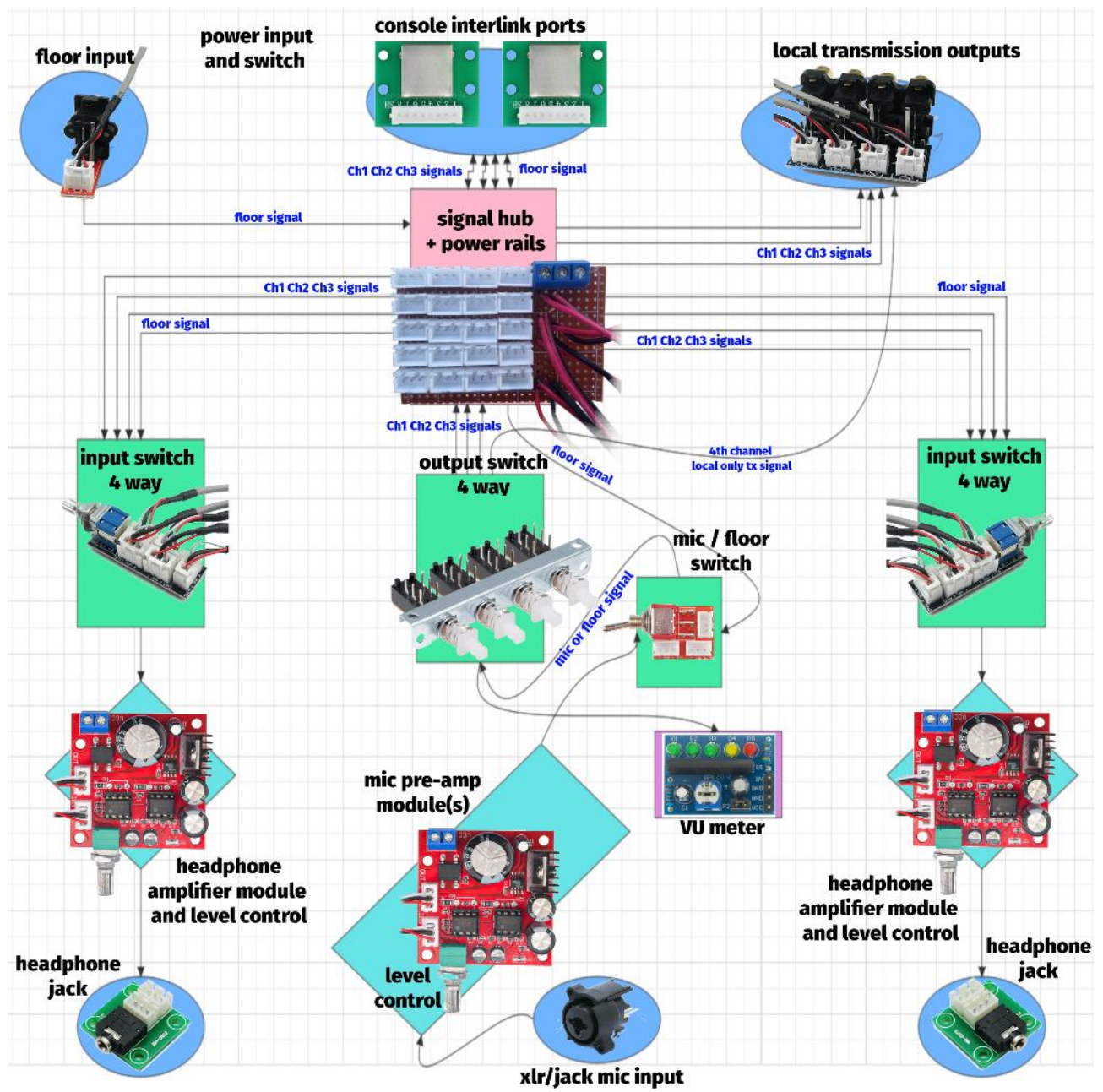
Another important consideration about layout is packing and transportation considerations. In order to reduce the chance of damage to switches etc during transportation, we recommend that all the knobs and switches be places on a single face of the console, the top face. We also recommend that they be positioned in way that ensure they do not touch each other when two consoles are placed together with the top face against each other. Doing this uses less packing space and protects from damage.

While on the subject of using less space, conventional box shaped cases will stack better than more esoteric shapes. However, various variations on wedges do produce the most ergonomic consoles in use, and if carefully designed they should also be possible to produce in a manor suitable for stacking with minimum wasted space when packing for transport.

You could use readily available cased or build your own. 3D printing may be an option if you are in no hurry and no mass-producing. Plastic is the obvious choice but obvious metal cases may be more durable and also less prone to interference due to being shielded. You can however easily shield plastic cases by gluing aluminium foil inside.

Appendix

Block diagram showing components



Recommended components and links

We've only included links to aliexpress but obviously you can find alternative sources (aliexpress has terrible customer support). We are not including prices as they change and often most of the final cost will be the shipping and that depends on how many you are buying. Also, you can reduce shipping costs by opting for slower delivery. Buy more than you need so that you have spares – this can also reduce per unit costs.

Switching components

Four way audio signal selection switch (for input selection, you need two per console)

Supplier names include GHXAMP, KaisayaHIFI and Lusya

<https://es.aliexpress.com/item/1005001775813317.html> (with 5 cables and 5 RCA socket pairs)

<https://es.aliexpress.com/item/1005002311270497.html> (with 5 cables and 5 RCA socket pairs)

<https://es.aliexpress.com/item/1005001972446250.html> (with 5 cables and 5 RCA socket pairs)

<https://es.aliexpress.com/item/1005004528573326.html> (with 5 cables and 5 RCA socket pairs)

<https://es.aliexpress.com/item/1005002710760410.html> (without cables and RCA sockets)

Four way interlocking push button switch (for output channel selection)

<https://es.aliexpress.com/item/4000353272977.html> (will require soldering)

Three way switch (for mic/floor send)

<https://www.aliexpress.com/item/4000413987958.html> (requires soldering)

<https://es.aliexpress.com/item/1005003023511224.html> (discounted plug and play option)

<https://es.aliexpress.com/item/1005001431967189.html> (expensive plug and play option)

Power switches

<https://www.aliexpress.com/item/32988949999.html> (annoying rectangular hole)

<https://www.aliexpress.com/item/4001190014176.html> (15mm hole mounting)

Potentiometers

Volume control 50k ohm potentiometer

<https://es.aliexpress.com/item/1005004338871774.html> (with JST)

<https://www.aliexpress.com/item/1005002124997673.html> (cheaper solder yourself option)

Plastic Knobs

<https://www.aliexpress.com/item/4000926690758.html>

Modules

Headphone pre-amps

<https://es.aliexpress.com/item/1005004462600205.html> (9-30v)

Microphone pre-amp

<https://es.aliexpress.com/item/1005001356869832.html> (preferred SSM2167 module 3-6v)

<https://es.aliexpress.com/item/1005001699213929.html> (preferred SSM2167 module 3-6v)

<https://www.aliexpress.com/item/1005004518215214.html>

<https://www.aliexpress.com/item/1005002820864600.html> (NE5532 12v alternative, untested)

VU meter module

<https://www.aliexpress.com/item/1005003096206860.html> (current recommendation)
<https://es.aliexpress.com/item/1005003444688100.html> (another alternative, untested)
<https://es.aliexpress.com/item/4000046596272.html> (potentially better option, untested)
<https://es.aliexpress.com/item/32799928359.html> (another untested alternative. DC9V – 12V only)

Internal cables and connectors

JST connectors, pcb mounted sockets and crimp on cable plugs
<https://www.aliexpress.com/item/4000029905021.html>

Preassembled JST shielded audio cables
<https://es.aliexpress.com/item/4000058023349.html>

Preassembled JST 8 wire ribbon cables for RSJ45 connections
<https://es.aliexpress.com/item/1005003478555617.html>

Preassembled 2 core red and black JST cables for power
<https://es.aliexpress.com/item/1005003081159084.html>

External connectors

Headphone sockets TRS 3.5 [you need two per console]
<https://www.aliexpress.com/item/33002903109.html> (needs soldering)
<https://es.aliexpress.com/item/1005002325088861.html> (JST plug and play)
<https://es.aliexpress.com/item/1005002260933584.html> (JST plug and play)

Combo XLR/TRS socket
<https://www.aliexpress.com/item/4001080357676.html>

TRS 6.5 (¼" jack) mono socket
<https://www.aliexpress.com/item/1005001339850331.html>

RJ45 sockets [you need two per console]
<https://es.aliexpress.com/item/1005004224676096.html>

DC barrel sockets
<https://es.aliexpress.com/item/1005002984738052.html>
<https://es.aliexpress.com/item/1005002325344271.html> (no solder solution)

Miscellaneous

Vero Strip PCB boards for signal hub
<https://www.aliexpress.com/item/4001247398544.html>

PCB for component breakout boards
<https://www.aliexpress.com/item/1005002339648367.html>

Voltage regulators
<https://www.aliexpress.com/item/1005004242883653.html> (5volt)

<https://www.aliexpress.com/item/1005004199247007.html> (6 volt)

<https://www.aliexpress.com/item/1005005253419936.html> (variable)

<https://www.aliexpress.com/item/4000315483530.html> (modules, 5v 6v 9v etc)

<https://www.aliexpress.com/item/4000262174489.html> (adjustable module)