



P.O. Box 1439 Canora, Saskatchewan S0A 0L0

THE MAGIC OF A CRYSTAL SET

The crystal set was popular during the 1920's and 30's because it was cheap to buy, much cheaper if you built one yourself, perhaps only a few shillings. Additionally a Crystal Set did not require electricity or expensive batteries, however it could only provide enough volume for headphone listening, and if it was situated in an area of low signal strength the listener would also require a very quiet room as the volume would be low. However In the 1920's hearing voices and music from a station miles away with no wires (hence the term Wireless) really was a magical experience! Listeners in the early twenties were also tinkerers and experimenters, trying different designs of crystal set in an attempt to get the loudest and clearest reception.

Since crystal sets have no batteries and no mains power, they rely entirely from the electrical energy developed between the aerial an earth connections - producing sounds as if by magic.

The crystal set had to be carefully tuned into the station by making adjustments to a tuning coil and condenser, these early crystal sets had the added complication of using a 'Cats Whisker' as the detector. The detector converted the radio waves received from the radio station into an audio wave that could be heard in the headphones. The Cats Whisker was a fine wire that rested onto a piece of galena, the crystal, and had to be very finely adjusted to obtain the loudest and clearest sound. Once the 'sweet spot' was found it was important not to move it, it would be very frustrating if someone bumped into the table and dislodged it!

To work at all a crystal set requires a very large aerial, but this is nothing more than a long piece of wire, perhaps 20 to 50 yards of insulated copper wire, hung outside around a garden between poles or trees, or even around the loft space. For the aerial to be effective it needs to be balanced with an earth. An earth is simply a copper rod or pipe about one yard long driven into some soft damp earth with a mallet. At the top of the pipe is fitted a jubilee or hose-clip to which is attached a length of insulated copper wire which is then fed into the house,



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along with the aerial wire, to the room where the crystal set will be operated and connected to the set's terminals.

It is quite possible to build your own crystal set. In its very simplest early form a crystal set consisted of a coil of wire, something called a 'detector' and a pair of very special headphones.

THE CONSTITUENT PARTS

The coil of wire is called a Tuning Coil, and the number of turns of wire on the coil determines the wavelength (frequency) that the set is tuned into. Tuning to different stations can be accomplished by varying the number of **turns** on the coil, or more easily by having many different tapping points on the coil so that adjustments can be made.

To make tuning easier a component called a tuning capacitor can be included in the circuit. In very early sets a tuning capacitor was not always included to keep costs down, or due to their being difficult to obtain.

The Detector converts the radio wave received into an electrical wave that is suitable for the headphones to, in turn, convert into sound waves that can be heard by the human ear. In the very early days of the crystal set the detector consisted of a holder containing a piece of galena crystal that had a very thin and springy wire placed on its surface that had to be very delicately adjusted to find the sweet spot where the radio station could be heard. This was commonly referred to as a "Cat's Whisker". Modern detectors are called diodes and are more efficient than early detectors and cats whiskers. Diodes are still quite readily available and inexpensive. Part numbers for modern diodes include OA90, OA91 and IN34. Diode part numbers that are perhaps now more difficult to obtain include OA47 and OA81.

The headphones have to be of a very special type called high impedance headphones. Because there is no additional power source in a crystal set the current generated in the circuit is tiny - minuscule in fact. Ordinary low impedance headphones, such as Walkman headphones, would present a virtual



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short circuit to the crystal set allowing the tiny signals to drain away to earth & consequently producing no sound - not very useful!

High impedance headphones, on the other hand, reduce or impede the flow of current down to earth, in effect saving the tiny signals to produce sounds from the headphones that we can then hear.

There is a problem however, these high impedance headphones that were so readily available in the 1920's and 1930's are **not** so easy to obtain today, but some specialist vintage radio outlets still stock them **though**, the price can be quite high. They can still be seen in museums of course. All is not lost though, today we can obtain a special earphone called, appropriately, a crystal earpiece very easily and far more cheaply than. An electronic component, called a resistor, must be connected **across** the crystal earphone to allow a path for DC current to get to earth. The value of the resistor is usually 47,000 Ohms and without it a crystal earphone tends to block DC current and as a consequence the sound will be very quiet and distorted.

Aerial and Earth: For a crystal set **to work**, it needs an efficient aerial and earth. Since a crystal radio has no power - no batteries or mains electricity - it relies entirely on the radio wave energy sent out from the radio station's transmitter and collected by the aerial to work. The aerial simply consists of a length of wire, but it necessarily has to be quite long, usually in the order of 10 to 20 meters. For the aerial to be effective the crystal radio set also has to be connected to a good earth point. A good earth often consists of a 3 or 4 foot copper stake driven into the ground, but sometimes a water pipe can be used to reasonable effect. (Safety: Never use the earth pin of a household mains plug)

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