Crystal Radio Engineering
Simple Radios

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The purpose of this brief chapter is to introduce you to what can be done prior to your efforts to build a good crystal radio. The simple receiver circuits here let you test your antenna, ground, diode, and headphones. There is little if any selectivity and you may hear several stations at the same time. But, and this is the important thing, if you hear anything then you can make a radio. If you hear little or nothing then you need to investigate why. The most common problem is a poor ground system. If this radio does not work then even the best crystal radio will probably not work either.

Build the circuit in Figure 1. You may hear little at first until your ears acclimate to hearing faint sounds. The volume will never be loud unless you are very close to the broadcast antenna. The inspirational thing here is hearing anything – for if you do then you are experiencing the same thing the very first pioneers in radio experienced over one hundred years ago. You are reliving history! The capacitor is theoretically needed but there might be little difference without it – tray that. The headphones should represent an impedance of several thousand ohms – use a transformer to match common low-impedance phones. If you are in a strong signal area then you might try using a speaker with the appropriate matching transformer to produce a primary impedance of several thousand ohms. In a quiet room you should be able to hear something. You might try the diode in the opposite direction. It really should not make any difference but sometimes there are surprises.

If you do not have the exact parts illustrated in Figure 1 then use whatever you have. The circuit is not critical and a wide variety of sub-optimal components will work to some extent. The key thing is to try something. It does not have to be perfect. You can always improve upon it later. Having something that works at all is an inspiration to persevere.

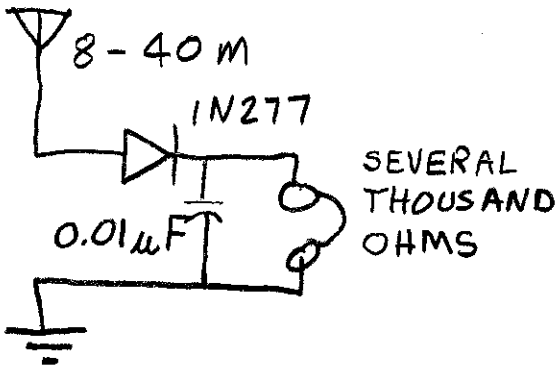

Figure 1: Simple Crystal Radio

The circuit in Figure 2 adds an inductor. The inductive reactance cancels part of the capacitive reactance of the antenna wire and enables a stronger signal to be received. Try whatever inductors you have in the 100 to 700 uH range. In theory the inductor could be variable and you could form resonance with a desired station. This would maximize the received signal strength. However, the overall operating Q of this is not going to be very high so selectivity will be poor. But it is a worthwhile experiment. This represents the beginnings of a good crystal radio and should build some excitement as to what ultimately can be achieved.

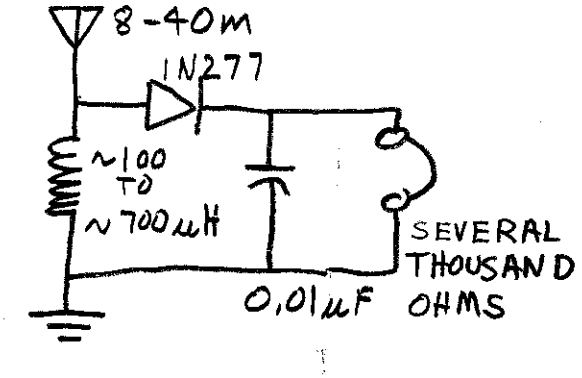

Figure 2: Improved Simple Crystal Radio

If you have made the circuits in Figures 1 and 2 work then you are on the road to success in building a real crystal radio. The next steps are optimal antenna impedance matching and a resonant circuit for tuning.