

Maxitronix™

ELECTRONIC LAB

OWNER'S MANUAL

ELECTRONIC CRYSTAL RADIO KIT

Safe, Solderless, Exciting, Educational and Fun!
Easy-To-Read Illustrated Operating Manual Included!
No Battery Required!



- A great fun to build your own working AM RADIO!
- Tune in your favorite AM RADIO stations!
- Receives 520-1650 KHz band!
- Learn how RADIOS work!
- With earphone included!
- Needs no batteries or AC power!
- Crystal Diode converts RF to audio!

INTRODUCTION

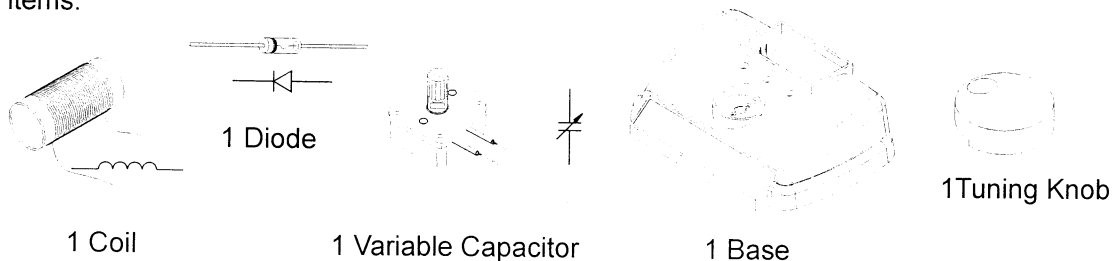
With your "Crystal" radio kit you can tune in AM radio stations without using batteries or AC power! This device works on the same principle as the early crystal radios, but the crystal has been replaced with a more reliable modern device called a *diode*. Your crystal radio kit requires no previous experience in the field of electronics. You can build and operate it by following the simple instructions in this manual.

GETTING READY

Before you begin, you need the following tools:

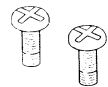
- Phillips-type screwdriver
- Pencil or ballpoint pen

Unpack your kit and check the all the parts. Your crystal radio kit should contain the following items:





3 Spring
Connectors



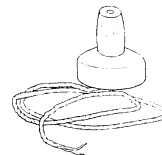
2 Screws



1 White
Ground Wire



1 Green
Antenna Wire



1 Earphone

Also Included:

1 Sticker

BASIC ELECTRONIC SYMBOLS

Explanation of components

Variable capacitor – This device is used to tune the radio to a station. The leads attached to the lugs will connect it to the circuit.

Diode – A small crystal is sealed inside this device with the leads connected to it. Electricity moves only in one direction through the diode.

Coil – This antenna coil is made by winding enameled copper wire around a plastic core 80 times. The leads have been stripped and tinned so they can be connected to the circuit.

Earphone – This earphone contains a device that can make electricity move a metal diaphragm to produce sound. The leads have been stripped and tinned so they can be connected to the circuit.

Antenna – A device used to transmit or receiving radio waves.

Ground – used to make an electrical connection with the earth or another type of grounding source and create a common return path for electrical current.

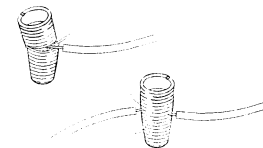
See “HOW YOUR CRYSTAL RADIO WORKS” on page 11 to learn more about these components and how they work together.

ASSEMBLING YOUR CRYSTAL RADIO

Follow the instructions in the order given, beginning with step 1.

Note:

- Don't rush. Take your time and enjoy building your kit.
- Check off each step as you finish it to be sure you did not forget anything.
- All through these instruction you're asked to make various connections. Good electrical connections are very important in electronic devices. One poor connection can keep your crystal set from working. Be sure all your connections are secure.
- To connect a wire to the spring terminals:
 1. Bend the spring to one side with your finger.
 2. Insert the end of the wire into one of the gaps in the spring.
 3. Release the spring. It should hold the wire firmly.

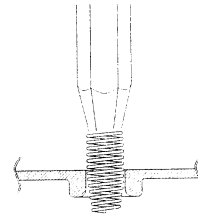


Be sure you connect clean, bare wire to each terminal. Some of the wires have insulation that has been stripped off the ends. Other wires have been "tinned" (coated with solder) at the ends so that they can make a good connection.

Make sure that you insert the bare end of the wire into the spring terminal. Be careful to keep the insulated part out of the spring. If a wire has a shiny tinned part at the end, insert the shiny part into the spring.

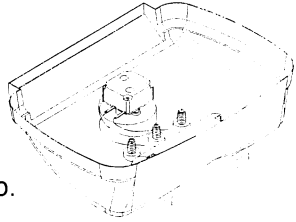
STEP 1. Inserting the spring terminal

1. Locate the three spring holes
2. Press the smaller end of each spring terminal into one of the punched holes.
3. Use the pointed end of a pencil to twist each terminal firmly into place.



STEP 2. Connecting the variable capacitor

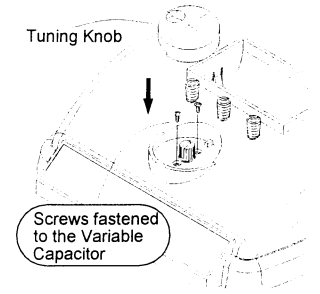
1. Turn the base upside down.
2. Place the variable capacitor (as shown) into the base. The metal shaft of the capacitor should extend through the opening.
3. Hold the variable capacitor in place and turn the base right-side up.



4. Insert the two smaller screws into the holes on top of the base and tighten them with a Phillips screwdriver.
5. Turn the base upside down and connect one wire to the antenna spring connector by bending the spring slightly to one side so the wire makes connections on both sides of the spring.
6. Connect the other wire to the ground spring connector in the same manner.

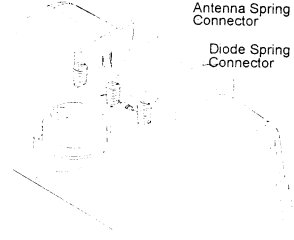
STEP 3. Install the tuning Knob

1. Turn the variable capacitor's shaft all the way to the left.
2. Place the tuning knob on the upper end of the shaft.
3. Place the dot on the knob on the left side as shown and press the knob into the shaft.



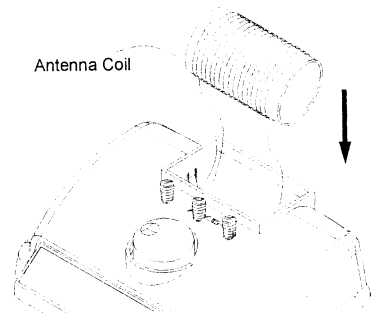
STEP 4. Mount the diode

Insert the diode end with the black stripe into the diode spring connector, and insert the other end into the antenna spring connector.



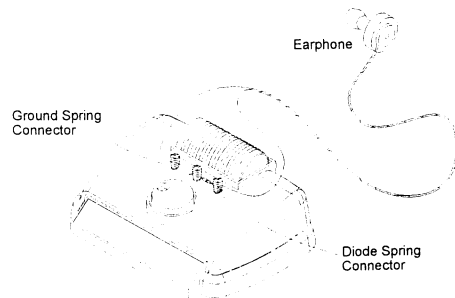
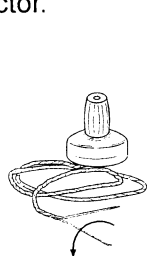
STEP 5. Install the antenna coil

1. Press the coil into the well until the coil clicks into place.
2. Connect one of the antenna coil wires into the ground spring connector.
3. Connect the other antenna coil wire to the antenna spring connector.



STEP 6. Attaching the earphone

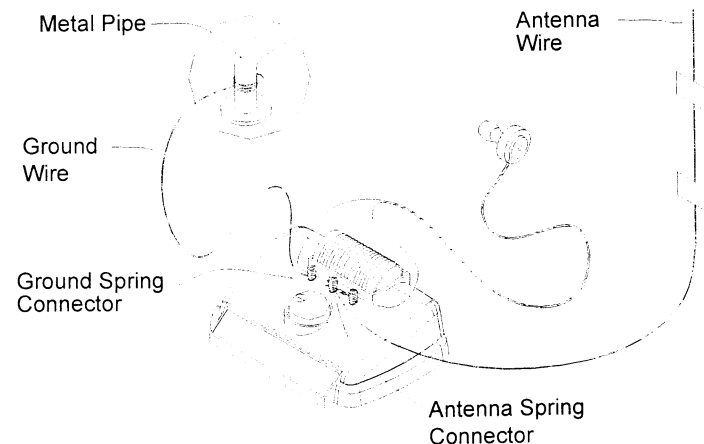
1. Unwind the end of the earphone's wire about two inches so there are two wire leads.
2. Attach one wire lead to the ground spring connector and the other to the diode spring connector.



STEP 7. Installing the ground and antenna wires

The ground and antenna wires are an important part of your crystal radio. Connect them carefully using the following instructions.

1. **Locate the white** ground and the green antenna wires.
2. Attach the short, stripped end of the ground wire to the ground spring connector.
3. Find a metal cold water pipe, metal radiator pipe, or another metal pipe, close to where the radio will be used.
4. Scrape any paint or dirt from the pipe until you see bright metal all the way around the pipe.
5. Wrap the long stripped end of the ground wire several times around the scraped part of the pipe and twist the wire tightly.



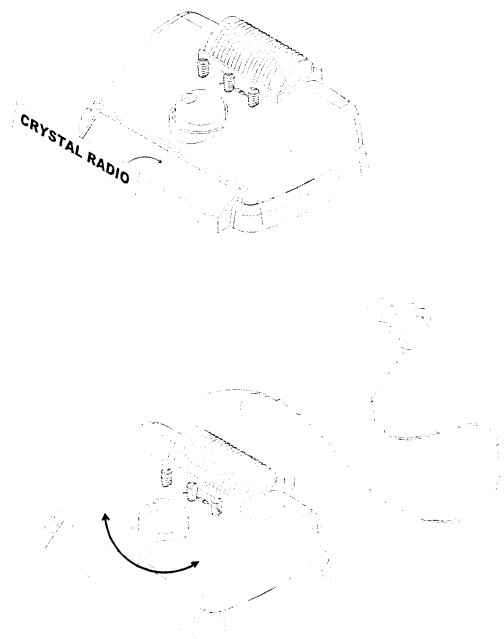
Caution: some pipes may be hot, so ask an adult to help you with this part of the project.

6. Connect the stripped end of the green antenna wire to the antenna spring connector.
7. Extend the antenna wire horizontally to its full length.

Note: The antenna should be placed in a straight line, away from power lines, electrical cords, and larger metal objects. We suggest taping it up high on a wall using masking tape (as shown).

STEP 8. Attaching the sticker

Peel off the paper backing and place the sticker on your radio as shown here.



You have now completed the building of your crystal radio. If you have followed the instructions carefully, you should be able to tune in one or more AM radio stations.

USING THE CRYSTAL RADIO

1. Place the earphone in your ear.
2. Adjust the tuning capacitor's knob for the clearest reception of a local station.

3. Remember that your crystal radio has no amplifier, so the stations you receive might not be as loud as if you were listening to a modern radio...

TROUBLESHOOTING

If your radio does not pick up a strong signal, or if you do not hear anything, these suggestions might help you figure out the problem and fix it. If your radio still does not operate properly, please contact us for assistance.

Radio does not work	Check all the spring connectors to make sure the wires are attached correctly and that none of the wires are loose.
	Make sure that the loose end of the antenna wire does not touch any other connection.
Ground wire does not make a good connection.	Try taping the wire to the shiny part of a pipe using duct tape. If the pipe is dull or rusty, use sandpaper to gently sand the area where the wire makes contact.
	Make sure the wire does not touch anything other than the ground connection, or the radio might not work properly.

Reception is poor	Make sure the antenna wire is stretched out as long as it can be and is as high above the ground as possible. Set the radio up on the highest floor where you live.
	Try placing the antenna wire in different positions (both vertically and horizontally) for the best reception.
	Insulated hook-up wire makes a very good substitution for the supplied antenna wire. Make sure the wire is at least 15 feet long.

HOW YOUR CRYSTAL RADIO WORKS

All radio broadcast stations do basically the same thing. They combine sound, or audio waves, with a radio carrier wave. The carrier wave travels great distances, and carries with it information about the strength and pitch of the sound waves.

One method of combining the radio carrier wave and the audio wave is called amplitude modulation (AM).

Your AM radio antenna picks up the carrier wave sent by the radio station.

Your crystal radio then does three important things (with some help from you) to allow you to hear the radio program. These are:

1. Tuning
2. Detection
3. Changing of an electrical current to sound waves.

Tuning

When you turn the Variable Capacitor's knob, you are adjusting a circuit formed by the Variable Capacitor and the Antenna Coil. This circuit allows only one radio station's carrier wave at a time to enter your radio. By tuning this circuit, you select the carrier wave of the station you want to hear.

Detection

The diode gets rid of the carrier wave by a process called detection using the ground as a reference point. At the same time, it allows a tiny electric current that represents the sound (audio) information to go to the earphone.

Changing electricity into sound

When the electric current reaches the earphone, it causes a small metal piece to vibrate creating the sound waves that you hear.

You crystal radio works very much the same way as the early ones. Of course, the “old time” crystal sets didn’t have diodes. They used a piece of galena crystal (lead ore), held in contact with a fine wire called a “cat’s whisker.”

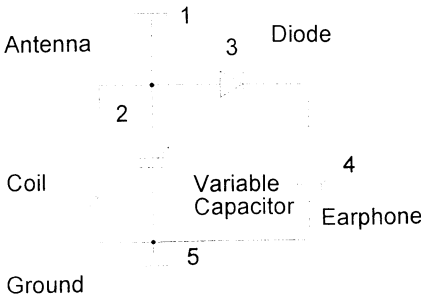
This earlier type of radio, like yours, had no amplification. Then, as now, more complicated radios amplify the audio waves to vibrate a loudspeaker and produce louder sounds.

All radios still use the basic combination of:

- (1) A tuned circuit that selects the carrier wave sent by the radio station.
- (2) A detector that separates the sound information from the carrier wave
- (3) An earphone or loudspeaker to let you hear the sound.

SCHEMATIC DIAGRAM

Here is a typical wiring diagram and explanation of how your crystal radio works.



- 1. The antenna receives signals through the air.
- 2. The tuner circuit, which includes the coil and the variable capacitor, selects a frequency, filtering out all other frequencies.
- 3. The diode rectifies the signal removing the carrier wave.
- 4. Audio current flows into the earphone.
- 5. The electrical current goes back to ground.

NOTES:
