Waveband control panel.

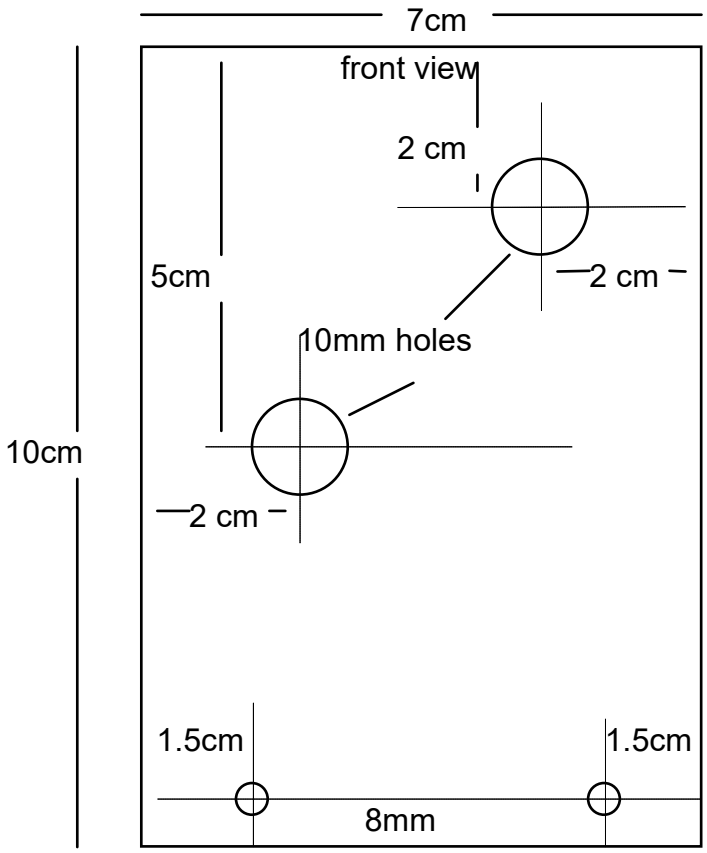
The frequency range of the basic radio can be easily extended to cover the Long wave band by replacing the 220µH inductor with a 4.7mH inductor.

It is worth either salvaging such an inductor from an old circuit (e.g. compact fluorescent lamp) or buying a new one, as to wind your own would require approximately 360 turns of 0.31mm enamel wire spaced over 20cm on a 36mm diameter former!

A 4.7mH inductor will give a tuning range of approximately 150kHz to 367kHz, and so will enable BBC Radio 4 to be received on 198kHz.

Disconnecting and reconnecting inductors can be a real nuisance especially when more inductors are used to extend the range of the receiver to the short wave and amateur radio frequencies.
It is therefore worth constructing a new control panel to support a 12 way switch (79-0100), which can switch different inductors to be in parallel with the tuning capacitor.

A diagram of such a panel is shown below.



The top hole on the right hand side is for adding an attenuator in the future. The attenuator will reduce the strength of the radio signal from the aerial if necessary.

Most of the inductor values in the table below are preferred values and so can be purchased/salvaged. However, the small inductor values are worth making, as it will be easier to adjust the value to provide the range required.

As the frequency increases, the tuning range provided by the tuning capacitor also increases.
E.g., with a 220µH inductor, the frequency range will be approximately 650kHz to 1350kHz, i.e. a range of around 700kHz.
With a 1µH inductor, the frequency range will be around 10MHz to 28MHz, i.e. approximately 18MHz!
Such a large tuning range makes accurate reception of radio stations difficult.
This can be reduced by connecting a capacitor across the inductor.
The inductors initially used and the measured frequency range are shown in the table below.

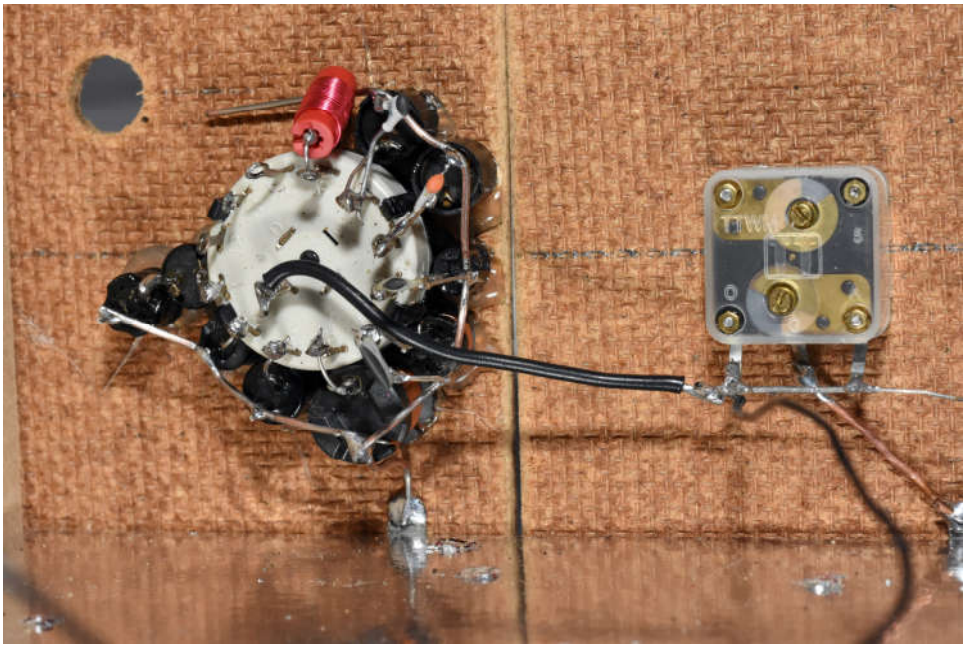
Inductor values and measured frequency range

Switch position	Inductor (H)	Frequency (Hz)
1	10 +10m	- 204.8k
2	4.7m	156.7 - 386.5k
3	1m	308.6 - 706.1k
4	220µ	658.4 - 1348.9k
5	47µ + 68pF	1.326 - 2.392M
6	22µ + 33pF	2.079 - 4.195M
7	6.8µ + 22pF	3.936 - 8.412M
8	2.2µ + 10pF	7.018 - 17.425M
9	1.0µ	10.008 - 28.127M
10		
11		
12		

The last three positions of the switch were not used initially as it is clear that the tuning range on position 9 (10 - 28MHz) is just too large and needs to be split up into smaller sections later.
The frequency ranges in the table were measured using a rf signal generator with a large output resistance and an oscilloscope with a very large input resistance. This ensured that the quality factor (Q) of the tuned circuit remained high and gave a pronounced peak in output at the resonant frequency.

The rear of the waveband panel and tuning panel can be seen in the photo below.
The inductors were glued to the panel and then wired directly to the switch, a thick wire connected the other side of the inductors to 0V. Keeping wire leads as short as possible is important, as a wire will have inductance and affect the tuning of the circuits at the higher frequencies.
Any capacitors were soldered directly across the inductor.

All of the inductors used were salvaged commercial types except for the 1µH coil.
This was wound onto a piece of 5.5mm diameter wire insulation and consisted of 21 turns of 0.31mm enamel coated wire spread over 10mm. A 10MΩ resistor was passed through the middle of the insulation to provide connecting leads to attach the wires from the inductor.
10MΩ is a sufficiently large value as to have little effect on the inductor.



The wiper from the switch is connected to the tuning capacitor, which is also connected to the aerial and the input to the demodulator.

In Use.

When used with a short aerial, strong stations on the long and medium wave were readily received. Stations on the higher frequencies were rarely heard apart from some very local radio amateurs. Touching the aerial detuned the radio significantly.

When used with a 30m long wire aerial, the long and medium wave stations were very loud, but because of the effect of the aerial on degrading the tuned circuits, it was difficult to separate the different stations.
On the higher frequencies, some commercial overseas stations in France and Germany were heard, but the degrading effect of the aerial on the tuned circuits was significant, and the tuning ranges bore little resemblance to the table of measured results.
Nevertheless, quite a few hours were spent at different times of day and night investigating just what radio stations could be heard with such a simple set up.