

## Winding the coils for Crystal Radio

Your crystal radio contains two coils, a tuning coil and an antenna coil. When you finish the radio, you will connect the antenna coil to an antenna and ground. The purpose of the antenna is to capture radio waves and convert them into alternating current. When the alternating current passes through the antenna coil, it creates a magnetic field. When the tuning coil of the radio is located in the vicinity of the antenna coil, alternating currents are induced in the tuning coil because it shares the magnetic field created by the antenna coil.

In your radio coil kit you should find the following:

- 1) 2 coil forms made from 3 ½ inch diameter PCV pipe – both forms are exactly alike
- 2) A plastic bag containing two coils of wire, one 312 ½ inches long and one 190 ½ inches long (don't unwind them). The 312 ½ inch wire is tied with a piece of red-insulated wire and the 190 ½ inch wire is tied with a black-insulated wire
- 3) A plastic bag containing twelve coils of wire, each 45 5/8 inches long.
- 4) A wood block
- 5) A piece of sandpaper

The wire for the coils is 22 gauge magnet wire. The wire is insulated by a thin coating of red enamel (paint). You must remove the insulation from the ends of each piece of wire before you wrap the wire around the coil form. The insulation is removed by using sandpaper. Place the end of the wire on top of the wood block and rub the sandpaper across the wire to remove the insulation (the wood block is used so that you do not scratch the table). You will have to turn the wire several times in order to remove the insulation all the way around the wire. Remove the insulation up to a distance of about one inch from the end of the wire. Make sure all insulation is removed from the last inch of both ends. Any insulation that is not removed may interfere with soldering operations that you will do later.

## Winding Tuning Coil

You should wind the tuning coil first. The wire for this coil is the two pieces, one 312 ½ inches and one 190 ½ inches. Find the coil of 312 ½ inches (tied with a red-insulated wire). Remove the insulation from each end. Then insert one end into one of the holes in the coil form (you must insert in one of the paired holes – the single holes are for machine screws that you will use to mount the coil on the radio base). Insert the wire into one hole and then insert into the second hole from the inside. After you are done the end of the wire should be protruding from the coil's exterior surface about ¼ to ½ inch. Start wrapping the wire around the coil form (see page 9 of your lesson on the radio). Hold your thumb down on the wire as you turn the coil form to wrap the wire. You want the turns of wire to be tight on the coil form. The turns of wire should also touch each other. If space develops between turns, squeeze the turns together as you go. When you have wound all of the wire on the coil form, tape it down with some packing tape. Then find the coil of 190 ½ inches and remove the insulation from each end. You will make a tap by twisting one end of the 190 ½ inch wire with the free end of the 312 ½ inch wire. Twist the wires together for a length of about ¼ inch. Then continue wrapping the coil form until all wire is wrapped around the coil. The twisted tap in the middle of the coil form should be pointing away from the exterior surface of the coil form (look at the example coil). When you have finished wrapping all wire, thread the end of the wire through the two holes, just as you did for the start of the coil. If a

soldering iron is available, solder the twisted wires of the tap in the middle of the coil form. Then apply two or three pieces of clear packing tape over the wire coils to keep the wires from separating.

#### Winding the antenna coil

The antenna coil has 12 taps and you will find this coil takes more work to complete. Find the bag with 12 coils of wire. Each wire is long enough to make about 4 turns on the coil form. Remember to remove the insulation from the ends of each of the 12 coils before wrapping the wire on the coil form. Attach the first piece of wire to the coil form as described earlier and then wrap it four turns around the coil form. Use a piece of packing tape to hold the wire in place. Remove the insulation from the ends of a second piece of wire and twist one end together with the end of the wire you just wrapped on the coil. This will be the first tap on the coil. The twisted wires should be about  $\frac{1}{4}$  inch long, pointing out from the coil form. Continue wrapping subsequent pieces of wire on the coil, twisting the ends together as before. Each subsequent tap of the coil should be slightly past the previous tap (if the taps are too close together it may be difficult to connect the adjustment wire – you will learn more about this later). The taps should not be spaced more than  $\frac{1}{4}$  of the way around the coil form. For the last few pieces of wire you may need to cut one inch or so off the length, so that the tap at the end of the wire is not rotated too far around the coil (see the example coil). After wrapping the last piece of wire, thread it through the pair of holes in the coil form. Then solder all of the twisted wire taps. Then apply tape to secure the coils of wire.

The taps on the antenna coil are used to tune the antenna circuit. As you tune radio stations of different frequencies, the best signal strength can be obtained by selecting a specific tap on the coil.