

SEE ALL 2

ELECTROMAGNETIC EXPLORATION TOOL

BUILD GUIDE

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HERZLICH LABS

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INTRODUCTION

Thank you for choosing a **SEE ALL 2 DIY KIT** - this build guide will help you in your endeavor to successfully build your new electromagnetic exploration tool - I recommend you read the build guide before starting your build, and I suggest leaving everything in the bags they came in until you are instructed to retrieve something from them. The **SEE ALL 2** is not a difficult build, but you can avoid potential pitfalls by following and familiarizing yourself with the build process before beginning.

SAFETY

Building electronics is a fun and rewarding hobby, but just as you practice basic safety procedures while cooking, so should you practice basic safety precautions in your workshop. Below are some recommendations on measures you should take while working:

- **Your soldering iron is dangerously hot.** When not in use, be sure to put it somewhere where it will not fall or roll away, and where you are not at risk of snagging the cable and making it fall on something, or yourself, as you work.
- **Be mindful of toxic chemicals and fumes.** I recommend using lead-free solder, working in a well-ventilated area to dissipate fumes, and if you opt to use leaded solder, be sure to wash your hands after soldering, and do not eat or drink in your work area.
- **Wear adequate eye-protection.** A good pair of safety glasses will not obstruct your vision, will be comfortable to wear for extended periods of time, can be had for less than €9 and will, most importantly, protect your eyes from injury. Hot solder can spit, and trimmed leads can turn into projectiles, both of which can cause irreversible damage to your eyes. Make it a habit to wear safety glasses while working.

You are responsible for your own safety while working – so please don't e-mail me if you decided squinting your eyes while trimming LED leads was a sufficient alternative to a pair of safety glasses and end up in the emergency room. With proper health and safety precautions, you can look forward to practicing your hobby for many years to come.

EQUIPMENT

You will need some basic hand tools and, ideally, some proficiency with them to successfully complete this project. If you need to buy tools, or if your tools are not up to the task, I recommend buying the best quality tools you can afford - it will serve you best in the long run, and you will not have to continuously upgrade every time a cheap tool breaks or proves insufficient.

I have added some tool suggestions in parenthesis, but please note I have no commercial interest in recommending one tool over another, this is only to help other people find tools they will be happy to use for years to come. You will need:

- A temperature-controlled soldering iron
- Needle-nosed pliers (Engineer PS-01)
- Low-profile side cutter (Knipex 78 71 125 ESD w/ lead catch)
- Good quality lead-free solder
- Safety glasses (Bollé Silpsi)
- Cyanoacrylate glue

The following tools are not strictly necessary, but will prove useful:

- Knurled nut driver (Xicon 382-0006)
- Socket wrenches (Bahco SL25)
- A decent multimeter
- Anti-static tweezers
- Reverse ceramic tweezers
- Solder braid and liquid flux
- Desoldering pump (Engineer SS-02)

These tools will all prove useful in countless other DIY projects – if you do not own some or any of the tools above, try reaching out to friends or even local hackerspaces, who will more than likely be happy to lend you the tools. Alternatively, you can of course also buy the tools you need, especially if you think you will build more DIY projects in the future.

DESIGN NOTES

The See All 2 is the successor to the See All, and spiritual successor to the now discontinued OMNISCIENT, also by Herzlich Labs. The principle by which the See All works is simple, as it relies on inductors to “sense” electromagnetic fields near the user and allows the user to become part of the circuit by touching the bolts on top of the device. The human body is, itself, a fleshy inductor, although not a very good one.

Similar devices rely on internal amplification, headphone amplifiers and batteries – the See All 2 takes a different approach, by relying on few, simple and high-quality components, instead offsetting the need for amplification to the user, typically by way of a field recorder, although other methods of amplification are also possible.

In this way, the method of operation is also demystified – the key to operating the See All 2 lies within the inductor itself, and its ability to more closely “sense” your surroundings. Electric guitar players will be familiar with the concept, especially with single coil pickups, which are susceptible to picking up “unwanted” noises when playing. Some bands even utilize this, by placing DC motors and the like near the pickups. In the time of landline phones, there also existed phone taps which used an inductor to pick up the content of conversations covertly.

The See All 2 offers a simple and accessible way to get stereo signals during your field recording sessions, which was both a challenge and a much-desired feature with the See All. The See All 2 is also sized to be easier to hold, and high-grade 1/4” outputs allow for better connectivity with field recorders.

Be sure to turn up the gain plenty on your field recorder, and go out and explore! Listen to DC motors, power cables, Bluetooth receivers, routers, laptops, phones, self-service checkouts, ticket machines, trains, electric cars, et cetera. There is an entire world of invisible signals that await you, and even a walk around your home can yield several hours of interesting recordings and samples. A day trip in the city can easily record enough material for an entire experimental album. Turn on your recorder, hit record and see what you can discover – now, you can finally SEE ALL.

BOM

Component	Designator	Qty
1/4" jack connector	U1, U2	2
3D printed washer		2
Inductor		2
M3 nut		3
M3 brass bolt (Philips head)		3
M3 brass bolt (cheese head)		3
M3 standoff		3

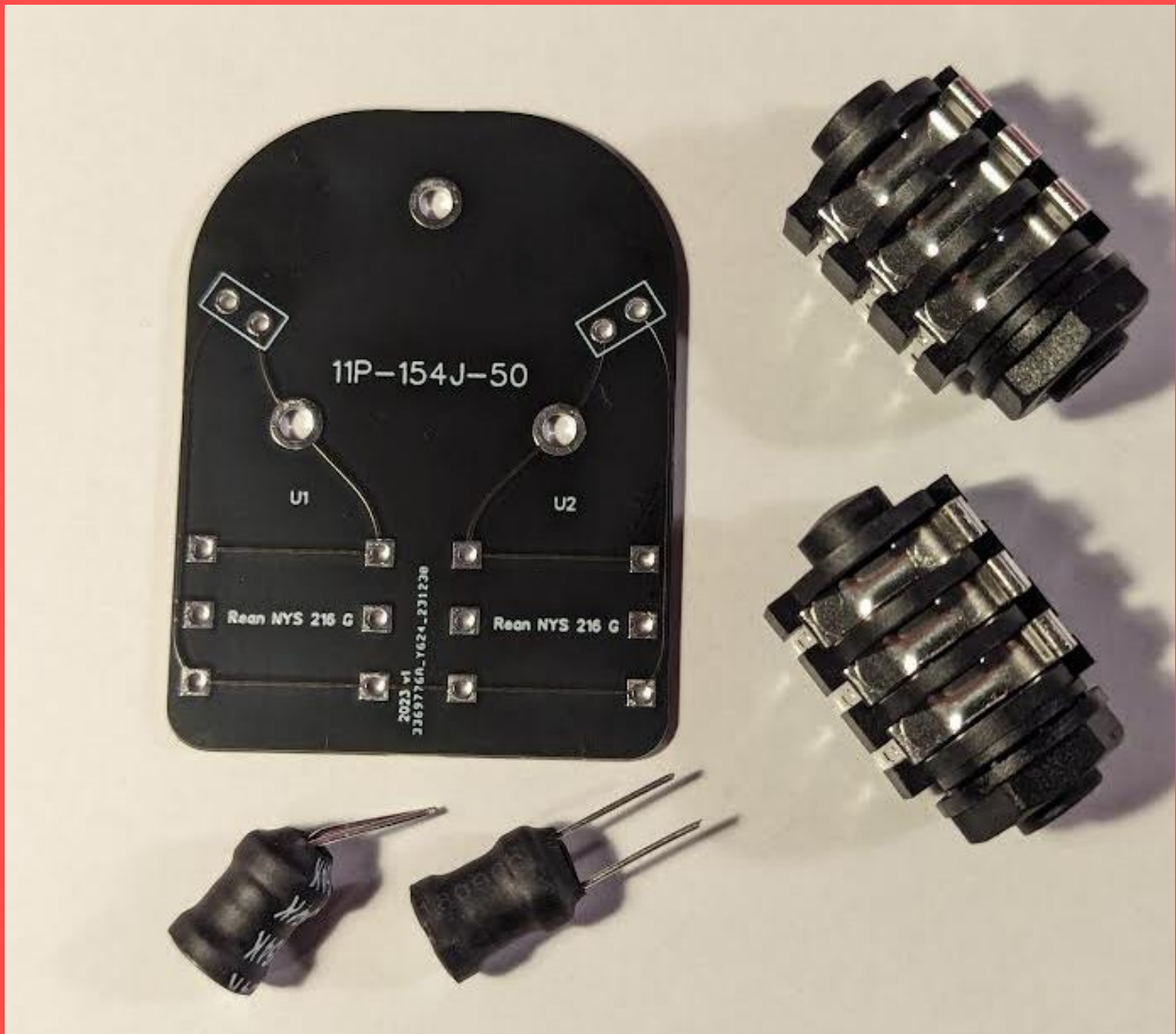
BUILD GUIDE

Let's build the See All 2 now. Inside the provided bag or box, you will find the components listed in the BOM, as well as three panels and a PCB. This is not a particularly difficult build, so take your time and enjoy it.

STEP 1: Beginning to populate the PCB

Take out the inductors and the 1/4" jacks, which will be used to populate the PCB. Turn the PCB with the silkscreen facing up, and pay attention that the more curved end of the circuit board faces away from you.

It is good practice to populate the circuit board with the components that have the lowest clearance first, so start by placing the inductors in their designated slots. The inductors are not polarized, so it doesn't matter which lead goes where.

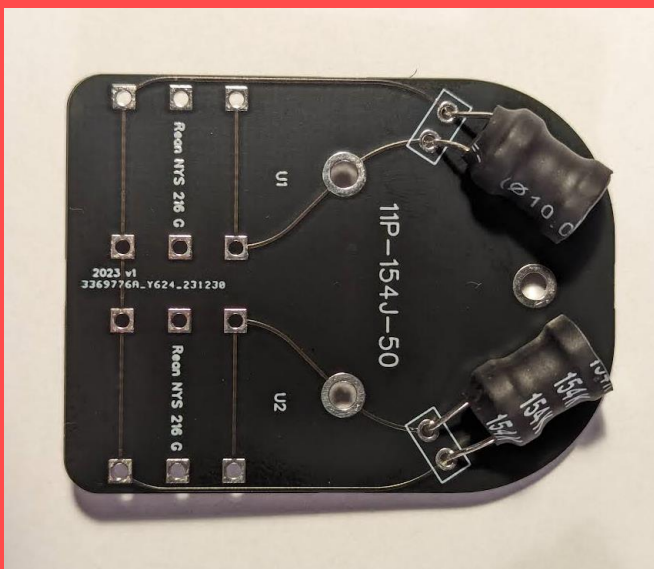


STEP 2: Soldering the inductors

With the inductors in place approximately as seen in the picture below, you should now solder one lead on each inductor. Solder the board on the side opposite of the side where you just placed the inductors.

When you have soldered one lead on each, check once more that both inductors are seated flush against the board and in the correct orientation. Our goal is for them to have approximately similar placements on the board, to gain a good, clear and consistent stereo image when recording.

When you are satisfied with their placement, solder both leads and trim the leads close to the board.



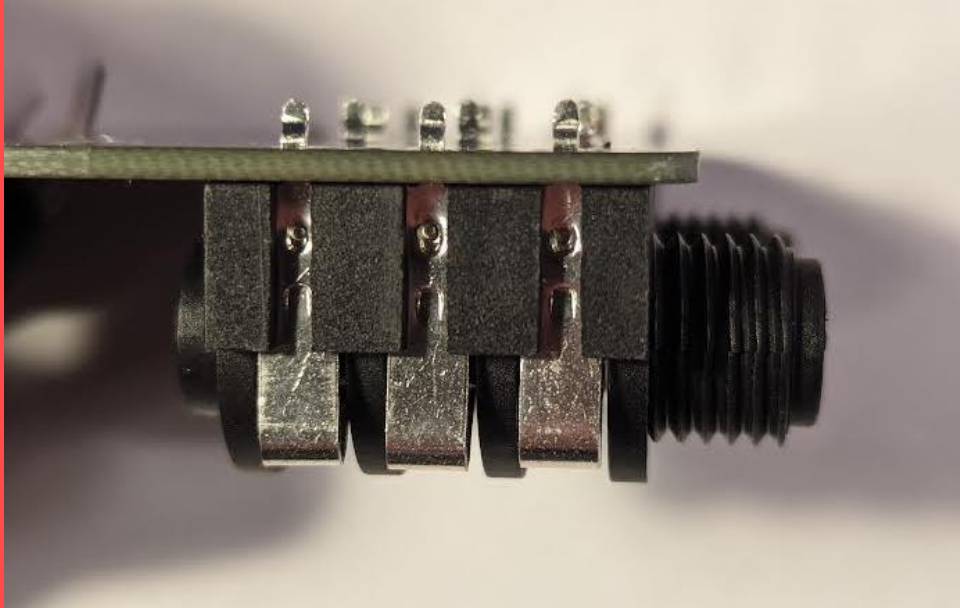
STEP 3: Soldering the jacks

Now, place the jacks in the board with the connector facing outward, towards you. Make sure they are flush with the board like in the image below, and solder one lead on each jack.

When you have soldered one lead on each jack, turn the board over and verify that both jacks are still flush against the board. If they are not, reheat your solder joint and try to reseat the jack so it sits flush. When both jacks are perfectly flush, solder the rest of the pins.

This technique is useful to remember, because if you solder all the pins and realize something sits slightly askew, it can be very difficult to reseat.

We are now done soldering – if this is your first time soldering, give yourself a metaphorical pat on the back and, if you really want to, shake your own hand. You did it! But, if it is your first time, bear in mind that you may have to come back and redo your work if something doesn't quite work, so just keep that in mind before you celebrate too much, OK?



STEP 4: Lower panel assembly

Take the lower panel, and insert one Philips head brass bolt at a time, fastening it in place with a nut. This part is not particularly thrilling, but it will keep the pins of the components well away from your hand and other conductive objects, which you will be grateful for later.



STEP 5: Assembling the lower panel and PCB

Now, place your PCB on top of the panel so that it rests on the nuts, and fasten it in place with the hex standoffs. Finger-tightness is sufficient, here, there is no need to get out the pliers and really tighten this down, unless you really want to, then go ahead.

I'm not going to stop you. Take the pliers out then and give it a go, if you want to.

Satisfied? Good, now you can proceed to attach the top panel, and we're almost done.



STEP 6: Attaching the top panel

If you have made it this far, my heart swells with pride at your keen DIY skills. Place the golden top panel on top of the standoffs, and using the cheese head bolts, tighten the panel in place.

The two lower cheese head bolts form body contact points, so that you yourself can become a beautiful, fleshy inductor. You can explore this very soon, but we are not quite done yet. There is a final step before you can enjoy your new device, although it is fully functional at this point.



STEP 7: Mounting the front panel on the jacks

We are almost, but not quite, done. Take the washers from the jack, and the additional 3D printed washers from the kit, and place them over the threaded jacks. It does not matter which goes on first, but in the image below you can certainly appreciate how cool the 3D printed washers look.

We will not look at them for long, however.



Take the front panel, and attach it on top of the washers, before finally applying the nuts.

With the nuts in place, you have finished the build of your See All 2 – you are now ready go out and conquer the strange and bizarre world of electromagnetic signals. Congratulations!



STEP 8: Record!

Now it's time to uncover the unheard world – simply grab two 1/4" TS cables and insert them in your favorite field recorder (or preamp, or audio interface, or whatever it is you have that has some hot amplification you can liberally apply) and venture forth!

Be sure to hit record and listen to everything around you, anything that seems like it might have something electric or electronic inside. Do not worry if people give you weird looks in public, your See All 2 is a perfectly legal and safe device that you are using to do perfectly safe and legal things, and do not let anyone convince you otherwise.

Finally, I encourage you to go out and record a weird experimental album in an afternoon, or go make a sample pack out of kitchen appliances. There is infinite potential, waiting for you to simply stretch your arms wide enough to grasp all the unheard sounds.

MODDING

There is ample potential to modify and change the behaviour of the See All 2 – for instance, you could design and 3D print a threaded connector on the bottom to attach it to a pole or pistol grip, and access hard to reach places that might have interesting sounds waiting for you. You could also use in-line passive filters, such as the Herzlich Labs Hyperoxia and Hypoxia, to filter out the sounds you detect around you.

Other ideas and mods can be emailed to me, and I will be happy to include them with appropriate credit in this build guide!

SUPPORT

Sometimes things go wrong - that's OK! If you have run into trouble while building your module, and you can't seem to get yourself out of trouble, you can reach out to lb@herzlich.technology for assistance. Please send well lit, high resolution photos of your PCBs to help me investigate and identify the problem with you.

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