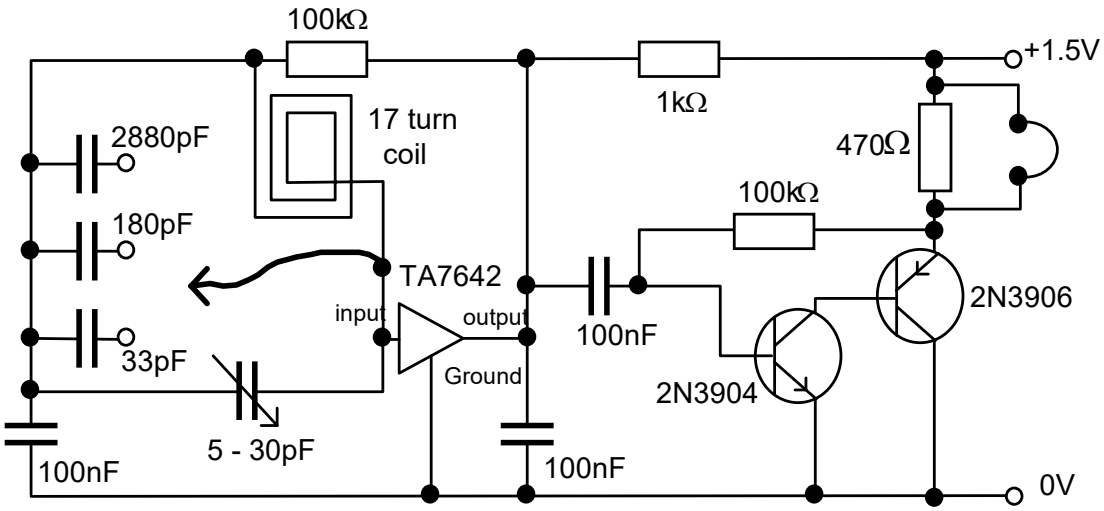
Cornflake Packet Radio Project.
Medium and Long Wave Radio

Specification

Operates from a 1.5V supply.
Provides reception on the Medium and Long wave bands.
Power standard 32Ω earphones.
Uses loop coils instead of a ferrite rod.

Circuit Diagram



How it works

Please see the document Cornflake Packet Radio Project - Medium Wave Crystal Set for a detailed description of how a basic radio works.
The coil and various capacitor selected by a crocodile clip form a tuned circuit which is designed to receive the required radio signals.
The output from this tuned circuit goes into a TA7642 integrated circuit which amplifies the radio signals and also starts to separate the music/speech from the radio signal.
The output from the TA7642 has the radio frequency removed by the 100nF capacitor and then passes to the 2N3904/2N3906 transistor amplifier, which amplifies the music/speech from the radio station enough to operate headphones. The other components ensure that the TA7642 and 2N3904 operate correctly. The headphones should be 16 - 32Ω - and are connected in series. This is easily achieved by just using the two 'live' connections on the stereo earphone socket.

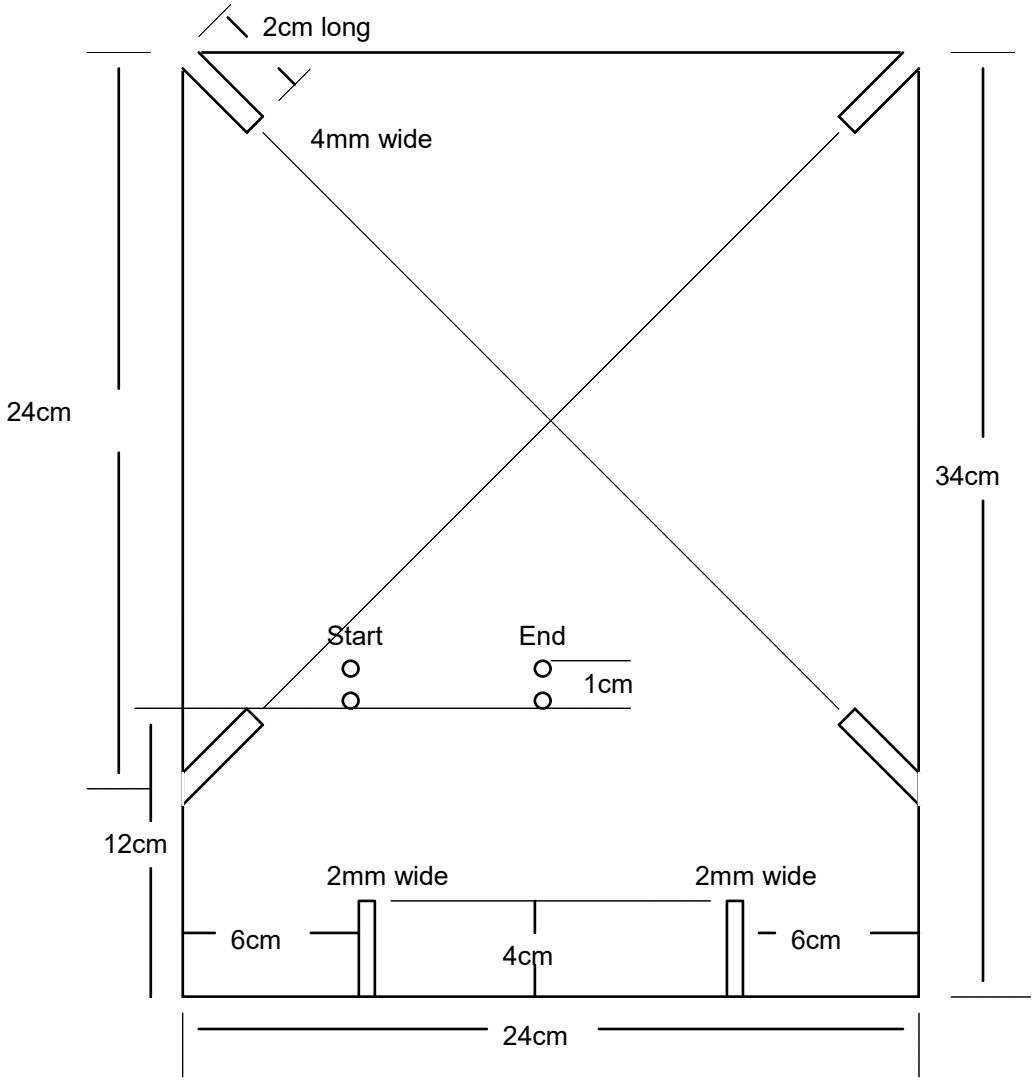
Power is supplied by a 1.5V cell (battery). With this circuit, removing the earphone plug does not disconnect the cell.

Construction

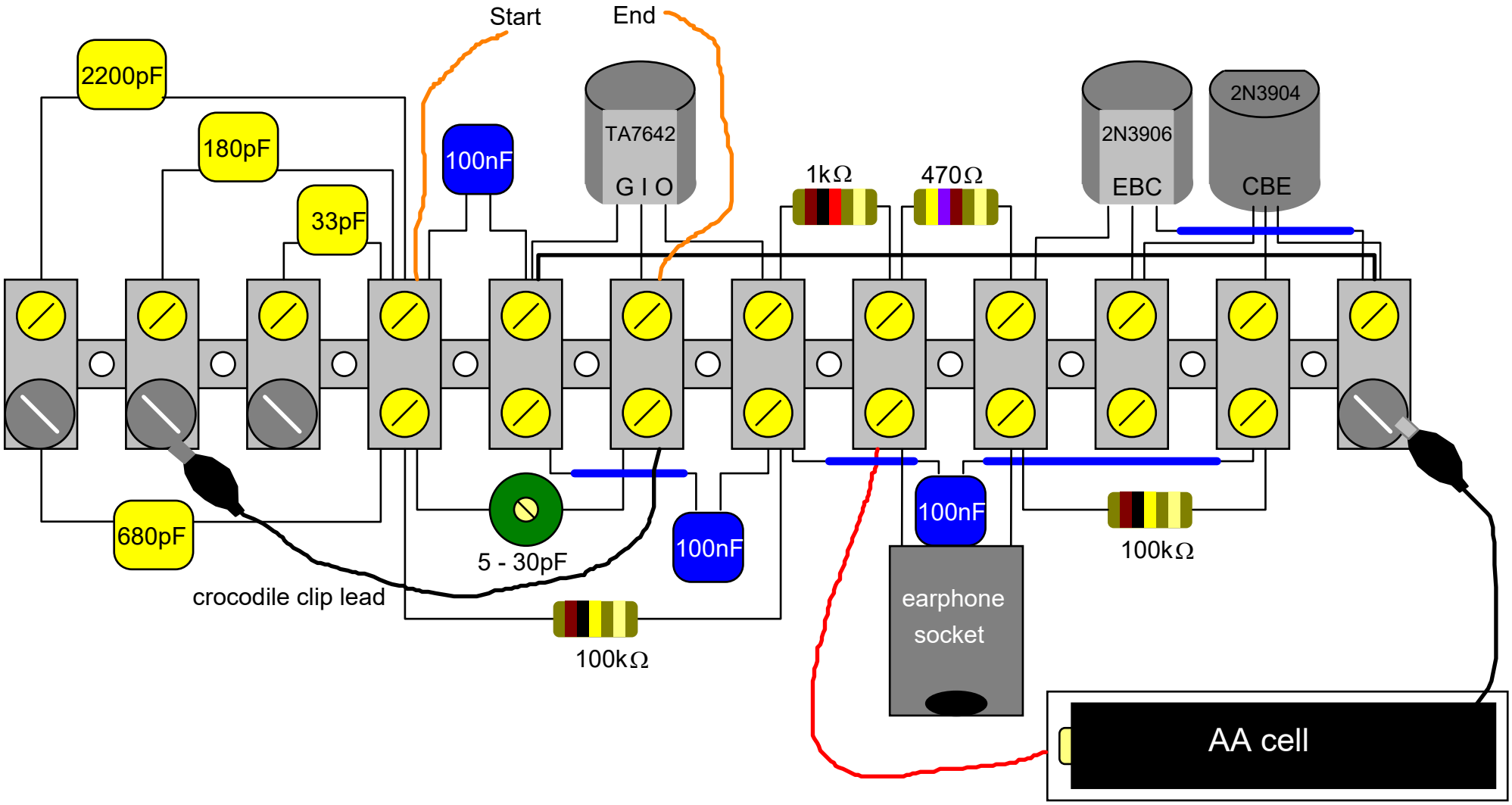
The first thing to make is the coil. This is wound on a piece of thick cardboard/thin wood that is 34cm x 24cm. The original was made from the front and back of a 790g packet of Cornflakes, stuck together with PVA glue to make a more rigid piece of card.
Slots are then cut into the card as shown below, 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 passing 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.

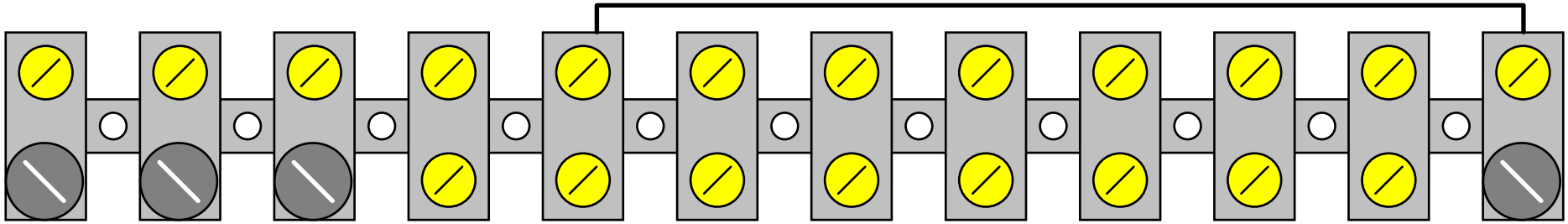


Terminal Strip Layout

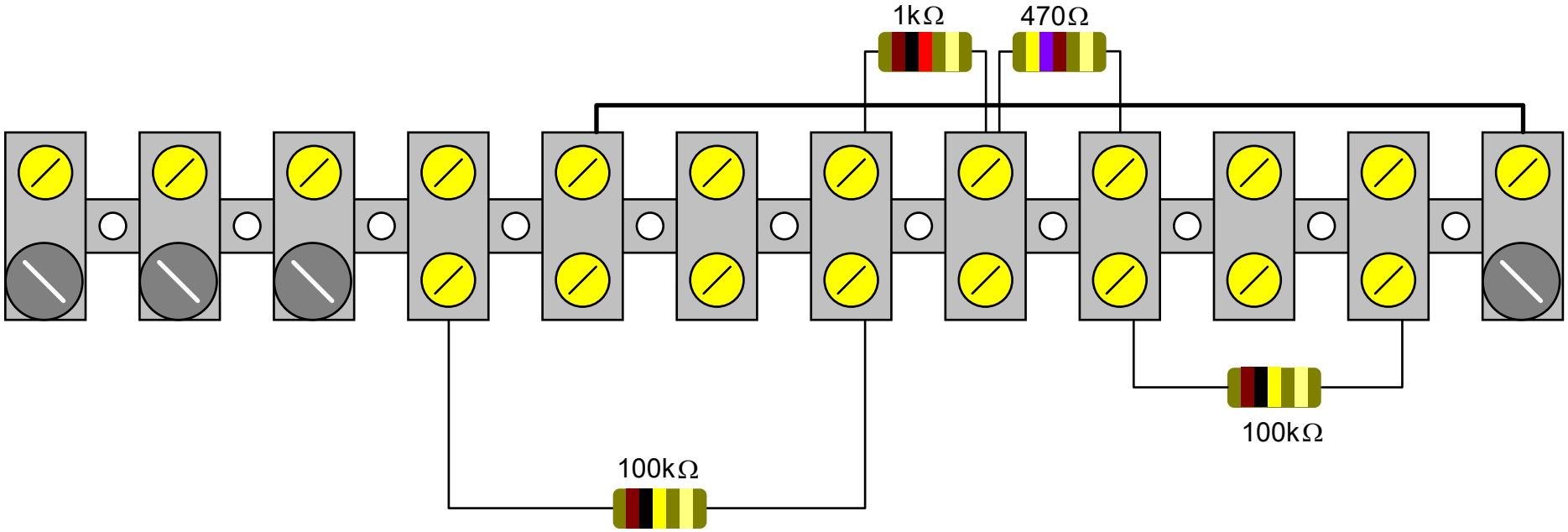


Step by step construction.

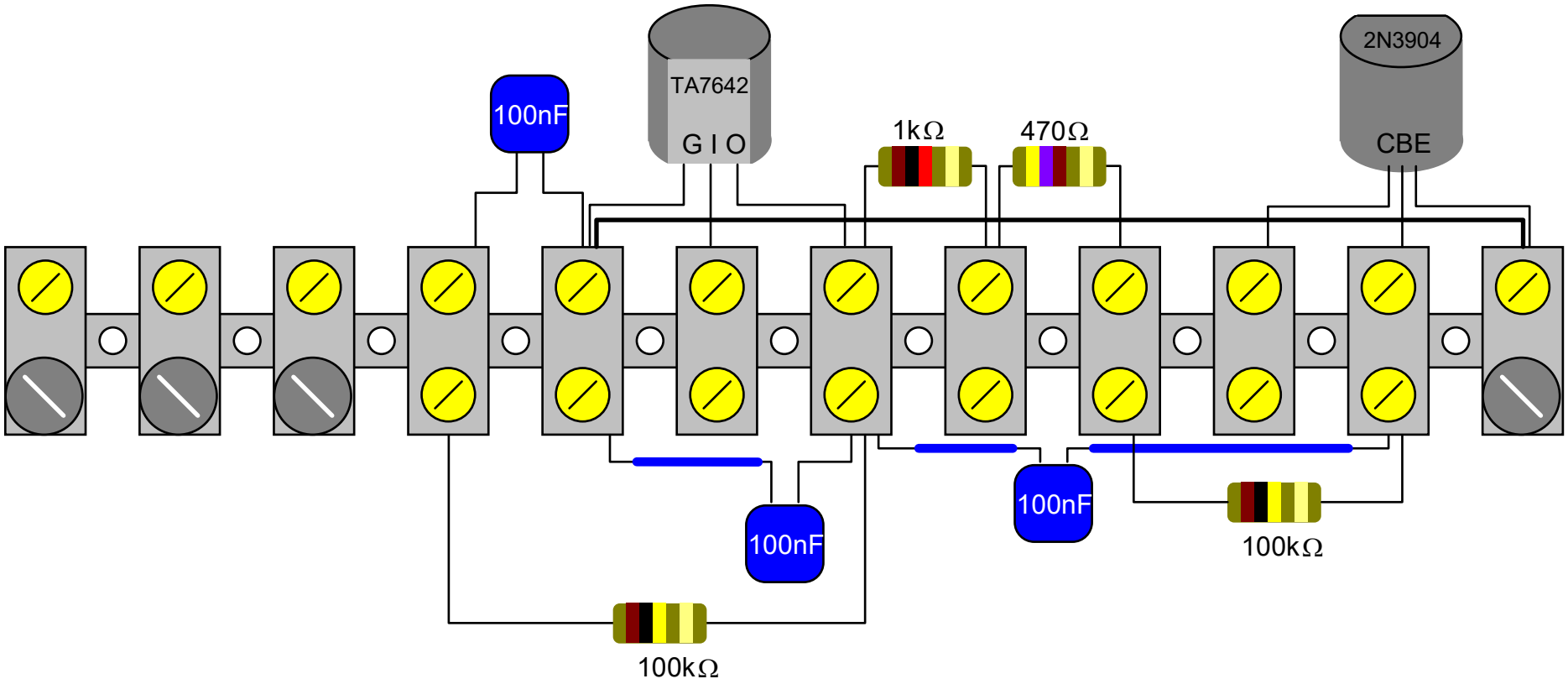
1). Cut a piece of black insulated wire approximately 11cm long and strip both ends. Bend the ends of the wire so that it will fit as in the diagram below.



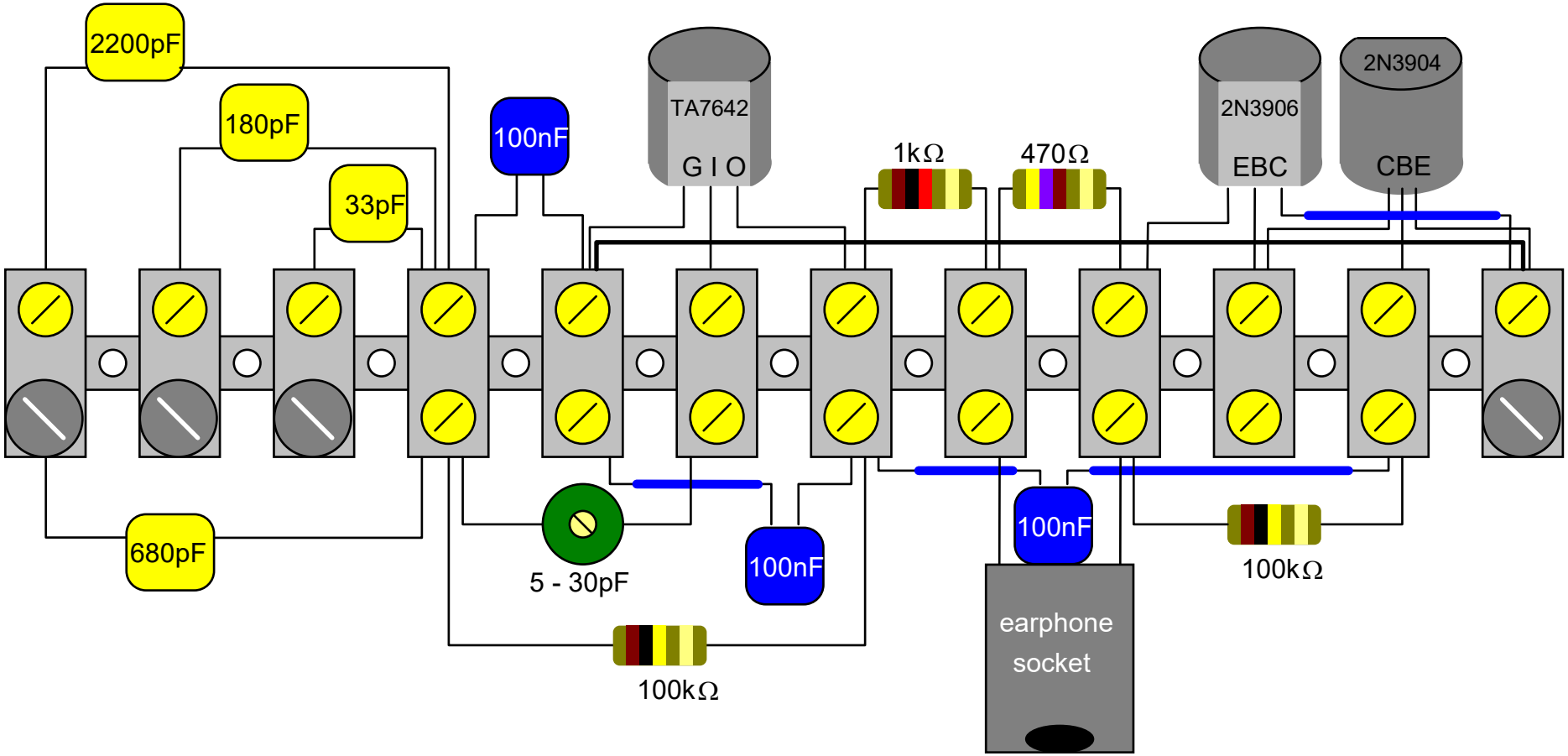
2). Take the two 100kΩ resistors (brown, black, yellow and gold), the 470Ω resistor (yellow, violet, brown and gold) and the 1kΩ resistor.
Carefully bend the leads so that they will fit as in the diagram below. Trim the leads if necessary.
It does not matter which way round they are connected.



3). Take the three 100nF capacitors and carefully bend the leads so that they will fit as in the diagram below. Trim the leads if necessary. Add insulation to the leads where needed. It does not matter which way round they are connected.
Take the TA7642 and the 2N3904. Carefully bend the leads so that they will fit as in the diagram below. Trim the leads if necessary. Ensure that they are connected the correct way round.



4). Take the 5 - 30pF trimmer capacitor and the earphone socket and bend the leads so that they will fit as in the diagram below.
Trim the leads if necessary.
Take the 2N3906 and add insulation to the emitter lead. Bend the leads so that they will fit as in the diagram below. Trim the leads if necessary.
Take the 33pF, 180pF, 2200pF and 680pF capacitors. 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.



5). Finally connect the wires from the coil to the terminal strip connector, the crocodile clip lead for selecting the radio station and the 1.5V cell.
Plug in the crystal earpiece to the earphone socket.
Leave the crocodile clip unconnected and with the coil standing vertically set the trimmer capacitor until the plates almost fully overlap.
You should hear sounds in the earphones - Absolute radio. Keeping the coil vertical, rotate the coil horizontally until the sounds are the loudest. Now adjust the trimmer capacitor for the clearest sounds.
Connecting the OV terminal to the mains electricity earth may make the sounds louder.

If no sounds are heard, check the wiring for errors. Check that the enamel has been completely removed from the ends of the coil wires.

Using the crystal set.

Selecting different radio stations is achieved by moving the crocodile clip between the various screw connectors and by adjusting the 5 - 30pF trimmer capacitor.

- Absolute Radio on 1215kHz needs 21pF and so the crocodile clip should be left unconnected and the trimmer capacitor adjusted for clear reception.
- Talk Sport on 1053kHz needs 47pf and so the crocodile clip is connected to the free end of the 33pF capacitor and the trimmer capacitor adjusted.
- Radio 5 Live on 693kHz needs 183pF and so the crocodile clip is connected to the 180pF capacitor capacitor and the trimmer capacitor adjusted.
- Radio 4 on 198kHz needs 2880pF and so the crocodile clip is connected to the 2200pf and 680pF parallel capacitors. The trimmer capacitor may have little effect on this station because of the large capacitance used. Reception of Radio 4 will be poor with the coil used for this radio.

For much better reception of Radio 4 use the coil and tuning capacitor from the Long wave crystal set.