

Xtal Set Society

Oat Box

Crystal Set

XS-OB1-08

By Phil Anderson, WØXI

This kit offers solder-less or solder assembly, and tunes the standard AM radio band. To keep price and cost low, you download this manual (in dpf format) from our website.

The Oat Box Crystal Set Kit has been offered by the society for some time. The kit features a tapped coil, wound on a standard 5-inch diameter, round cereal oat box you provide. A detection diode, resistor, and cap are included in the kit, along with 6-32 nuts, bolts, solder lugs, and a 100 foot spool of #24 hookup wire. A paper label is part of the downloaded that you can cut out and paste to the Oat Box, providing a guide on where to make holes and attach the wire and components. A bill-of-material is listed below.

XS-OB1-06 Bill-of-Material:

Item	quantity	part
1	1	Spool #24 wire, 100 ft
2	1	IN34 Diode
3	1	100 pf Capacitor
4	1	47K Resistor
5	3	alligator clip
6	1	Ear Piece
7	5	6-32 by 1/2 screws
8	10	6-32 nuts
9	5	#6 solder lugs

Materials and tools you will provide:

1	1	5-inch dia. Oat Box
2	1	small wire cutters
3	1	small xacto-knife



4	1	small pliers
5	1	1/2-inch masking tape
6	1	roll of wire for antenna
7	1	soldering iron
8	1	small portion of solder

Whether you order a set from us or not, remember to always ***think safety first!*** Don't run antenna wires near power lines; don't use a metal ladder near power lines when stringing up an antenna, and don't ground your crystal set to house wiring. Safety is your responsibility. Consult an electrician or other knowledgeable person if you have any doubts about your installation.

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Summary of Assembly Instructions

(Please read through completely before starting the assembly steps)

The paper layout label, Figure 1, denotes the layout and wiring of the XS-OB1-08 Oat Box Crystal Set. Cut the label out, along the outer dotted line, paste it onto your 5-inch diameter Oat Box, centered midway between top and bottom of the box. Use an xacto-blade to punch an "X" pattern at each of the five hex nut positions noted and at the feed holes noted as points C and D. Install five 6-32 by 1/2 machine screws from the inside of box out and secure each with a 6-32 hex nut on the outside.

Prepare 7 pieces of #24 insulated hookup wire, each 10 feet, 8 inches long, with one inch of insulation removed from one end. You'll use these pieces, one at a time, to wind a coil around the oat box. As you wind, keep each wire snug to the last one (touching). Wind one of the wires, starting at the top of the box, point A. Wind the bare end around the bolt and secure with a second 6-32 nut. Then wind the wire fully on the box ending near eyelet 7, roughly eight turns, and secure with masking tape. Now twist a second wire to the first, making the eyelet at "7" and wrap another 8 turns on the box. Add 6 more wires in exactly the same way. The last wire to be added starts at eyelet "1" and ends when it reaches point C, noted "bottom of coil" on label. Loop the remainder of this wire through the hole into the box and back out the hole at D; then wrap it around the bolt labeled "ground," at point G.

Attach the alligator clip to an 8-inch piece of hookup wire and wrap the other end to point E, also marked "Antenna." Then, add the "101" capacitor (between bolts E and G, 47K resistor (between bolts G and F), and the diode (between bolts B and F). Finally, cut a 5.5-inch piece of wire, again removing 1 inch of insulation from each end, and connect it between points A and B (see the vertical dark line on the layout). Finally, attach the leads of the EAR PIECE to bolts G and F (Either lead may go to point G). Secure all wires with a second 6-32 nut. (If you chose to solder the connections, add the provided solder lugs at each bolt position first - on the outside of the box! - and solder all wires and components to the

lugs. Also solder the eyelets on the coil to make more reliable connections!)

Step-by-step Assembly Instructions

If you prefer to check off each assembly step as you go - and we encourage this, consider using this list of assembly steps.

Before you start, decide on completing the assembly using soldering or without solder. If you decide to solder connections - recommended, then add the #6 solder lugs with each screw where noted. If not, leave them off. Without soldering, you'll need to wrap the end wires of components and wire lengths around the 6-32 machine screw bodies and secure with 6-32 hex nuts.

___Step #1 Cut out the assembly diagram, Figure 1, and paste it to your Oat Box. Center the paper on the box. Wipe from the center of the paper out to smooth out the glue; wipe off excess and set aside to dry.

___Step #2 Prepare seven 10 foot 8 inch pieces of wire. Cut the sections off the spool and strip off 1 inch of insulation at one end of each.

___Step #3 Prepare one 8-inch piece of wire, stripping off 1-inch of insulation on each end, and attach one end to the alligator clip, by pushing the wire end through the hole at the end of the clip and securing with the screw.

___Step #4 Install the five 6-32 by 1/2-inch machine screws where indicated on the layout. Use an xacto-blade to cut an "X" pattern through the label and oat box. Then install the screws from the inside of the box and secure with solder lug and hex nut on the outside. See the picture at the back.

You will now wind the 7 wires on the Oat box, starting at the top. See the winding diagram in back.

___Step #5 Wind the stripped one end of the first piece of wire around the bolt at A - to hold it - and wind the wire around the box 8 times until you reach eyelet location "7". Then cut the end 1-inch past position "7" and strip off 1-inch of insulation. Secure wire with masking tape.

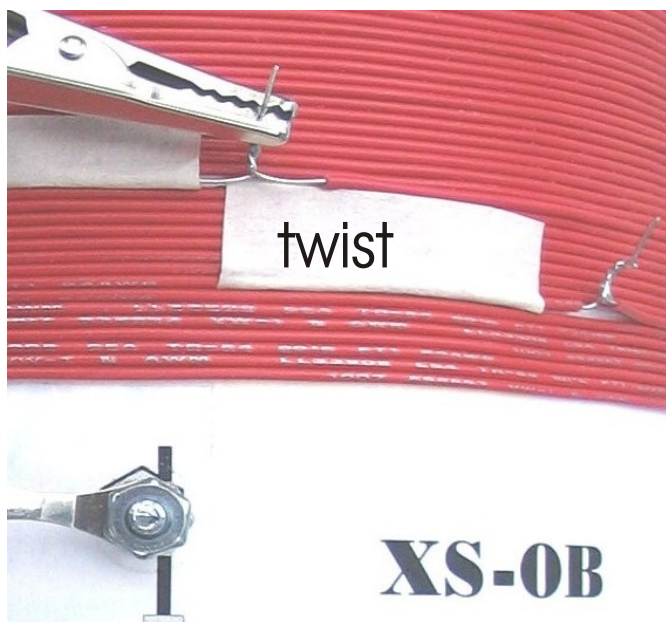
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___Step #6 Twist the bare end of another wire to the bare end of the wire (you just taped down) to form the eyelet/tap point 7, and then wind this wire also 8 turns until you reach the next eyelet, "6." Again measure, cut, strip 1-inch insulation off and mask down.

___Step#7 Repeat the step above until you have completed a total of 6 eyelets and have reached the "bottom of the coil," point C, Figure 1. At "C", loop the wire into the inside of the box and back out again at point



D, and wrap around the bolt at point G (or attach to the solder lug).

___Step#8 Add the diode between points B and F. Direction of the diode does not matter. Secure the leads of the diodes under a second 6-32 hex nut at each bolt. Don't tight too hard yet, since you'll be adding more parts leads at each bolt location. Or, if you added the solder lugs, slide the ends of the diode into the holes of the lugs. Don't solder yet.

___Step#9 Prepare one 6-inch piece of wire, again stripping off 1-inch of insulation on each end, and attach an alligator clip to one end. Attach the other end to point B, winding the wire around the bolt (or through the solder lug eye if you are using solder).

Step#10 Add the 47K resistor between points G and F. Secure the leads of the device to the bolts using a 6-32 hex nut. If you added the solder lugs, slide the ends of the diode into the holes of the lugs. Don't solder yet.

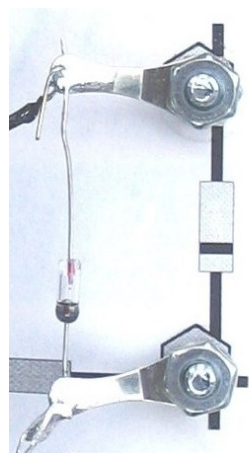
___Step#11 Add the 100 pf capacitor, labeled "101," between points E and G, similarly.

___Step#12 Add the leads of the Ear Piece between points G and F. Either lead may attach the G; order doesn't matter. Again, use the hex nuts or solder to secure.

___Step#13 Attach the wire with alligator clip to the bolt or lug at point E. Secure or solder.

___Step#14. If you decided not to solder, tighten all connections. Check that all metal to metal connections are made and are secure. If you decided to solder, solder all of the joints now at each solder lug. **Also solder the eyelets you twisted together along the coil.**

That completes your assembly. You're now ready to attach a ground and antenna.



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Installation and Operation

Connect a wire from a ground or cold-water pipe close by to point G. Connect an antenna, about 50 feet of wire, to point E (Antenna). The higher you can get the antenna the better. *Remember, proper use of ladders and avoiding power lines are your responsibility. Be careful!*

Once the set has a ground wire and antenna wire installed, attach the alligator clip from point “E” to TAP # 7, near the top to start. Attach the alligator clip from point “B” to TAP # 5, midway down the coil. Then insert the ear piece in either ear.

Move the “E” clip (from point “E”) from tap to tap to search for a station. Once you hear one, move the “B” clip from tap to tap for loudest and clearest signal.

Generally, connecting the “E” tap to the top of the coil will find stations in the bottom half of the AM band. Clipping lower down the coil will move you toward the top half of the band. Listen during the day for local stations. See what you can hear at night for more distant stations. See our AM Broadcast Band article on the website (articles-index page) for a listing of stations by frequency and location.

Coil Winding Table (for experimenters).

Assume an Oat box of 5-inches diameter with wire thickness including insulation of 0.05 inches. If you are building a set for the first time, you'll want to wind all 56 turns as per the above instructions.

turns	coil-length	L uH	wire-feet
56	3.0	388	73.3
48	2.4	310	62.8
40	2.0	235	52.4
36	1.8	200	47.2

A 50 foot antenna, mostly vertical will have a resistance of about 50 ohms and a capacitance of nominally 140 pf. This capacitance adds to the 100 pf cap installed. Given total C and L, resonant frequency can be estimated. Sharper tuning can be had by adding more taps to the coil.



Parts

The 100 foot spool of # 24 hookup wire is shown at the top. The hi-impedance ear piece is shown at the bottom. Three alligator clips are shown at left. The 100 pf capacitor, 47K resistor, and 1N34 diode are shown in the middle. The diode has a clear glass body while the resistor has colored bands (yellow-violet-orange). The hookup hardware is at right, top-to-bottom: #6 solder lugs, 6-32 hex nuts, and 6-32 machine screws with pan-head (Phillips).

It's easy to mount the screws from the inside of the box, securing them with a lug and nut on the outside. Make an “X” pattern cut with your xacto-knife and then push the screw through the oat box's cardboard layer.

See the attached drawing for coil winding techniques. Good luck and enjoy!

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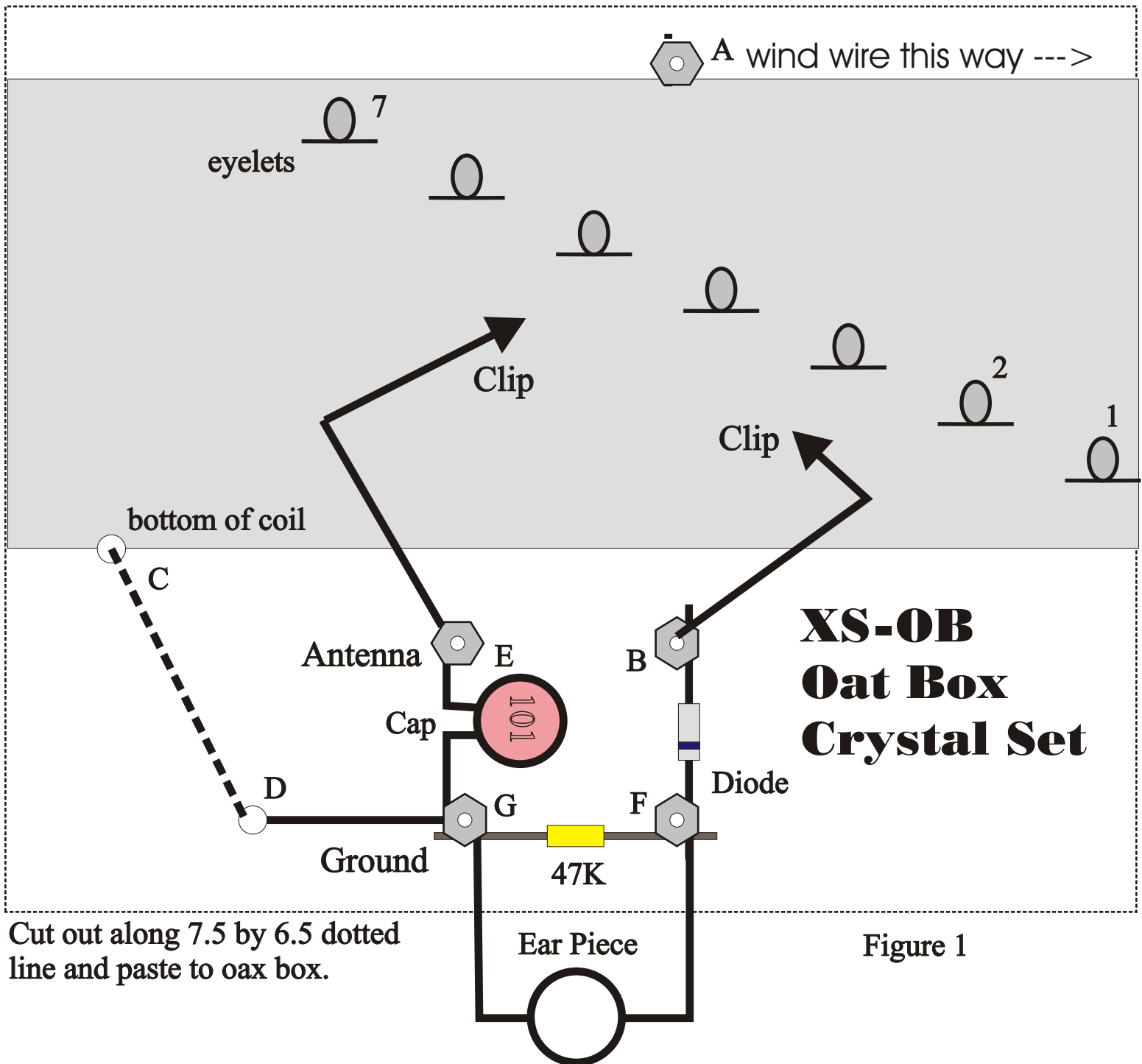
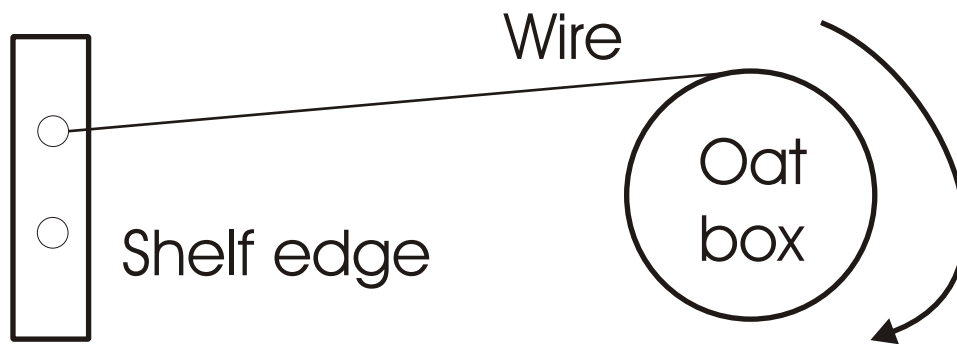


Figure 1

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This layout of Phil's Oat Box Crystal Radio Set updates the 2006 plans for the OB1 Kit. This version supplies 6-32 nuts and bolts, solder lugs, Ear Piece, 100pf cap, 47K resistor, and 1N34 diode noted on the layout above. One 100-foot spool of #24 wire is included with the kit, which uses nearly all of it in winding 56 turns on the typical 5-inch diameter Oat Box. Hence, you'll want to provide your own antenna wire, wire from the society, or order the new OB2 kit, which includes all of the above plus a second spool of wire.

Suggestions for Winding the coil



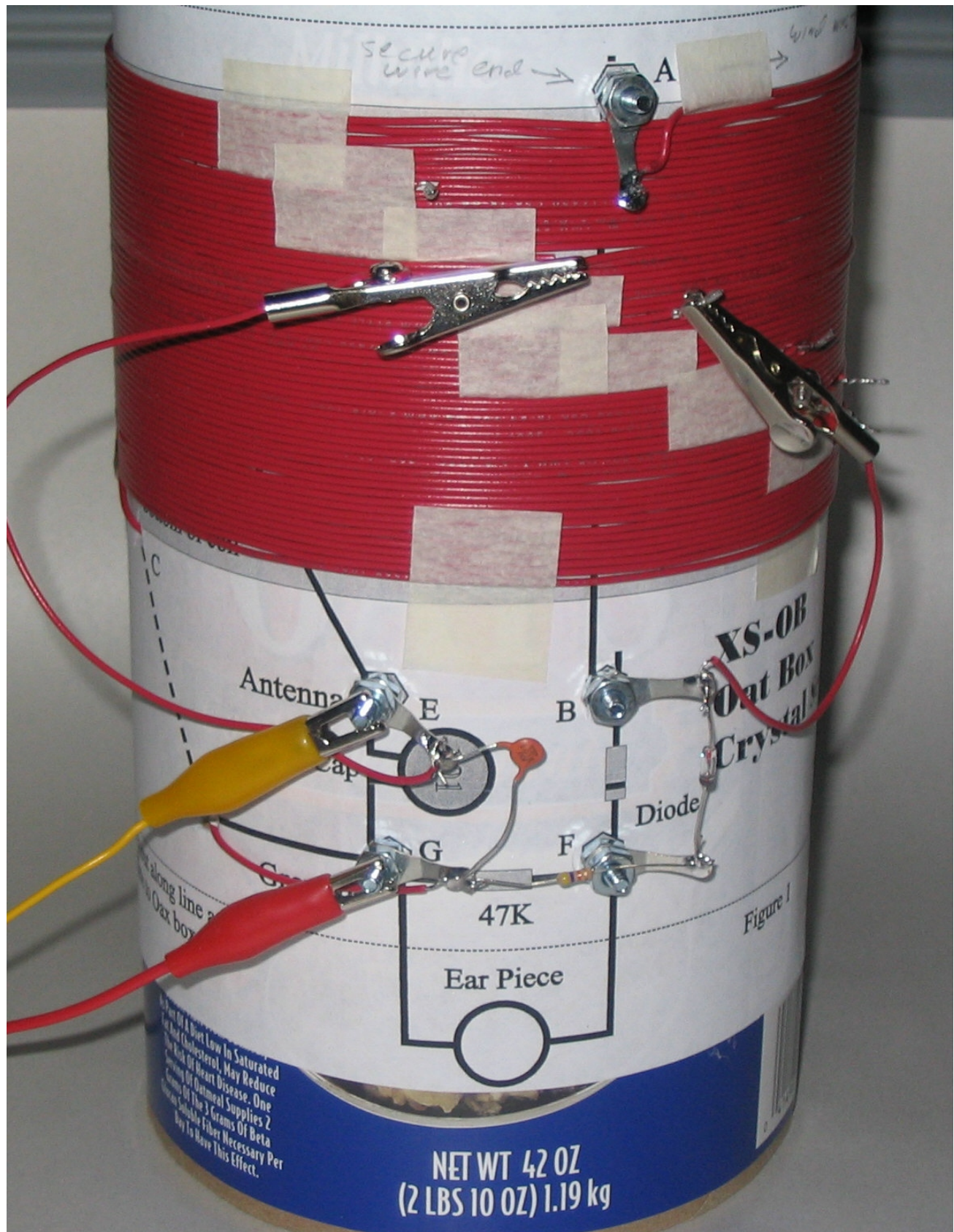
Attach the wire to the oat box per the instructions. Then attach the other end of the measured out wire, 10 feet, 8 inches per section as per the instructions, to a hole in a shelf support or other stationary object. Then slowly rotate the oak box toward yourself and down - as per the sketch - guiding each turn snugly against the last as you go. When you reach the shelf, secure the winding made so far with a piece of masking tape. Then disconnect the wire end from the support.

Repeat the process for each section of the coil.

We've found it helpful to twist the next wire onto that already wound and to solder it at that time. It's then more secure as you wind the next section of turns. Good luck!

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