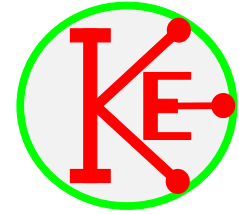
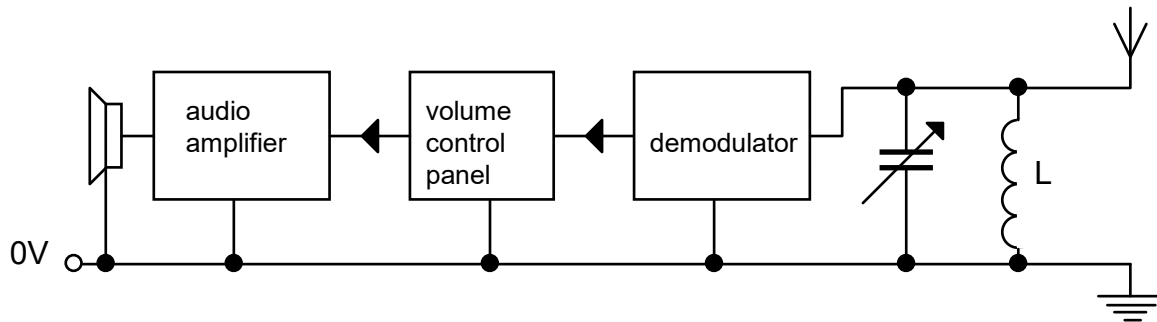


First inductor.



In order for the system to receive radio signals an inductor needs to be added. The inductor is connected in parallel with the tuning capacitor forming a tuned circuit.

All of the subsystems are connected together as shown below.



The tuning capacitor, inductor, aerial and earth are connected to the demodulator.

The aerial can be a length of wire around 2m long.

The earth connection can be the mains earth or a cold water pipe, so long as no plastic piping has been used in the plumbing installation.

A good choice for a first inductor is one with a value of $220\mu\text{H}$.

This can either be bought (e.g. 88-1640 for approximately £1) or hand wound from thin wire.

There are many possibilities for making this coil, but 98 turns of 0.31mm enamel coated wire on a 36mm diameter plastic pipe, spaced over 40mm, will give an inductance of approximately $220\mu\text{H}$.

The actual inductance can be varied slightly by adjusting the spacing of the windings (space out further to *reduce* the inductance.) (32mm plastic waste pipe has an external diameter of 36mm.)

The inductor can be temporarily secured to the baseboard with white/blu-tak.

With the $220\mu\text{H}$ coil and variable capacitor, the frequency range covered is approximately 700kHz to 1.6MHz, which is a large part of the medium wave band.

The strongest medium wave radio signals in England are:-

- Radion 5 Live (693 and 909kHz)
- Talk Sport (1.053MHz)
- Absolute Radio (1.215MHz)

and tuning in these stations by adjusting the tuning capacitor should not be a problem. By holding the far end of the aerial, you act as part of the aerial and so will increase the strength of the received signal.

In other parts of the country/world, there will be other strong radio stations on the medium wave band and so it should always be possible to receive at least one radio station with this basic arrangement.

Calculation

The resonant frequency of a tuned circuit is given by the formula

$$f = \frac{1}{2\pi\sqrt{LC}}$$

where f is the frequency in Hz, L is the inductance in Henries and C is the capacitance in Farads.

The tuning capacitor has a range from approximately 10 - 212pF.

The inductor will also have some self capacitance from its construction and this can be as high as 10pF. The demodulator circuit and aerial will also have some capacitance and this is around 20pF.

Combining all of this stray capacitance together will give the tuning capacitor an effective value of 40pF to 252pF

So with an inductance of 220μH and a maximum capacitance of 252pF, the resonant frequency will be 676kHz.

With the tuning capacitor set to the minimum value of 40pF and with an inductance of 220μH, the resonant frequency will be 1.7MHz.

These values are only a guide - a commercial 220μH inductor is likely to have a tolerance of ±10%, and for a hand wound inductor it may be even higher.