

Sonic Arts and Electronica 1 (piezo mic)soldering

Workshop by Liz Dobson who is a tutor at The University of Huddersfield

Workshop originally developed for the Yorkshire Sound Women network

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Workshop on sound design in 3 parts - Part 1: Soldering a Piezo contact Mic

Components and equipment

Check that you have these materials to hand.

- 2 piezo (in case one is ruined first time)
- mono audio cable - around 2 foot. Stereo is also fine too but this workshop focuses on mono.
- male jack plug (1/4 inch is easier first time)
- soldering iron
- solder (Duratool Rosin Core solder wire Diameter 0.7mm)
- wire strippers/cutter
- wet sponge and/or wire wool for soldering

Also helpful

- tip tinner
- blue tack (or 'helping hands') for holding the disk or jack in place
- glue gun for finishing if soldering direct to piezo

Safety

- a workstation that is clean and clutter free with somewhere to put rubbish
- long hair should be tied back and out of the face
- a well ventilated area (or extractors to remove fumes)
- safety glasses (as solder can spit up into your eye)
- check for and deal with trip hazards
- notify everyone when you are turning on the soldering iron
- really focus on how you pick up your soldering iron so that you don't touch the hot area
- ask for the objects you need if they're not close to you. Ensure everything is easily within reach so that you're not leaning over the hot iron
- use something like 'helping hands' or blue tack to keep the objects that you're soldering from moving around

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Choosing your connector

Which type connector



Male tip sleeve for (mono) unbalanced
balanced cable



Male tip ring sleeve (stereo)

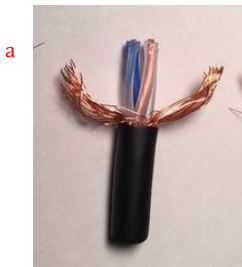
Also Female – which is useful for creating a cable that you can plug things in to. Note that the piezo disk used in this workshop can be used to record sound, or as a buzzer/mini speaker which plays sound.



Choosing the cable

All of these examples are of shielded cable, which means it is grounded.

The shielding cuts down the amount of hum in the sound. Notes that you might find filler, plastic cord and thread inside the cable too. This is to just support the structure of the cable and you clip that out before soldering.



This is dual core (balanced/stereo).

Above is another example but note that the shielding is different. Avoid the weave shielding as it takes a long time to unplat.



This is single core (unbalanced/mono). Not a good idea if you're making longer cables.

The balanced cable does a clever thing with signal phasing which removes noise. So if you are using a longer cable and it is

important for you to control the quality of the sound choose balanced. For more information:

<http://www.instructables.com/id/How-to-Make-an-XLR-microphone-Cable/>

We will use unbalanced (single core) for this workshop.

The Piezo

A metal disk with a circle of piezoelectric crystals in the middle.

When the crystals vibrate they create an oscillating voltage.

Also if you apply an oscillating voltage to the piezo it vibrates.

So it can work as a pickup and as a buzzer.

Some come with soldered cable.

Some just come as a disk and you solder onto that.



These websites include some helpful resources and information.

<http://www.openmusiclabs.com/learning/sensors/piezos/>

<http://www.instructables.com/id/Make-a-Contact-Microphone/>

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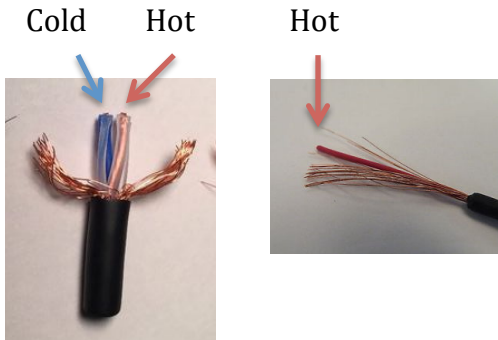
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The signal

Balanced cables are made up of two wires (hot and cold). Unbalanced cables are made up of one (hot) wire.



Preparing the cable

1) Cut your cable to length and strip 1 inch off the end to expose the shielding.
Twist the shielding wire together.

Do not cut the shielding off, and avoid cutting the wire inside.

2) Typically you will see either a red (hot/signal) and blue insulated wire, or just a red one.
The cable used for this workshop handout was covered in transparent insulation. In this case you treat that as the red/live wire.

(If you are working with dual core cable, and have a blue wire, strip it down to the level of the black cable and twist it in with the shield). For this workshop you should just have your signal (hot/red) wire and shield (which you twist).

3) Remove $\sim 1/8$ " of the signal wire and twist it so that instead of having lots of individual wires you have one strong one.

4) Bend the end of the signal cable.

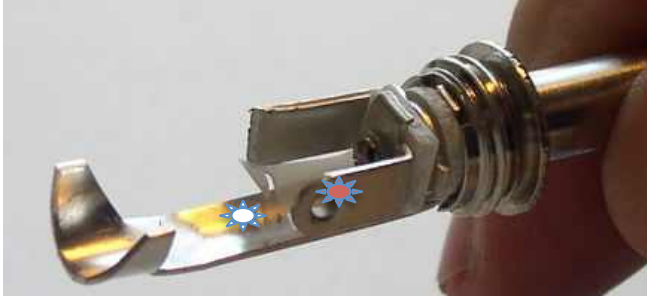
You're almost ready to solder it into your jack

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Soldering your TS (jack)

1) Unscrew your jack to find this (remove the plastic).

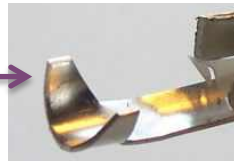


2) Tin the wires (put solder into them).

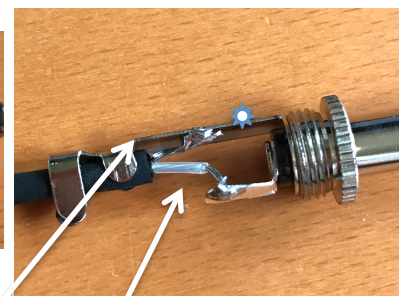
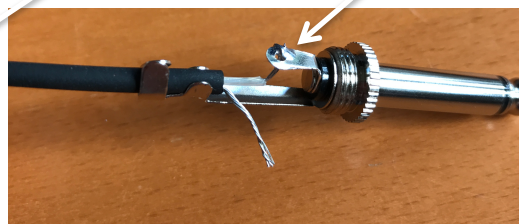
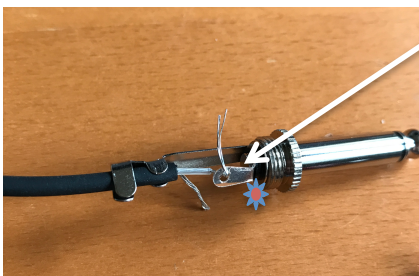
The footnote video link demonstrates this¹

Also tin the jack: a small blob of solder onto the soldering iron, heat the jack where you will be soldering the cable and add a small spot of solder there. You need to place the solder at the point where soldering iron and jack meet.

Use pliers to clamp the cable into the cable housing.



3) Next thread the red (hot) wire through the hole and solder. Clip away excess wire



4) Solder the shield anywhere on this part of the jack.

Make sure the two wires aren't touching each other (note the plastic insulation shield is still covering most of the live wire, and that there is not too much excess solder.

When you've finished, put the casing back on because if you don't do that now, once your piezo disk is attached you definitely won't be able to.

¹ How to tin audio wires

<https://www.bing.com/videos/search?q=youtube+video+on+tinning+wires&view=detail&mid=4047C86705434A757DFC4047C86705434A757DFC&FORM=VIRE>

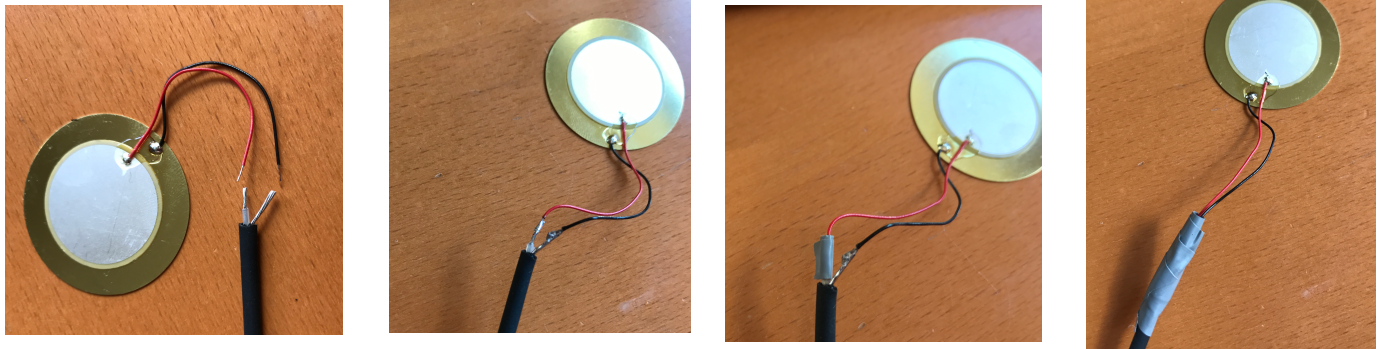
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Soldering the piezo



If you are using a presoldered disk make sure that you solder the hot/red wire to the red wire that is already soldered to the centre disk. The shield should be soldered to the black cable. This is rough and ready DIY!

If you have a disk without wires, follow these steps:

- Strip the cable to the diameter of the piezo disk
- Trim off shield and remove any filler
- Prepare the ground wire/shield to be soldered to the outer disk (like the black one in the picture above)
- Trim signal wire to middle circle (like the red one above) and strip the end of the insulation (use the images above as a guide).
- Tin the wires and be generous with solder.
- Melt a small blob of solder close to the end of the metal (ground) disk [hold iron to disk and feed in some solder where disk and iron meet. Don't let the solder touch the inner crystal].
- Touch ground lead/shielding onto solder blob, and touch with soldering iron. Push in additional solder.
- Do the same with the signal lead. Don't 'blob' the crystal terminal first but if the wire doesn't sit easily it does help.
- Once it is dry you can add some glue to make sure they don't come apart.

Finishing

Turn off your soldering iron and let everything cool.

Tidy your workstation

When you feel that everything is cool and dry you are ready to plug your new microphone into a recorder or guitar amp and start exploring sound!

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Reference materials

This workshop draws heavily on this website <http://www.instructables.com/id/Make-a-Contact-Microphone/> except instead of using a female mono jack we use male mono jacks. Also we have not taken it as far; the link shows how to use a bottle cap to make a piezo case. All of the images on pages two and three are from this website.

Also online videos

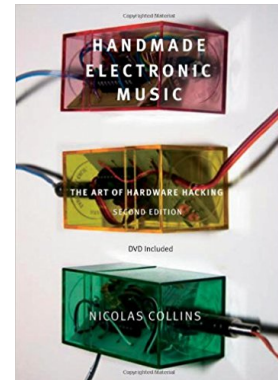
Nic Collins shows how to transform a piezo disc into a contact mic

<https://www.youtube.com/watch?v=P8iAshJ1Pk0>

This is from his book 'Handmade Electronic Music – Art of Hardware Hacking'

Another series of instructions from Zack Poff

<https://www.zachpoff.com/resources/building-contact-mics/>



Where to buy materials

<https://www.redco.com/>

https://www.parts-express.com/?utm_source=google&utm_medium=cpc&utm_campaign=INT_UK_E&utm_group=Brand_E&utm_term=parts%20express

Example sound artists and resources

David Dunn - <http://subtropics.org/micro-listening-workshops/>

Dirty Electronics (John Richards) - <http://dirtyelectronics.org/download.html>

Nina Richards - <https://yorkshiresoundwomen.com/resource/soldering-making-a-noise-instrument/>

Also of interest

Vicky Clarke - <https://vickyclarke.org/>

Building desktop synths

Understanding soldering can open up the possibility of soldering electronics kits and building your own synths. It's really not that difficult, and it can be incredibly satisfying to have built something that works. Also, if you build something from kit, not only do you learn about audio electronics but it will save you a bit of money. <https://www.thonk.co.uk/product-category/desktop-synth-kits/>

Please do make sure that you solder safely and in an environment where you have permission to do so!