Colin Bowring's Crystal Set – a winner!



Circuit and operation





Plan and Elevation views of Colin's Set



CRYSTAL SET STORY

I have wanted to build an early type crystal set for some time and the advent of the NZVRS crystal set competition provided the incentive to get started.

In researching various designs for inspiration I came across an interesting set dubbed "the mystery crystal set". Details of this set were first published in 1932 and it was quite unconventional in that it used two coils wound together turn over turn on the same cylindrical former. This arrangement apparently performed well, but how it worked was not easily understood, hence the name 'mystery crystal set' (for full details see http://www.clarion.org.au/crystalset/mystery.html).

After lashing up a test set I evaluated the standard mystery set as good, but in my opinion, not spectacular. I liked the basic concept but the 'fixed' coil arrangement was somewhat restrictive. I felt spider web spiral wound type coils would be the way to go, as they are appropriate for the vintage era, usually have a high Q and I like the look of them. From this point on with much experimenting, trial and error, and guess work, 'my crystal set' eventually evolved into a completely new design.

Referring to the circuit diagram opposite, L2 is the aerial coupling coil which is inductively coupled to the tuning coil L3. The degree of coupling between L2 and L3 is variable through 90° via the front panel 'coupling' knob. At maximum coupling L2 is standing parallel to L3 with about 15mm between the two coils. At minimum coupling, L2 is lying horizontal with its outer edge about 35mm away from L3. The aerial is connected to L2 via L1, which is included to better match a 'standard' or long aerial. The earth is connected via CV1 which tunes the aerial coil L2 to the frequency of interest. SW1 is an internal part of CV1 arranged so as to bypass CV1 and connect the earth directly to L2 at the last 2-3° of rotation i.e. plates fully closed, extending the versatility to tune various aerial types.

L3 and L4 form the main tuning circuit. The station tuning circuit comprises of L3, CV2 and C1. L4 consists of 11 turns wound together with the last 11 turns of L3. That is the two wires are wound close together side by side. Note this tuning circuit (L3) makes no physical connection to any other circuit components; it is inductively close coupled to L4 and variably coupled to L2. C1 is a padder for CV2. The circuit around L4 is a standard detector and phones arrangement.

When I started this project the only suitable component I had was one variable capacitor. All the other component parts were either acquired along the way or made from scratch. I used some sort of hard plastic material (don't know what it is) that closely imitated ebonite as a substitute for the real thing for the coil supports and other bits where necessary.

Coil L1 is 46T 30swg DCC self supporting basket wound on an 11 peg jig. Coil L2 is 25T 24swg DCC spiral wound on a 30mm dia centre with 9 wooden 'fingers'. Coil L3 is 53T 24swg DCC and L4 11T 30swg DCC spiral wound together on a 30mm dia centre with 18 wooden fingers. L3 & L4 are wound in the traditional 'slotted disc' style, however the 18 fingers are arranged in pairs to form 9 winding slots with no material former or solid dielectric between the windings.

The crystal detector is home made, made from bits and pieces from my junk box. The glass tube was cut from an old test tube using a 'hot wire' technique described in some vintage literature.

The front panel labels and coupling scale are made from brass plate. Full size copies were taken from a 1925 parts catalogue and through various processes the labels were etched in a way similar to making a PCB. These were painted black, then sanded and polished to reveal the lettering etc in brass against a black background.

The base board was made and supplied by a builder who claimed the wood was salvaged from a very old cupboard. It is a nicely grained and heavy piece. Fine sanding and a couple of coats of clear lacquer resulted in an excellent finish. The remaining original old components were individually disassembled and cleaned up to a presentable standard before final set assembly.

This project took a lot of time to complete, but the end result is very satisfying. This set covers the whole broadcast band from about 500Kc to 1600Kc, and with a bit of practice any station can be tuned in with relative precision in a matter of seconds. The variable coupling enables a smooth transfer between sensitivity and selectivity. An ideal balance can easily be attained for a station of interest, depending upon the reception conditions prevailing at the time.