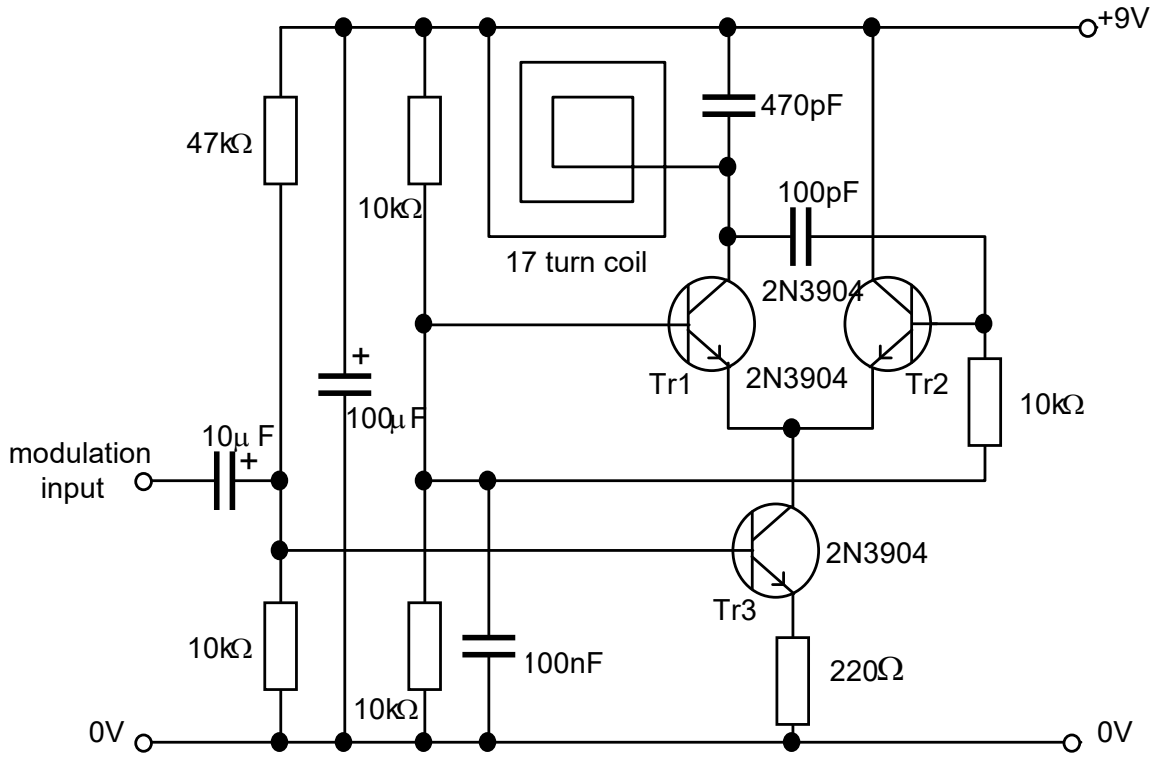
Cornflake Packet Radio Transmitter.

Specification

Operates from a 9 - 12V supply.
Provides an amplitude modulated output on approximately 460kHz.
Has a range of a few metres.
Uses standard components and a loop coil.
Can be used for testing/experimentation with the other parts of the Cornflake Packet Radio Project.

Circuit Diagram



How it works

The 17 turn coil and 470pF capacitor form a tuned circuit which is resonant at ≈ 460kHz.
A portion of the oscillating voltage produced across the coil is passed to the base of Tr2 which buffers this voltage before applying it to the emitter of Tr1. Tr1 acts as a common base amplifier, amplifying the signal from TR2 and passing it onto the coil and 470pF capacitor in its collector circuit, so maintaining the oscillations.
Tr3 is a common emitter amplifier. It controls the current flowing in Tr1 and Tr2. When an audio signal is applied to the modulation input, TR3 amplifies this signal and uses it to control the current flowing in Tr1 and Tr2, so controling the amplitude of the current passing in the coil and 470pF capacitor, so amplitude modulating the oscillations and radio signal produced.
A modulation input signal of ≈ 0.5V is needed to produce a reasonably well modulated radio signal.

The frequency of the radio signal can be changed by changing the value of the 470pF capacitor and the number of turns of wire on the coil. A frequency of ≈ 460kHz was chosen as there are no strong radio transmissions around this frequency.

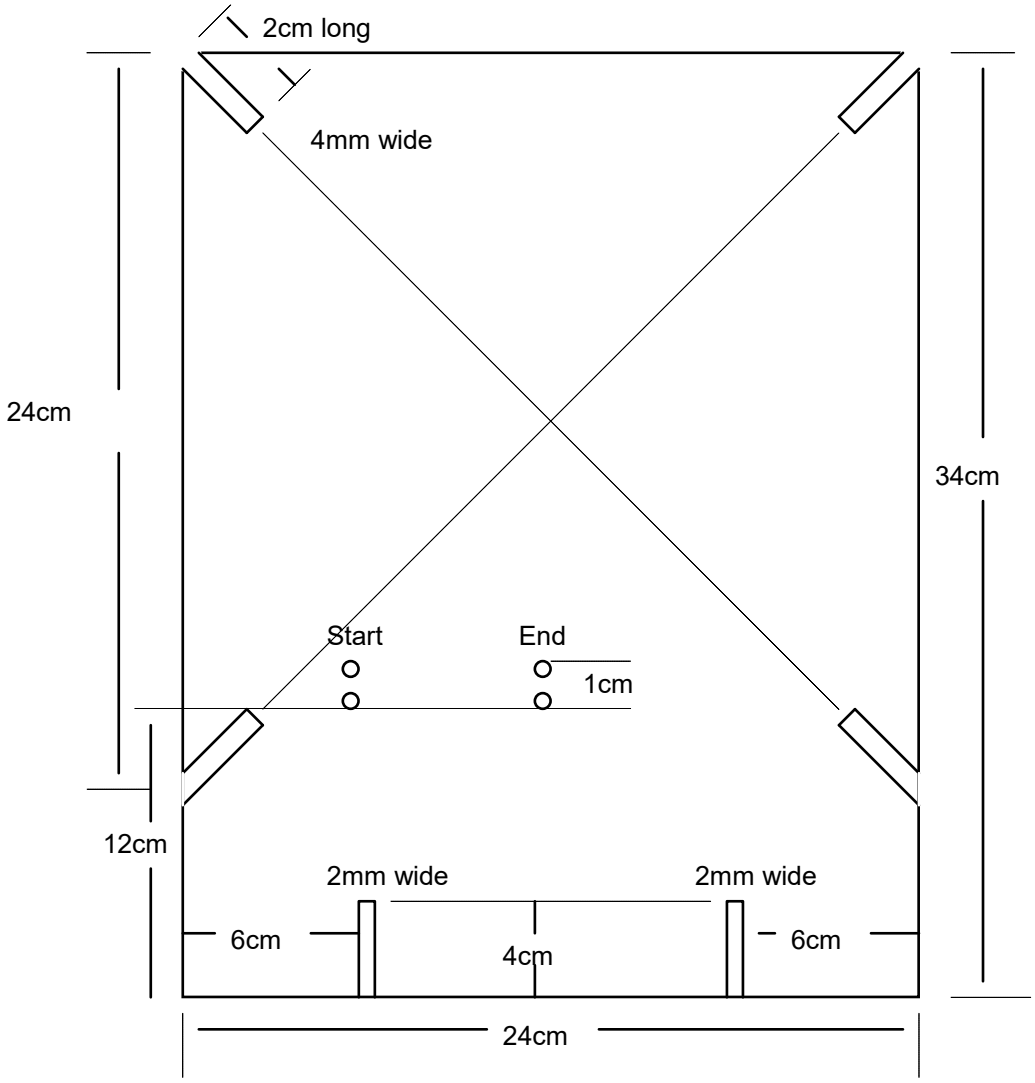
Construction

This should start with the coil, which is the same as for the medium wave band crystal set. The details are repeated below.

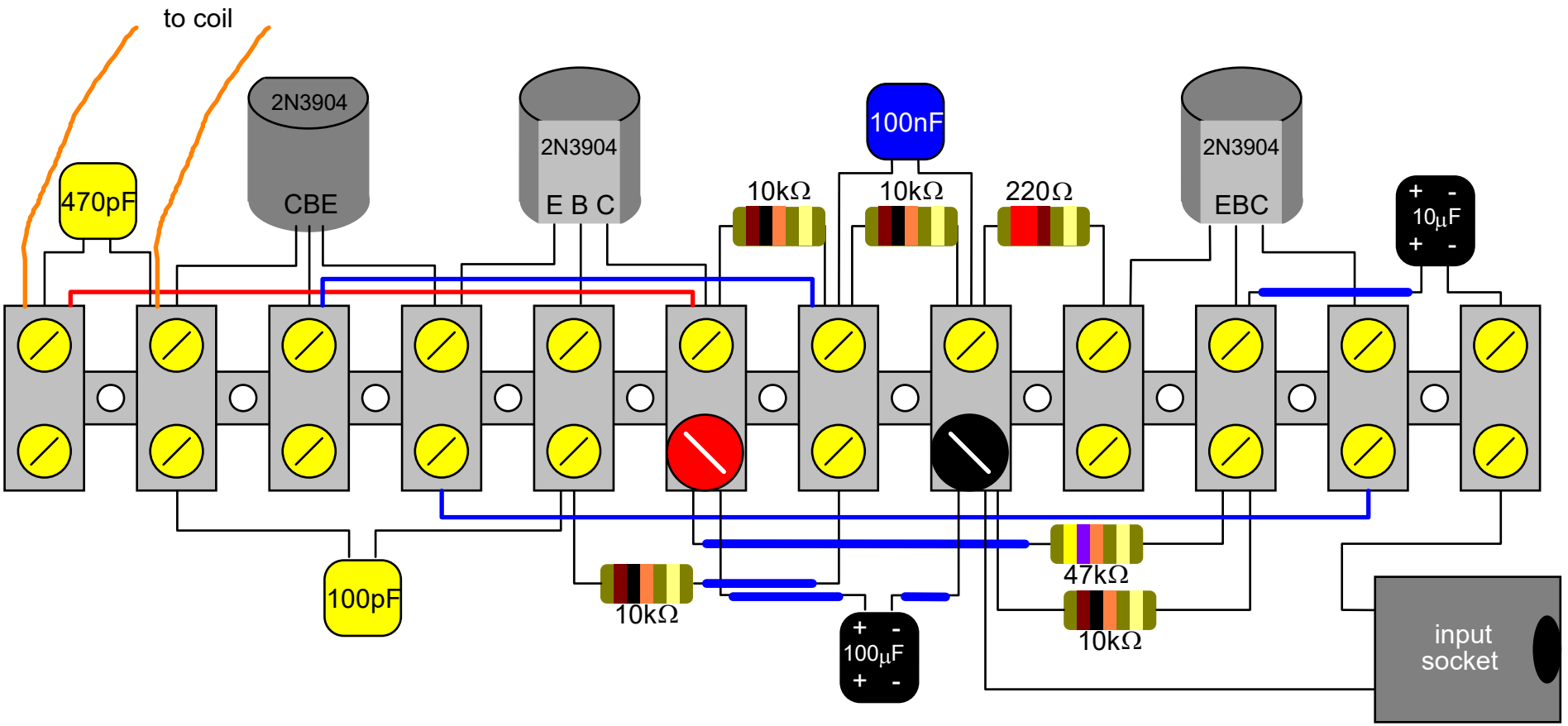
The first thing to make is the coil. This is wound on a piece of thick cardboard/thin wood that is 34cm x 24cm. The original was made from the front and back of a 790g packet of Cornflakes, stuck together with PVA glue to make a more rigid piece of card.
Slots are then cut into the card as shown below, to enable the coils to be wound and to provide a base to stand the card up. The diagram below is NOT to scale.

The diameter of the wire is not critical and 30swg (0.31mm) enamel coated copper wire was used for the prototypes.
The wire is secured by looping it through the 'start holes'. Remember to leave sufficient wire at the end to connect to the terminal strip circuit. The wire is then wrapped around the corner slots in the cardboard, finishing on the 17th turn and securing the end by looping through the 'end holes'. Again remember to leave sufficient wire at the end to connect to the terminal strip circuit.

The enamel will need to be removed from the wire at the ends of the coil. The easiest way is to use the flame from a match to burn away a cm or so of the enamel at the end of the wire. The ends can then be gently cleaned with a nail file or emery board.

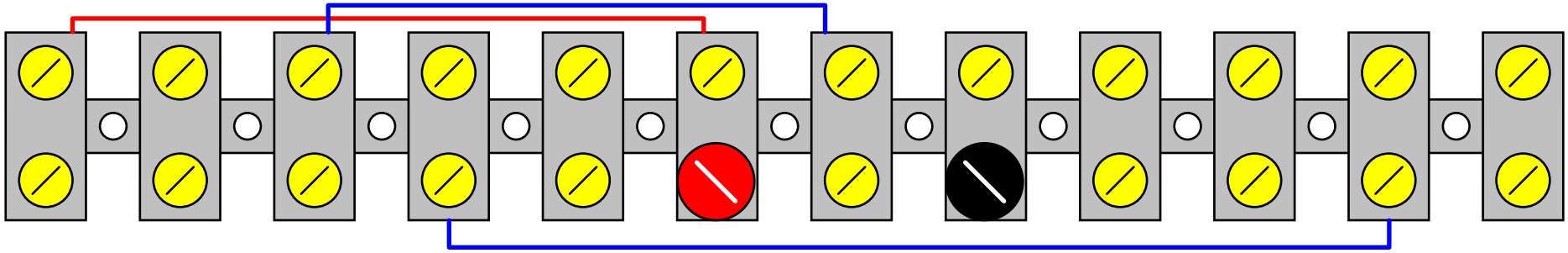


Terminal Strip Layout

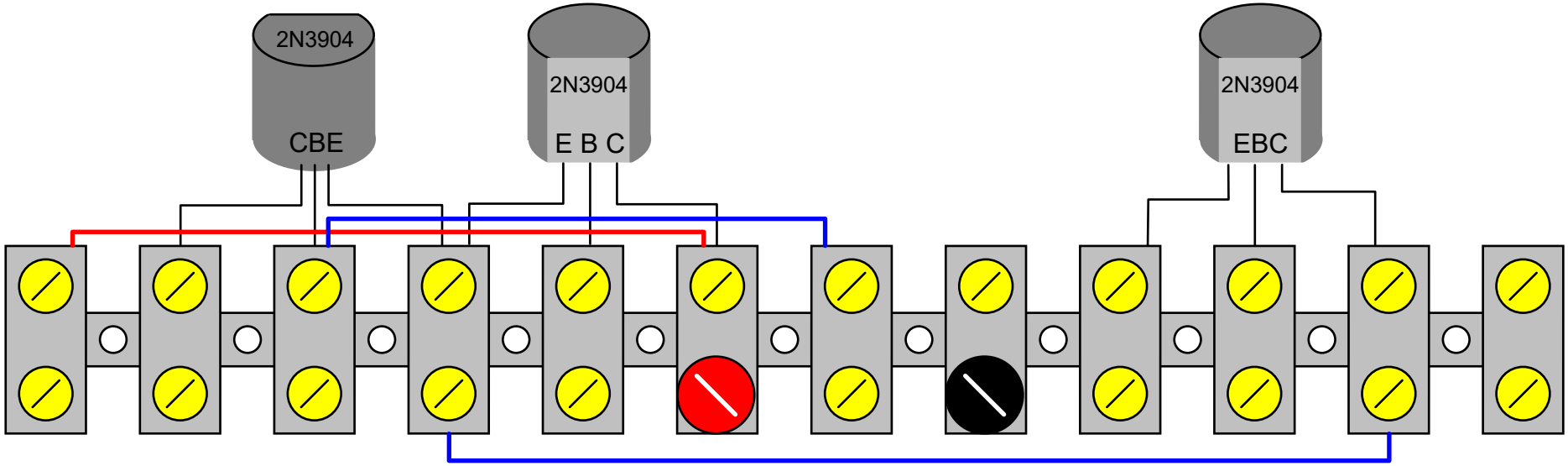


Step by step construction.

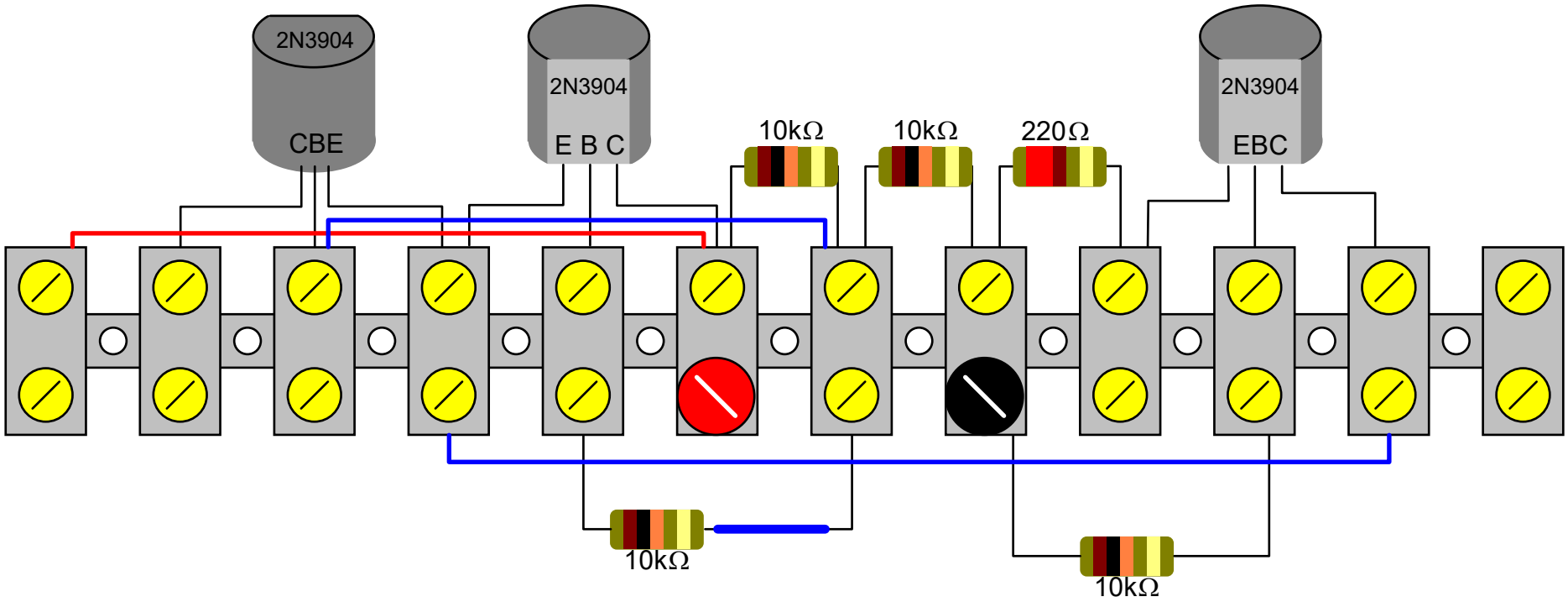
1). Cut three pieces of insulated wire to fit as in the diagram below. Strip both ends and bend the ends of the wire so that it will fit as below.



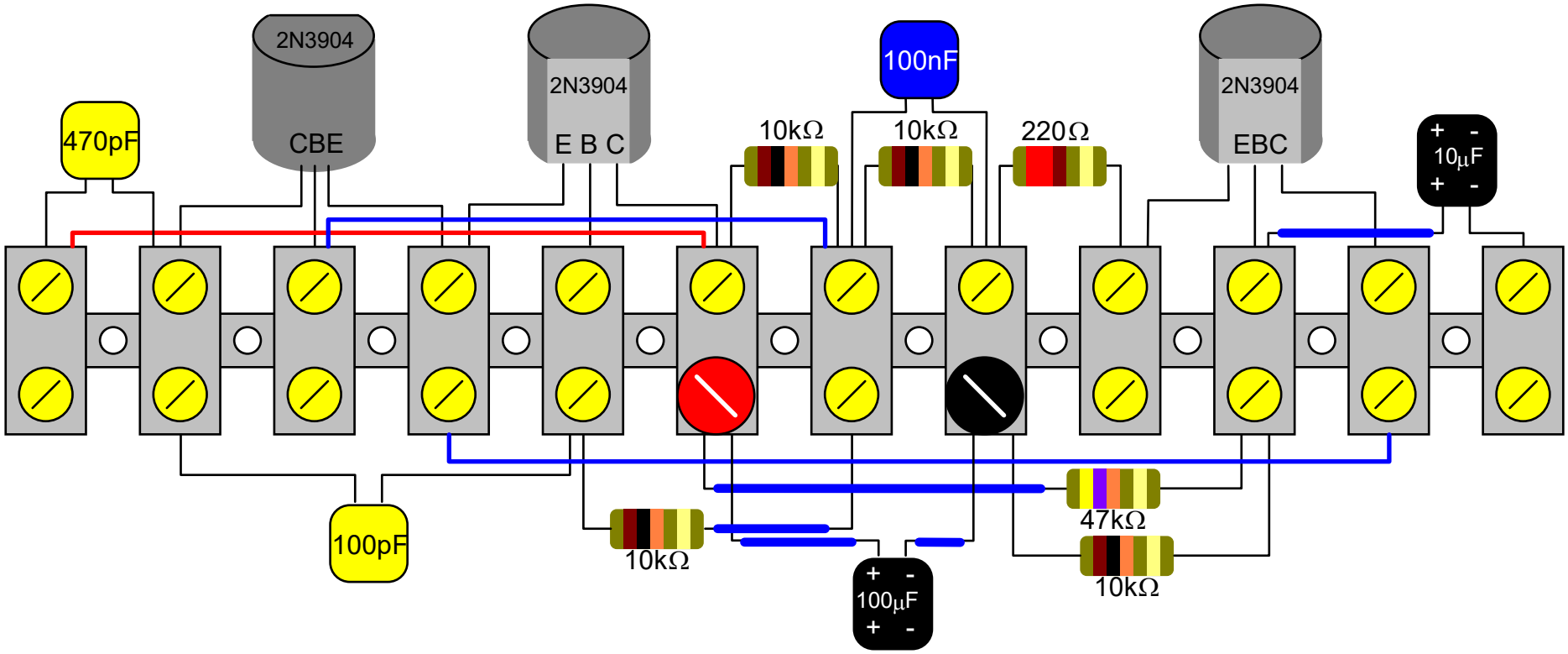
2). Take the three 2N3904 transistors. Carefully bend the leads so that they will fit as in the diagram below. Trim the leads if necessary. Ensure that they are fitted the correct way round.



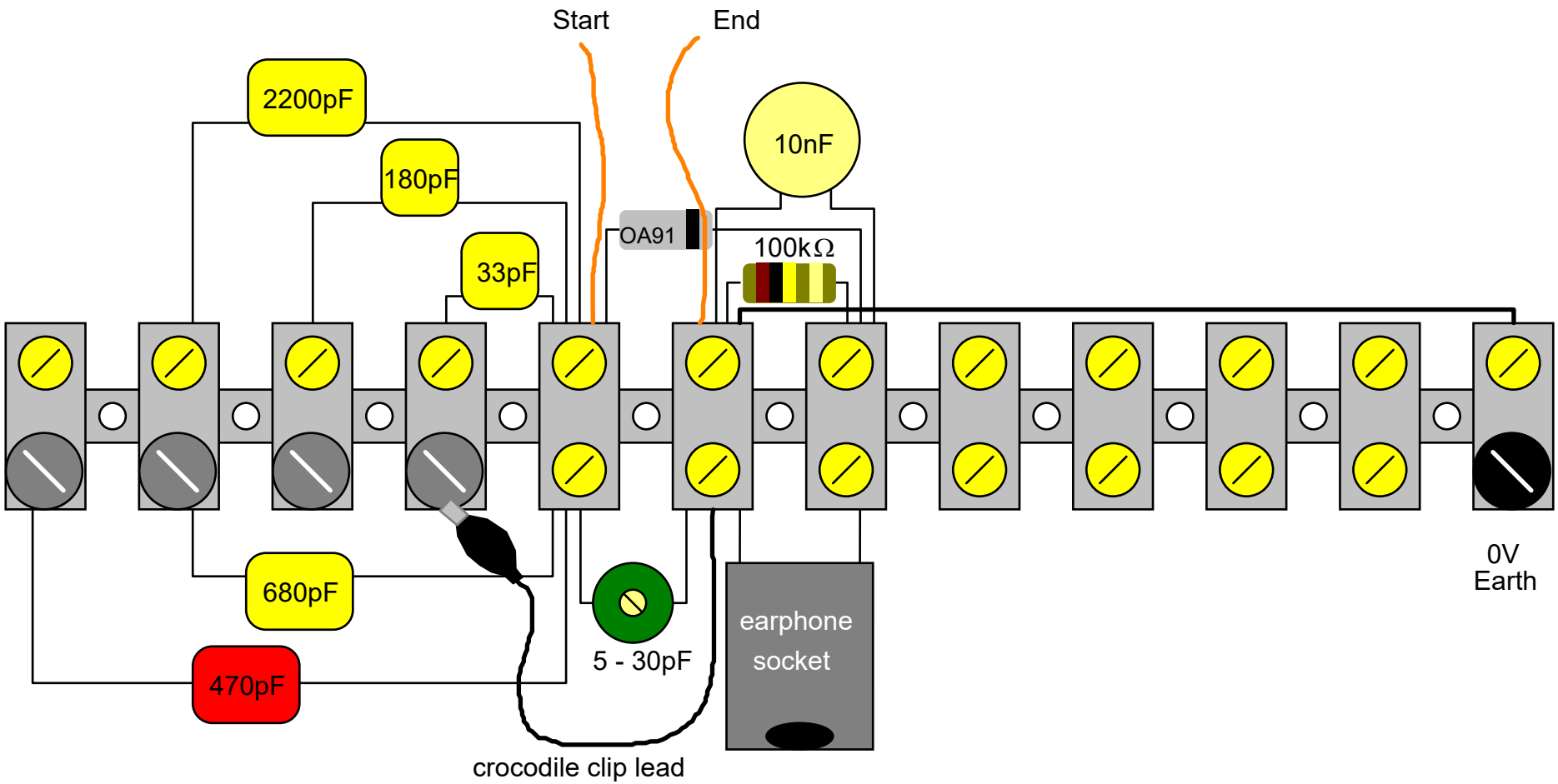
3). Take the four 10kΩ resistors (brown, black, orage, gold) and the 220Ω resistor (red, red, brown, gold). Add some insultaion to the lead of one of the 10kΩ resistors. Carefully bend the leads so that they will fit as in the diagram below. Trim the leads if necessary.
It does not matter which way round they are connected.



4). Take the 47kΩ resistors (yellow, violet, orange and gold). Add insulation to the leads. Carefully bend the leads so that they will fit as in the diagram below.
Take the 470pF, 100pF and 100nF capacitors. Carefully bend the leads so that they will fit as in the diagram below. Trim the leads if necessary. It does not matter which way round it is connected.
Take the 100µF and 10µF capacitors. Add insulation to the leads. Carefully bend the leads so that they will fit as in the diagram below. Trim the leads if necessary. These must be connected the correct way round.



5). Finally connect the input socket and the leads from the coil as in the diagram on page 3.
To receive the signals from the transmitter, the cornflake radio medium wave crystal set has to be modified. This is easily done by adding a 470pF capacitor (shown as red) to the end screw terminal, as in the diagram below. If the audio amplifier has already been added, this will only improve the strength of the audio signal received and so does not affect the transmitter testing.



Connect a 9V battery to the RED and BLACK terminals on the diagram on page 3. Plug an input into the transmitter. This can be a microphone, guitar or output from an MP3 player but should give an output signal of at least 0.5V, or the modulation may be too weak to hear.

Testing the transmitter

Set crocodile clip lead of the cornflake radio medium wave crystal set radio (with or without the audio amplifier) to the 470pF capacitor connection.
With earphones connected, faint radio stations may be audible.
Place the transmitter coil about 50cm from the radio, and parallel to the radio coil. Switch the transmitter on. If it is working, then the sound in the earphones should go quiet. Adjust the trimmer capacitor on the radio for maximum quietness.
If the sound in the earphones does not go quiet, then the transmitter is not working and the coil and components near to the coil should be checked for errors.
If the transmitter is working, then apply an input to the transmitter from a microphone, MP3 player or similar. The input should be ≈ 0.5V.
If the transmitter modulator is working, then the signal applied to the transmitter should be audible in the earphones.
If it is not, then check the wiring around the right hand side of the transmitter and also check the input source.