

# How To Make A Crystal Radio

## Introduction

A crystal radio is the simplest type of radio receiver it is possible to make and very similar to the first radios that were invented. If you follow these instructions carefully you will have a working radio that can receive strong signals from nearby stations and will work forever without needing any batteries. The sound you hear in the earpiece is generated directly from the energy in the radio signals received by the antenna.

## You will need:

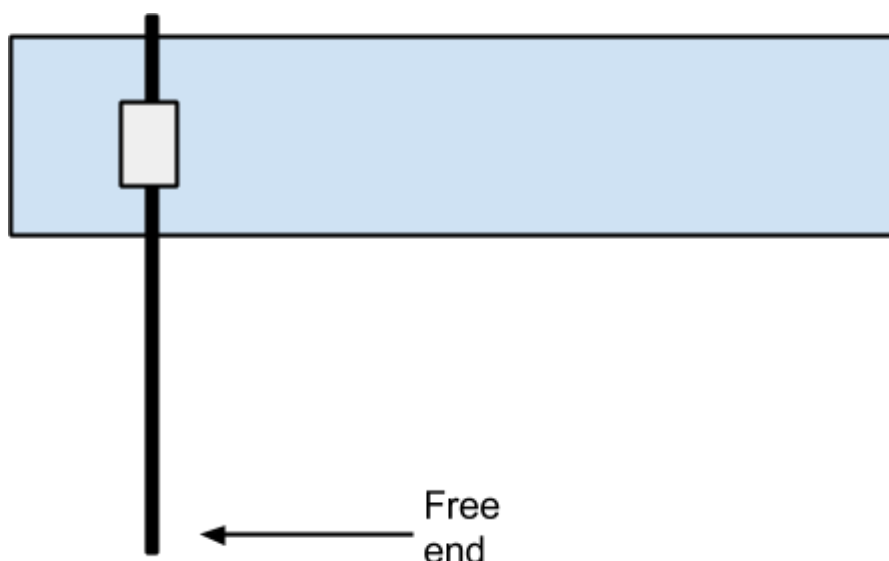
- 1 x 3-way connector block [21-4269]
- 1 x 10k $\Omega$  resistor (small and brown with coloured bands, wire at each end) [62-0397]
- 1 x signal diode (small and glassy, wire at each end) [47-0836]
- 1 x 100pF variable capacitor [12-0255]
- 1 x crystal earpiece [35-0165]
- 1 x 80mm diameter plastic or cardboard tube (many 1L drinks bottles should work)
- 1 x 3m length of wire [01-1500]
- 1 x 15m long length of wire [01-1500]
- 1 x antenna wire (as long as possible) [01-1500]
- A few short pieces of Sellotape

**Parents/Leaders:** The numbers in [square brackets] are the part numbers to order these components from Rapid Electronics ([www.rapidonline.com](http://www.rapidonline.com)) and equivalent parts may be sourced from other suppliers.

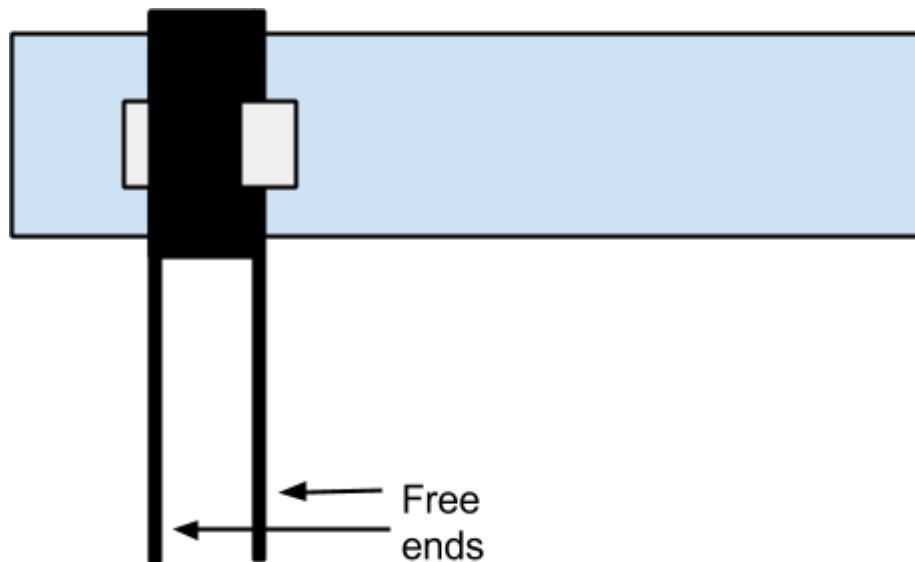
## Making The Coils

This is probably the hardest part of building the radio but it is very important for success so please do take your time and follow these instructions carefully. You are going to wind two coils of wire next to each other on your tube.

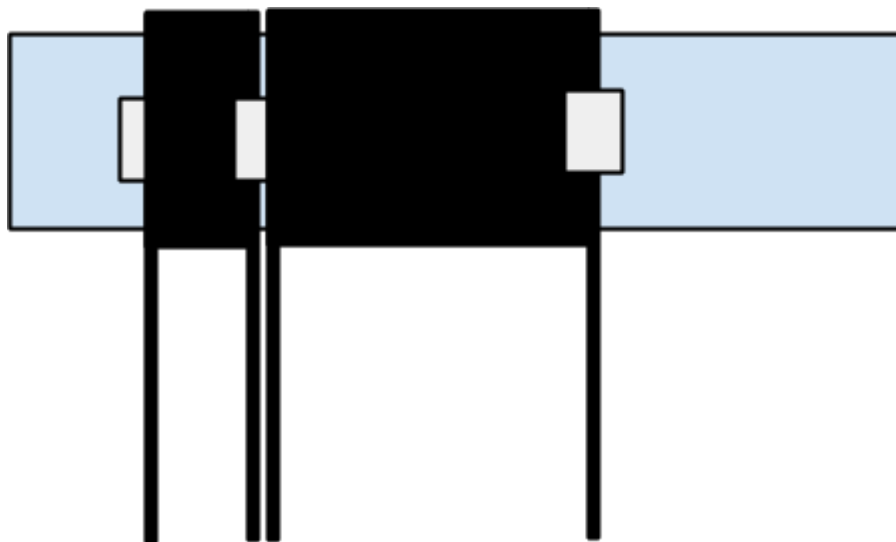
Start by taking the 3m piece of wire and use tape to stick it on to the plastic tube with a 'tail' of about 20cm of wire hanging free.



Then wind the wire around the tube **ten times** making sure that each turn is tight up against the previous turn. There should not be a gap between the wires on each turn and they should not be slack on the tube or crossed over other wires. After ten turns, secure the last turn with another piece tape and leave another tail of about 20cm.



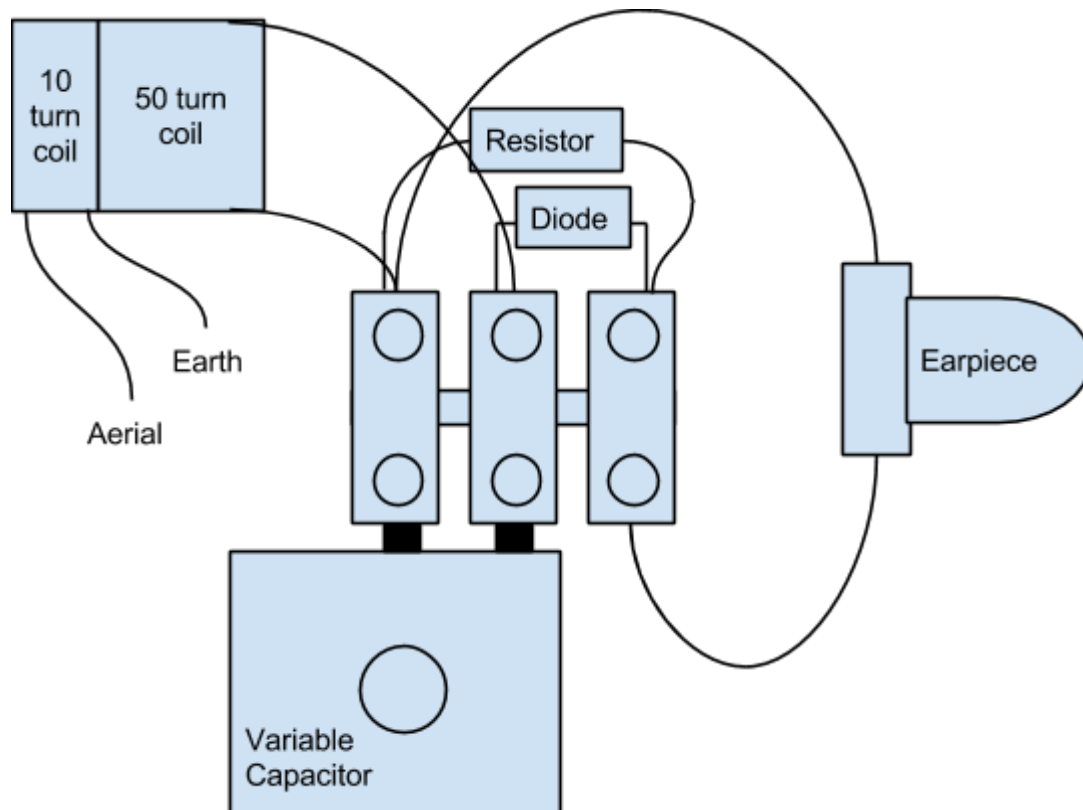
Now use 15m of wire to build another coil right next to the first one, but this second coil needs to be **fifty turns** long. Be careful; it is very easy to get the wire tangled and you don't want any knots in it. Again, make sure that the turns are all tight up against one another, and use tape to hold the first and last turns in place. When you are finished it should like like this:



Cut the four tails so that they are each about 10-15cm long, and use wire strippers to remove ~1cm of insulation from the end of each one.

## Making The Circuit

The radio circuit is very simple. It is constructed on a short terminal block with screws to hold the connections in place instead of soldered connections. Some of the components such as the diode and the resistor are very small and can be a bit fiddly to work with.



Your earpiece may have a 3.5mm plug on the end of its cable. If it does, cut it off and use wire-strippers to bare 1cm of the ends of the two wires just as you did with the coil tails.

You can see that some terminals have more than one component or piece of wire connected. You may find it easier to twist together all of the wires going to one terminal and then tighten the screw on all of them at the same time rather than putting in one after the other, when they might fall out. Making good connections is important because this radio is so simple that if just one connection isn't right then the whole radio will not work at all.

You will need to connect one side of the shorter 10-turn coil to an aerial, and the other side of the short coil to an 'earth'. It doesn't matter which way round you connect them. Twist the wires together for a good connection. The aerial needs to be a long piece of wire high up in the air, as long and as high as you can make it! The antenna picks up the tiny radio signals and feeds them into the radio - you want to 'collect' as much as possible. The earth needs to be something that is well grounded, such as a metal water pipe or a radiator.

## Testing The Radio

Don't expect hi-fi quality sound or a stomping bass from this radio - it is not an iPod! Remember that it has no power source except for the radio waves it picks up and so the volume of the sound in the earpiece will not be very loud. Be sure that you are in a quiet place when you try listening or you will not be able to hear very much from the radio.

You should hear something as soon as you connect the aerial and the earth, even if it is just a click or a hissing sound. If you hear silence then you probably have a connection that is not working or a component in the wrong place and you should go back to the connection diagram and check everything carefully.

Tune the radio with the variable capacitor and you should be able to hear at least one local radio station in the earpiece. It may be very sensitive to small movements (or even to you touching it) so listen carefully and tune slowly. If it is too quiet then try making the antenna longer or higher and check that your earth connection is good.

