Tech Articles

Build Guide - 2 Tube Regenerative Radio

This build guide for a 2 tube regenerative radio is based on a kit we formerly provided (K-925). This kit was discontinued as a standalone product, but you can still easily build it yourself using our components as long as you are willing to cut & drill your own mounting boards! The instructions below are provided to walk you through the process. A schematic can be found at the end of this document.

Introduction:

This radio kit will cover the AM radio band along with the SW radio band. Power for this receiver is 1.5VDC for the filaments and 45VDC for the plates. Use one “D” cell battery for the 1.5V supply. You can use either one 45V radio battery or five 9V transistor batteries wired in series for the plate supply. **A 2kΩ headset or an audio amplifier is required.**

Tools Needed:

- Soldering iron
- Philips head screwdriver
- Flat head screwdriver
- Wire strippers
- Needlenose pliers
- Wire cutters
- Scissors
- Wood saw
- Drill
- Drill bits (5/64", 3/32", 5/32", 9/32", 5/16")

Supplies Needed:

- Rosin core solder
- White glue
- Aluminum foil
- Index card
- Scotch tape
- Fine sandpaper (optional)
- Clear acrylic coating

Parts List

Below is the parts list as it appeared in our original product. You can obtain most of these parts through us, though you will have to provide some on your own - these are usually obtainable through your local hardware store.

Value	Qty	SKU	Information
Capacitors			
470 pF	2	C-D470-6000	Used for C1, C5
0.047 µF	3	C-D47000-100	Used for C2, C8, C9
365 pF Variable	1	C-V365	Used for C4
0.001 µF	1	C-D1000-2000	Used for C7
100 pF	1	C-D100-3000	Used for C6
Potentiometers			
50 kΩ Audio	2	R-VA50KA	Used for R5
Resistors			
2 MΩ	2	R-A2M	Used for R1, R4
1 kΩ	1	R-A1K	Used for R3

Value	Qty	SKU	Information
10 kΩ	1	R-A10K	Used for R2
4.7 kΩ	1	R-A4D7K	Used for R6
Screws and Nuts			
Wood screws	9		#6-32 × 1/2"
Machine screws	2		#6-32 × 1"
Machine screws	5	S-HS632-12	#6-32 × 1/2"
Machine screws	4	S-HS632-38	#6-32 × 3/8"
Machine screws	2	S-HS632-14	#6-32 × 1/4"
Machine screws	4		#4-40 × 3/4"
Hex Nuts	4	S-HHN440	#4-40"
Hex Nuts	11	S-HHN632	#6-32"
Other Parts			
1.5" PVC Pipe	1		Used for winding coil. (O.D. 1.9", I.D. 1.593", Thickness 0.145")
1T4 vacuum tubes	2	T-1T4_DF91	
22 AWG Magnet Wire	2	S-MW-22-100	Used for C3 - need ~2 feet
28 AWG Magnet Wire	2	S-MW-28-200	Used for winding the coil
7 pin tube sockets	2	P-ST7-815	Used for V1, V2
Alligator clip lead	2	S-T5000	Used for J1, J2
Fahnestock clips	7	S-H11-4034	
Hookup Wire	2	S-W401-50	Need ~2 feet
Knobs	2	P-K300	Need any two knobs for indicators
Nylon spacers	6		#6 × 3/8"
Solder lugs	16	S-H112	
Wood board - ~3/16" thick	1		Will be used to cut into mounting panels

Value	Qty	SKU	Information
Wood board - 5/8" × 3/4" square edge	1		Will be used as mounting rails

Antenna & Ground Tips:

It is important to have a substantial antenna and ground in order to receive a strong radio signal. Try some of these antenna and ground suggestions to get more enjoyment out of this kit.

- Use 50 to 100 feet of 16 AWG (American Wire Gauge) stranded aerial wire for the Antenna wire
- Hang your antenna in a way that it is kept isolated from ground.
- Use a solid path to “earth” for your Ground wire. You can use water pipes or the grounded screw on a power outlet.

Prepare the Coil Base

Building the coil requires a paper template for proper drilling of holes. Click here to download the `regenerative-radio-drill-template.pdf` drilling template file to be used below.

Step 1

The PVC pipe listed above will be used as the base to wind your coil. To prepare it for use, first cut the pipe to a length of approximately 2.5 inches.

Step 2

Cut out the **Coil Form Template** from the drill guide above. Affix it tightly around your PVC pipe using a piece of tape.

Step 3

Drill the indicated holes in the coil as shown in the drill template (5/32" and 5/64" bits). When finished, remove your template paper and discard.

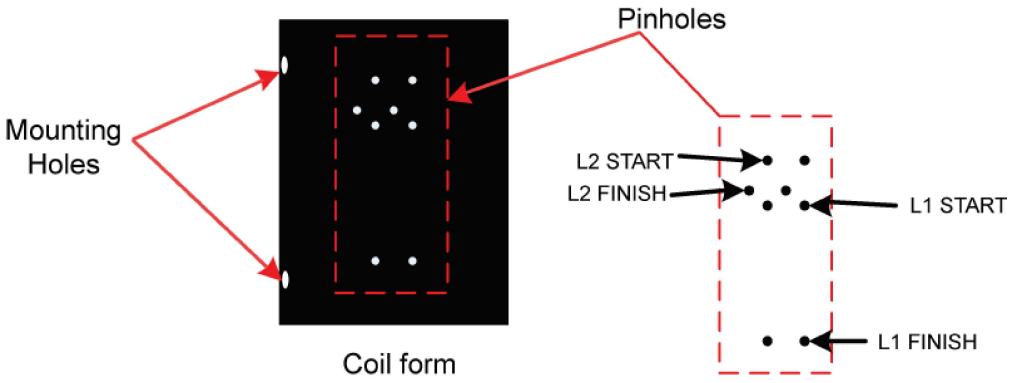
Wind the L2 and L1 Coils

Step 1

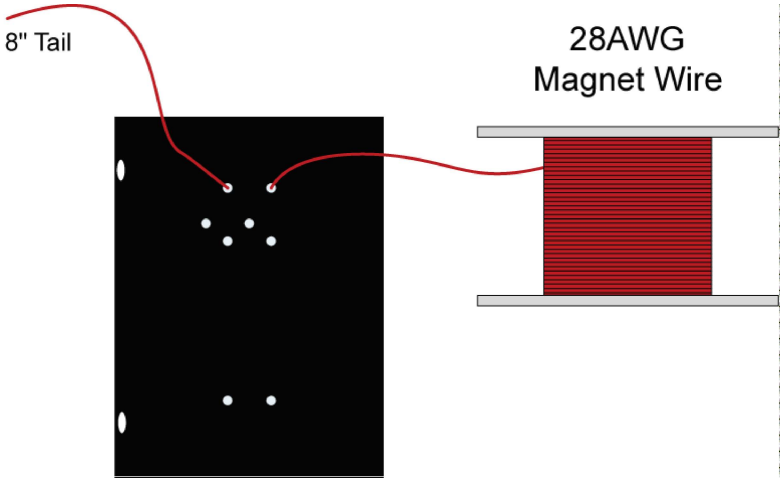
Cut a piece of index card to ½" x 2". Set aside

Step 2

Hold the coil form in your hand with the two large mounting holes facing leftward and the eight small pinholes facing up toward the ceiling.



Insert the 28AWG wire through the top right pinhole and then pull the wire back out through the top left pinhole. Pull it tight. ***(Pull out an 8 inch tail which will be soldered to a solder lug later in the instructions)***



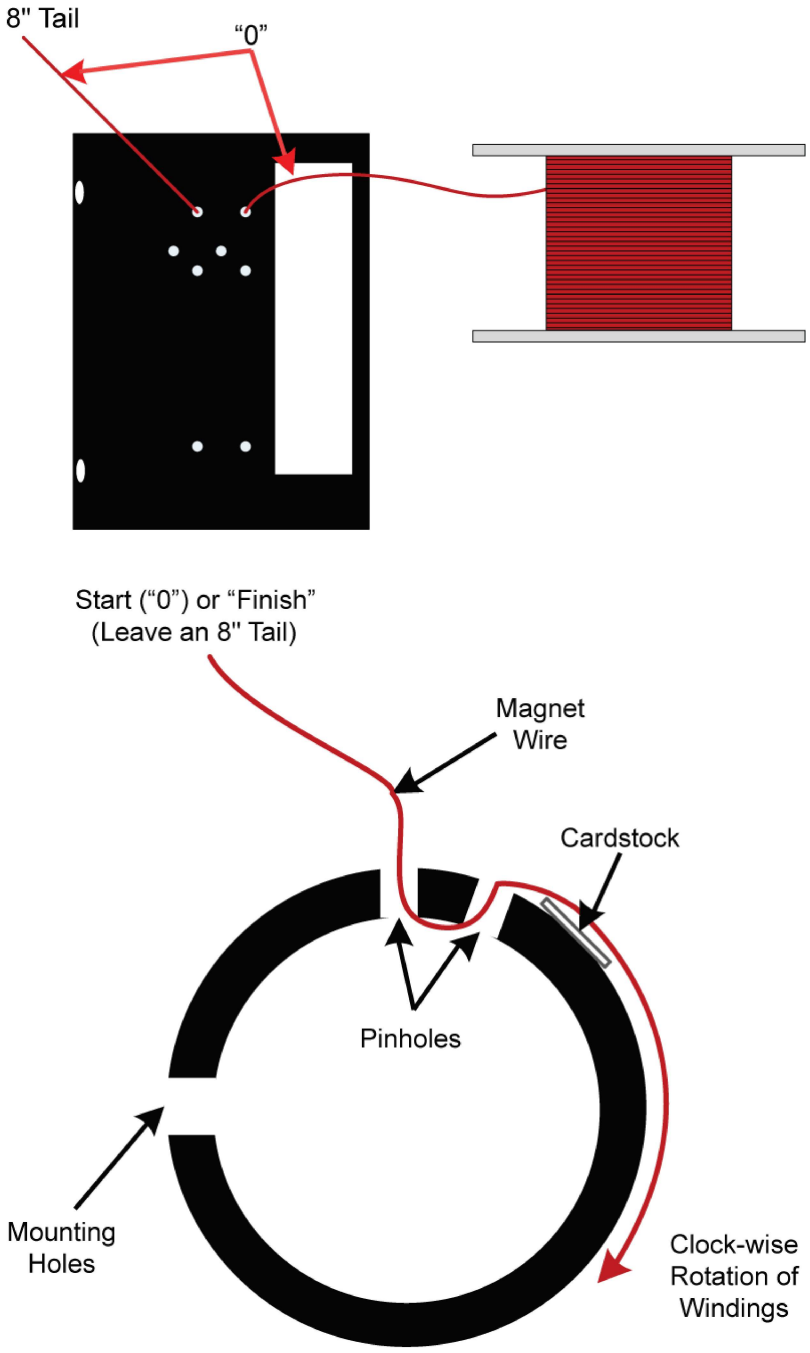
Before you begin winding the coil, keep the following in mind:

- After you have wound both coils, the Clear Acrylic Coating will be brushed (or sprayed) over the windings to hold them in place permanently.
- Take your time and make each turn of the coil tight and side by side with the previous turn without crossing over or under the previous turn.
- Avoid making any kinks in the wire as you wind each turn.
- Be careful not to cover up the mounting holes.

Step 3

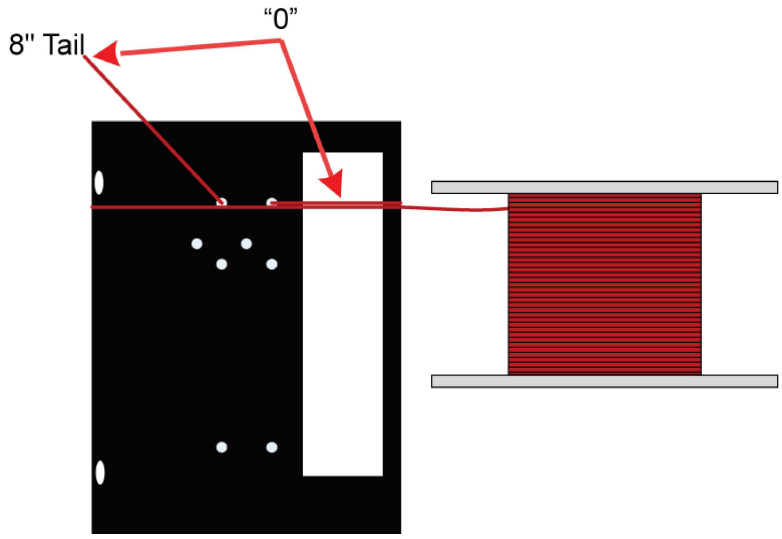
Place the ½" x 2" piece of cardstock on the coil form just to the right of the pinholes. Make sure that the length of the cardstock is to the right of each set of pinholes. (You might find it easier to temporarily hold the cardstock in place with a couple pieces of scotch tape).

Begin winding the wire over the cardstock and around the coil form in the clock wise direction as shown in the drawings.

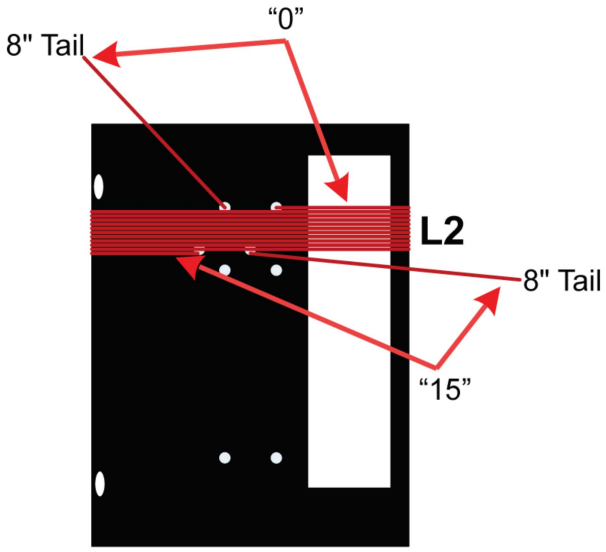


Step 4

Continue winding 15 turns of wire around the coil form.

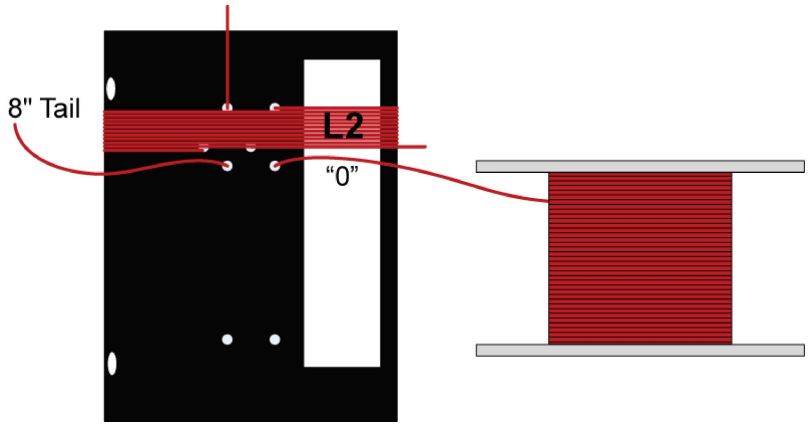


After the 15th turn, continue around the coil form and insert the wire through the bottom left L2 pinhole and then pull it out through the bottom right L2 pinhole. Pull it tight leaving another 8" tail (to be soldered to a tube pin later)

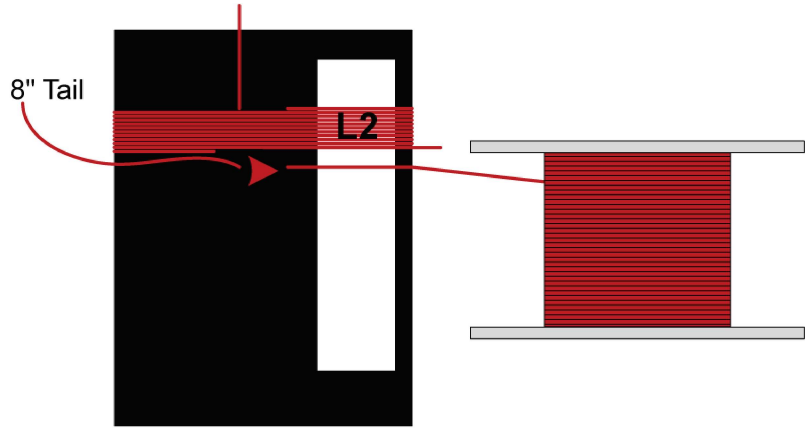


Step 5

Insert the 28AWG magnet wire through the L2 top right pinhole and pull it back out through the L2 top left pinhole leaving an 8" tail. Pull the tail tight. (It will be soldered to the variable capacitor later).

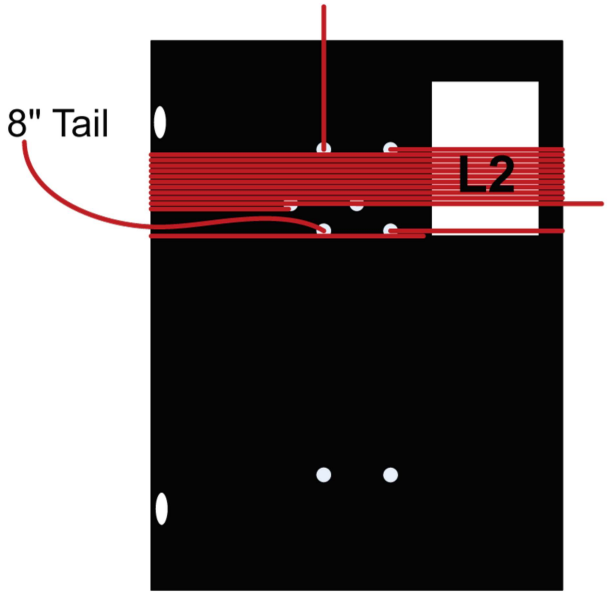


Begin winding one turn of wire over the cardstock and around the coil form in the clock wise direction as shown in the drawing.



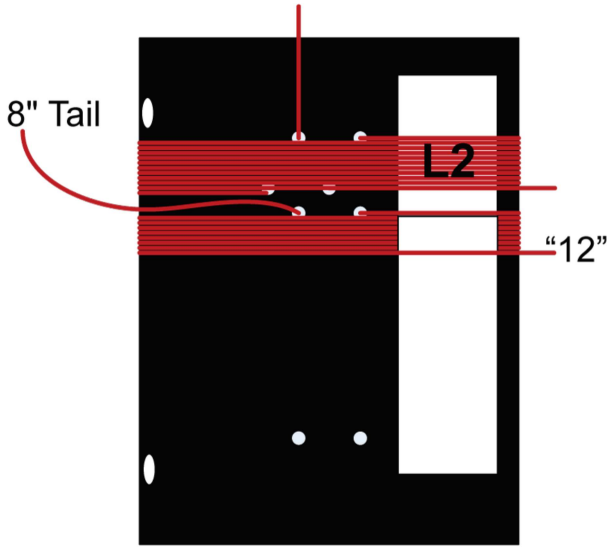
Step 6

After passing one turn over the cardstock, lift up the remainder of the cardstock in order to wind the next 11 turns underneath the cardstock.



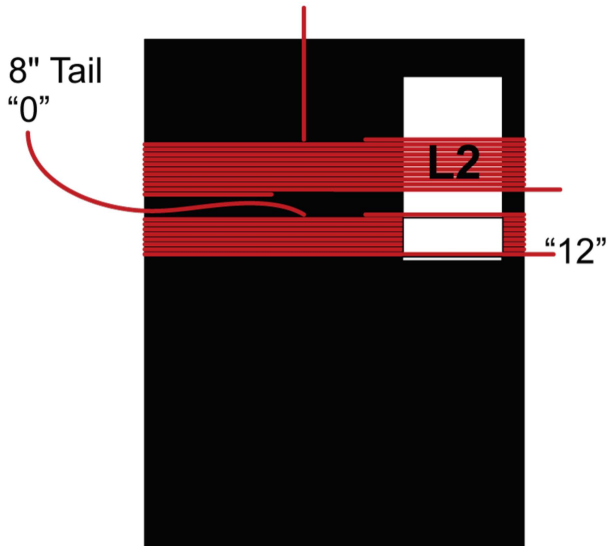
Step 7

After the 11 turns have been wound underneath the cardstock, bring the cardstock back down and wind the 12th turn over the top of the cardstock.



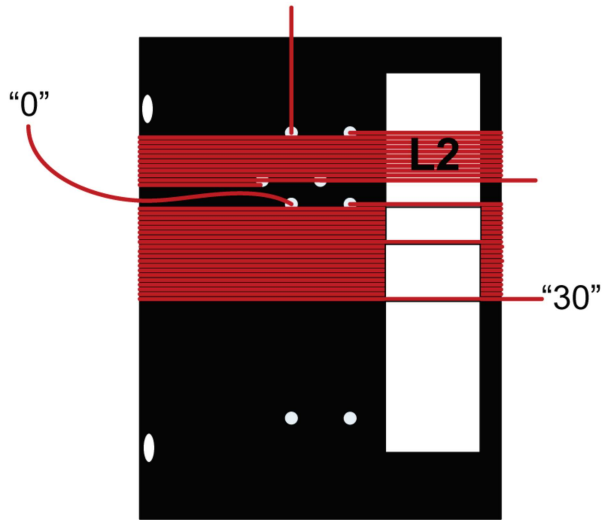
Step 8

Lift up the remainder of the cardstock in order to wind the next 17 turns underneath the cardstock.

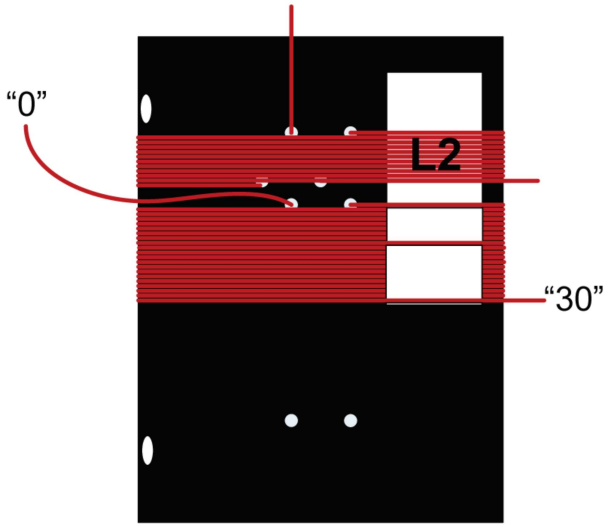


Step 9

After the 17 turns have been wound underneath the cardstock, bring the cardstock back down and wind the 18th turn over the top of the cardstock.

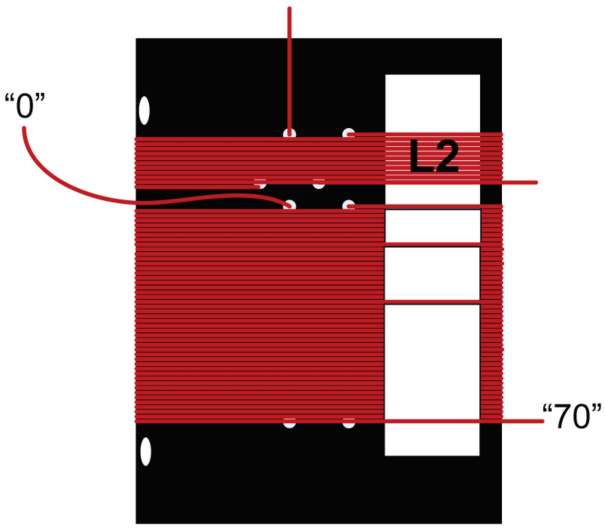


Lift the card stock up for the next 39 turns.

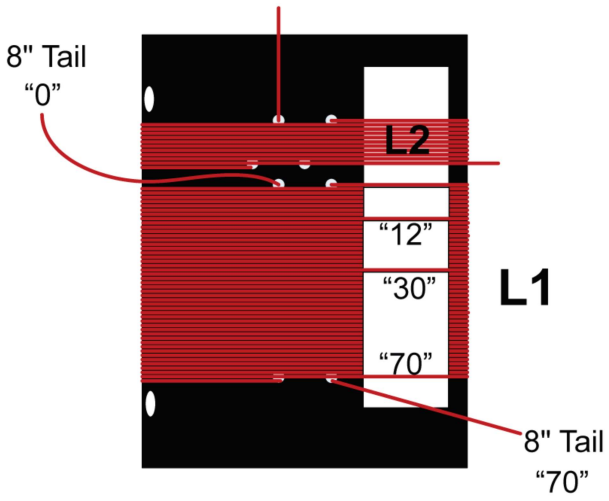


Step 10

After the 39 turns have been wound underneath the cardstock, bring the cardstock back down and wind the 40th turn over the top of the cardstock.



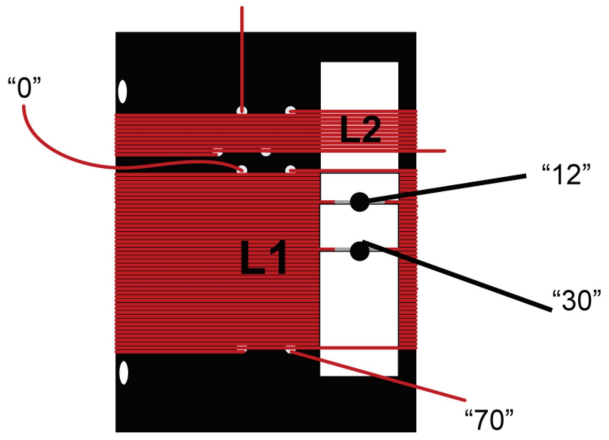
After the 40th turn (70 turns total), continue around the coil form and insert the wire through the bottom left L1 pinhole and then pull it out through the bottom right L1 pinhole. Pull it tight leaving another 8" tail (to be soldered to a solder lug later).



Step 11

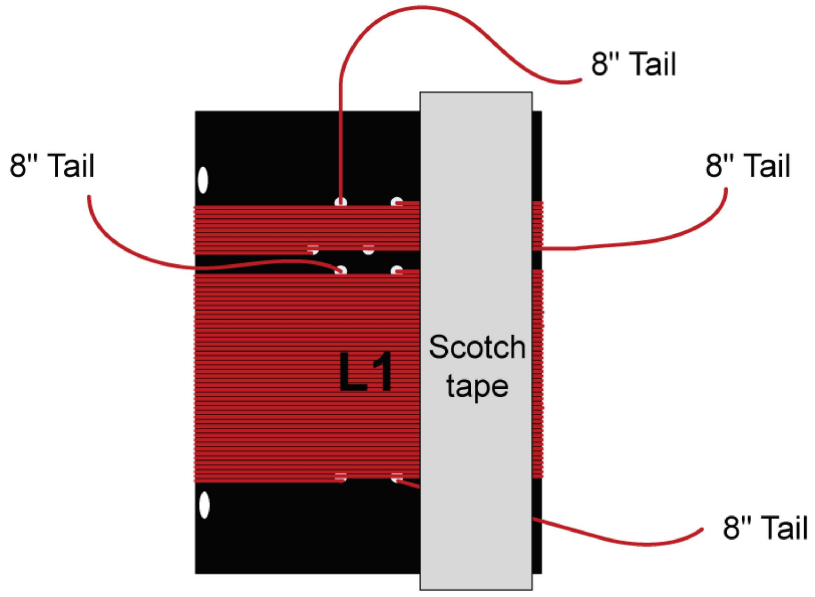
Use a sharp knife to scrape the red insulation from the wire over the cardstock at "12" and "30".

Tin the bare magnet wire with solder so that you can connect your wire taps at these points later.



Step 12

Cover "12" and "30" with scotch tap to keep them untouched by the Clear Acrylic Coating



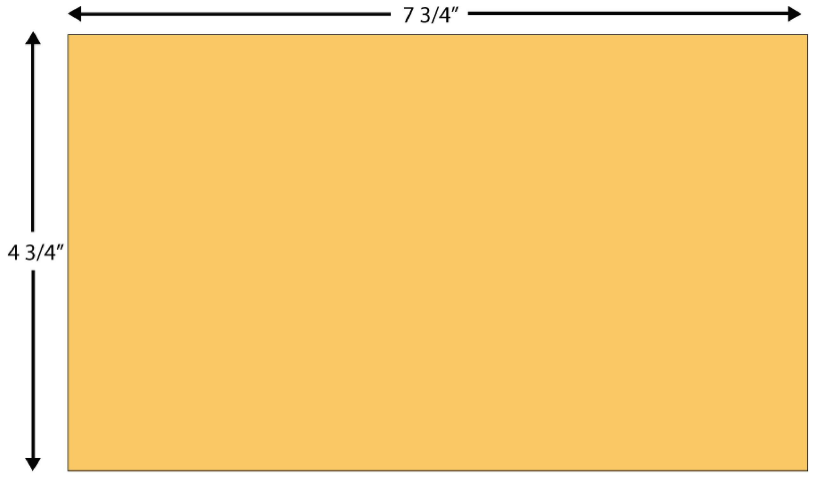
Make sure you are in a ventilated area and thoroughly brush or spray on a clear acrylic coating all around the windings. Allow this coating to dry. (It should take a few hours).

Preparing the Mounting Boards & Rails

Building the mounting boards requires a paper template for proper drilling of holes. Click here to download the `regenerative-radio-drill-template.pdf` drilling template file to be used below.

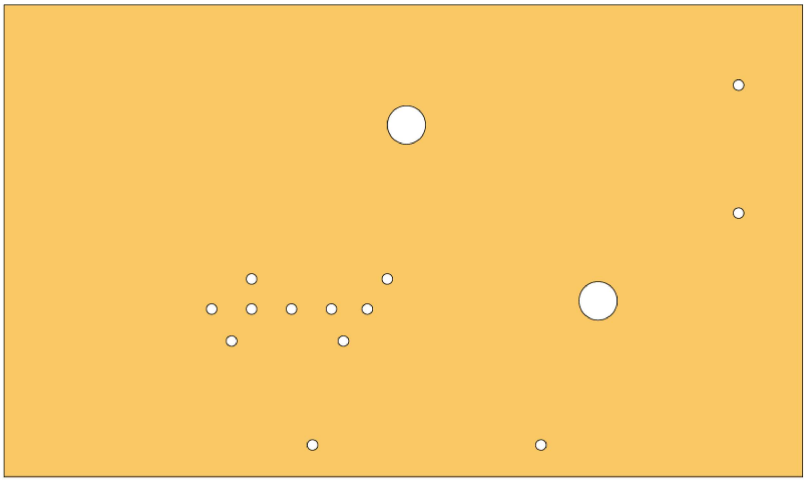
Step 1

Using your ~3/16" thick wooden board, cut out a rectangle to serve as the front panel. It should be 4 3/4" × 7 3/4".



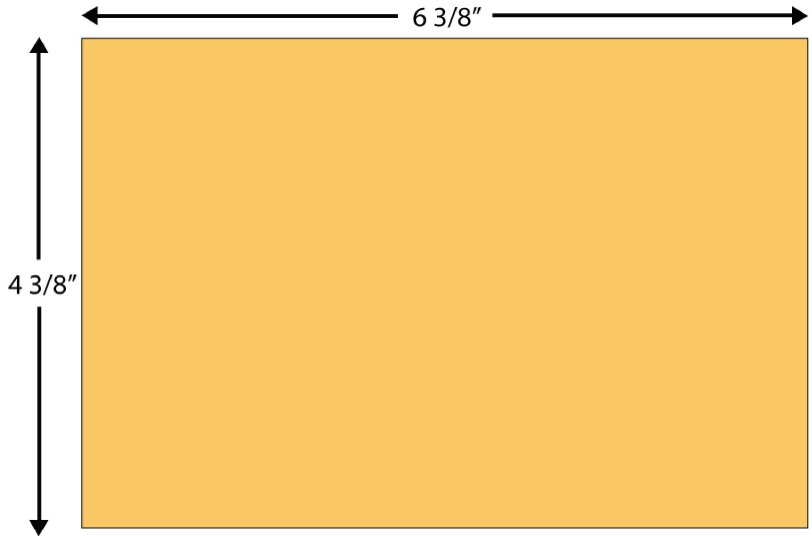
Step 2

Using the **Front Panel Template** from the drill template file above, drill the appropriate holes in the front panel board as indicated (9/32", 5/16", 3/32").



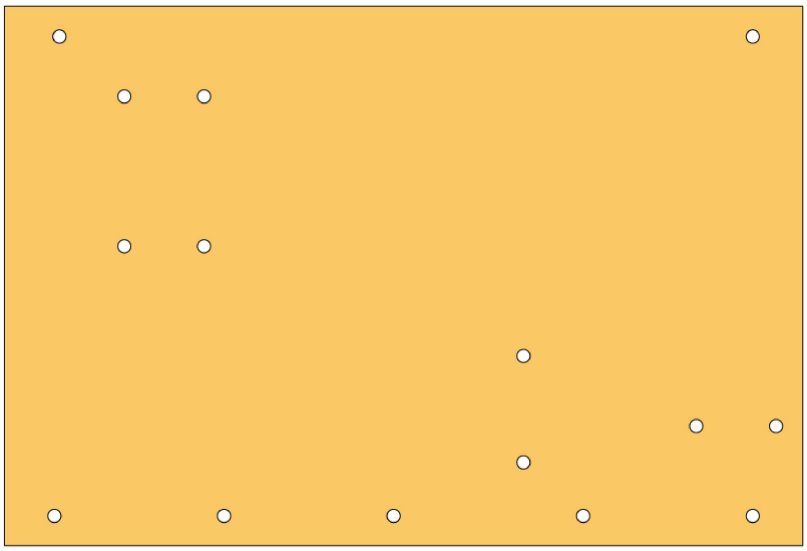
Step 3

Using your ~3/16" thick wooden board, cut out a rectangle to serve as the chassis panel. It should be 4 3/8" × 6 3/8".



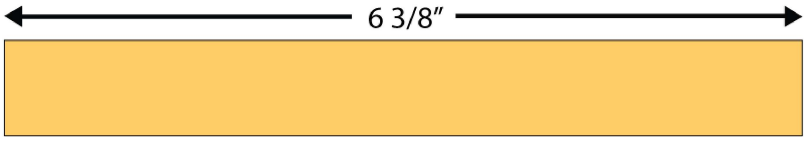
Step 4

Using the **Chassis Panel Template** from the drill template file above, drill the appropriate holes in the chassis panel board as indicated (3/32").



Step 5

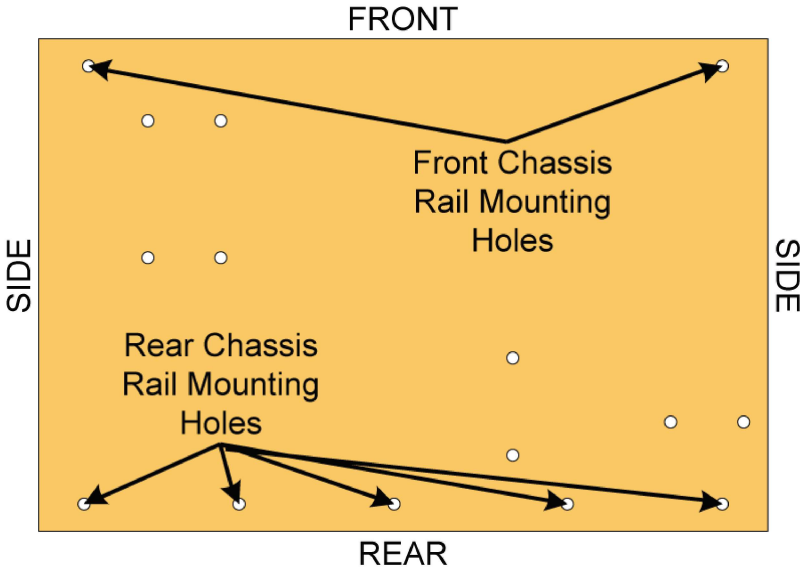
Using your 5/8" × 3/4" wooden board, cut two chassis rails of length 6 3/8".



Assemble the Chassis Floor

Step 1

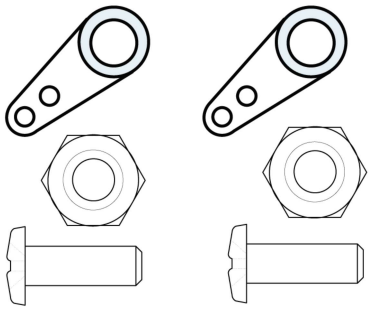
Use seven wood screws to attach the chassis rails to the bottom of the chassis panel. Attach the 5/8" edge of the chassis rail to the chassis floor.

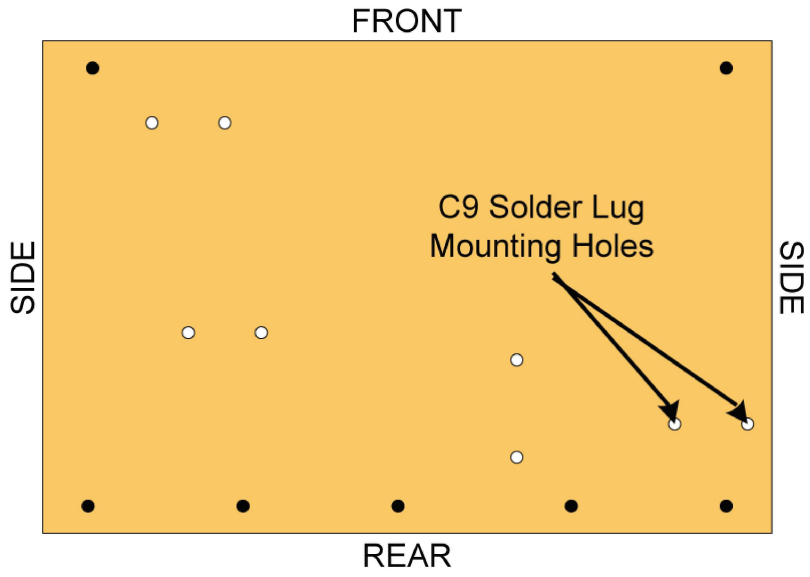


On each of the rear rail screws, place the Fahnestock clips with the solder lugs on top as shown.

Step 2

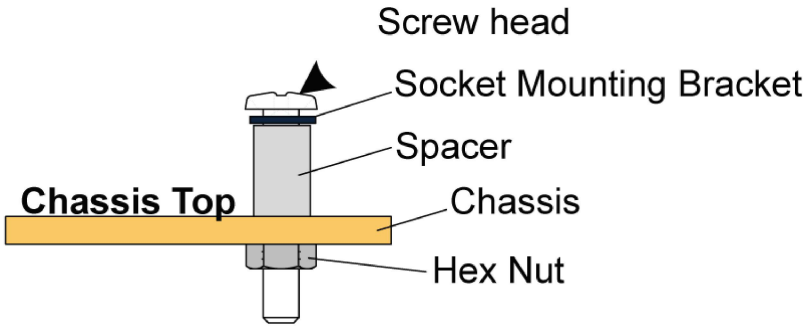
Mount two solder lugs for the C9 capacitor using 3/8" machine screws and nuts.



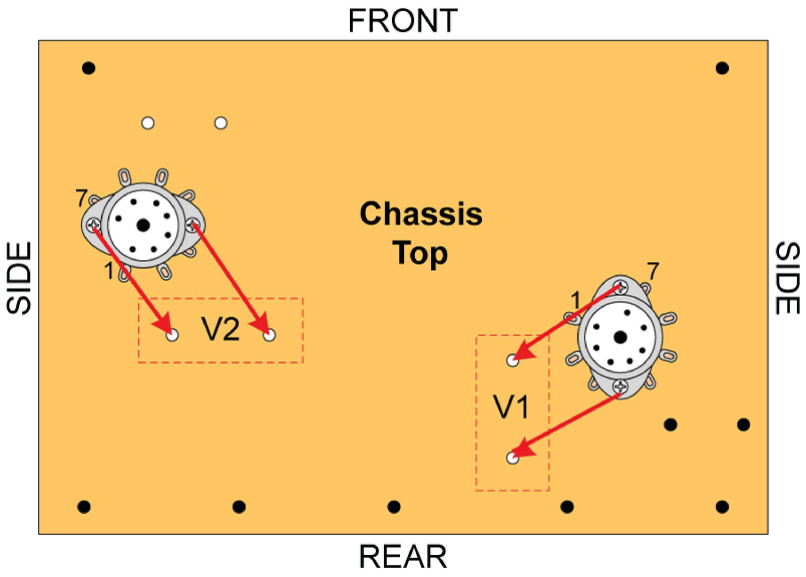


Step 3

Find the two 7-pin tube sockets, cut and remove the isolated center pin, then bend the seven solder lugs upward to facilitate soldering to them. Mount these tube sockets to their respective locations (V1 & V2) using ¾" machine screws, nylon spacers and hex nuts.

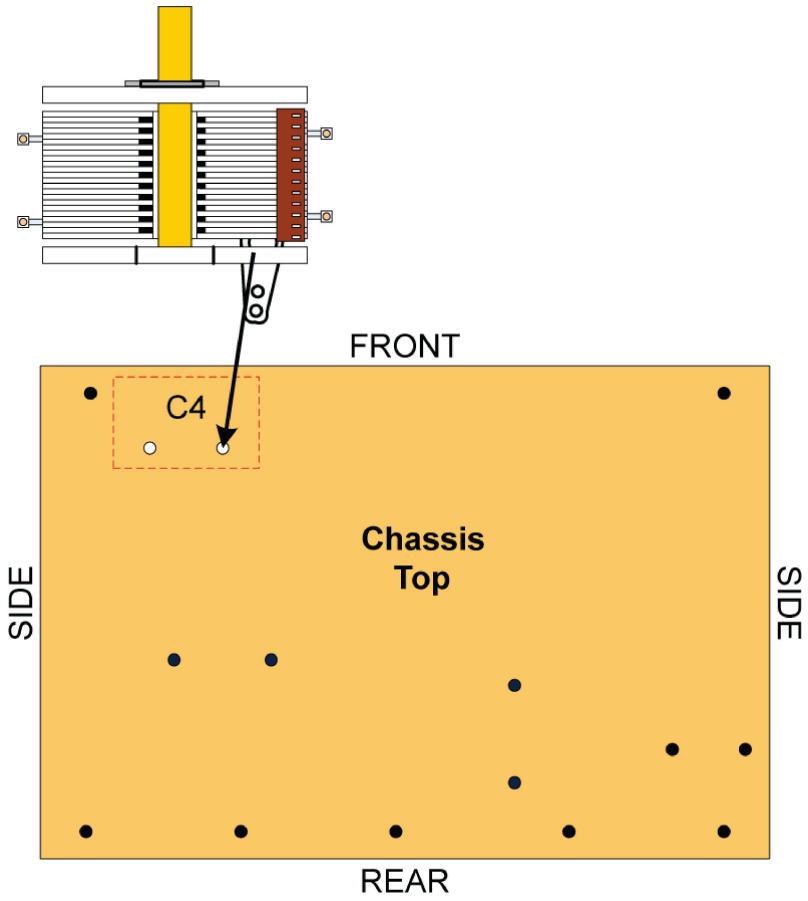


Mount the sockets with pins 1 and 7 in the same orientation as in this drawing.

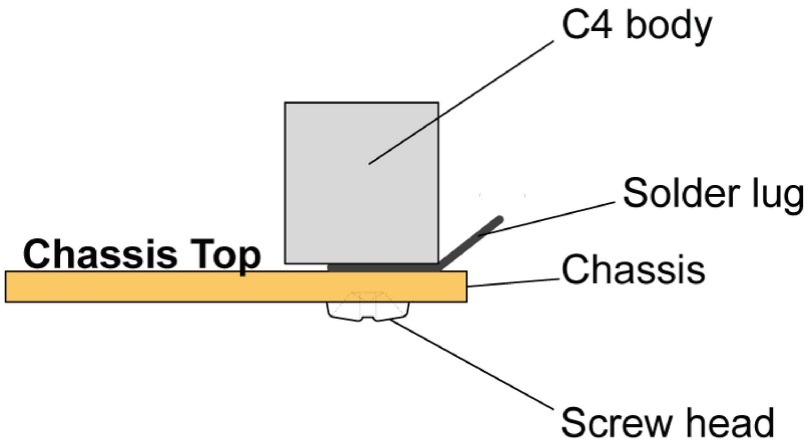


Step 4

Mount the variable capacitor (C4) to the chassis using the two ¼" machine screws and one solder lug.



Bend the four solder lugs on C4 upward to facilitate soldering to them.

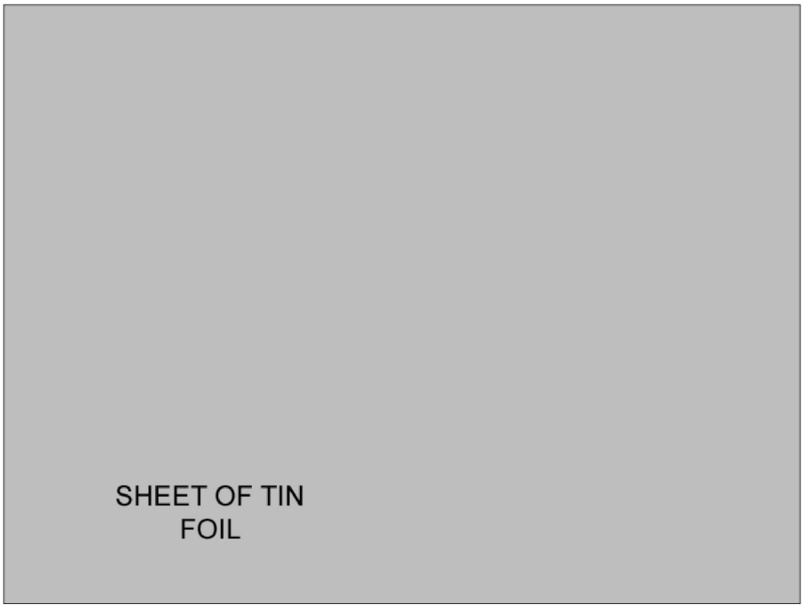


Assemble the Front Panel

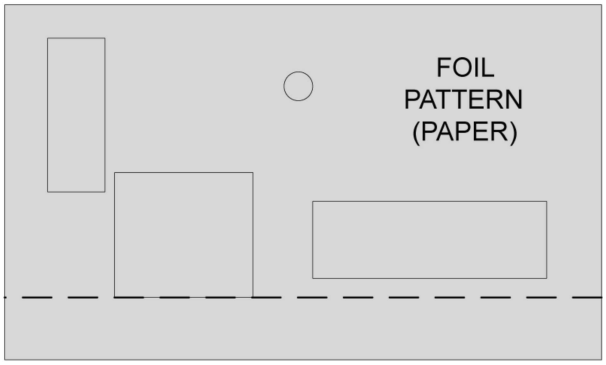
Assembling the front panel requires a paper template for proper cutting of holes. Click here to download the `regenerative-radio-foil-template.pdf` panel paper template file to be used below.

Step 1

Cut out a sheet of tin foil that is larger than the included foil pattern (downloaded above).

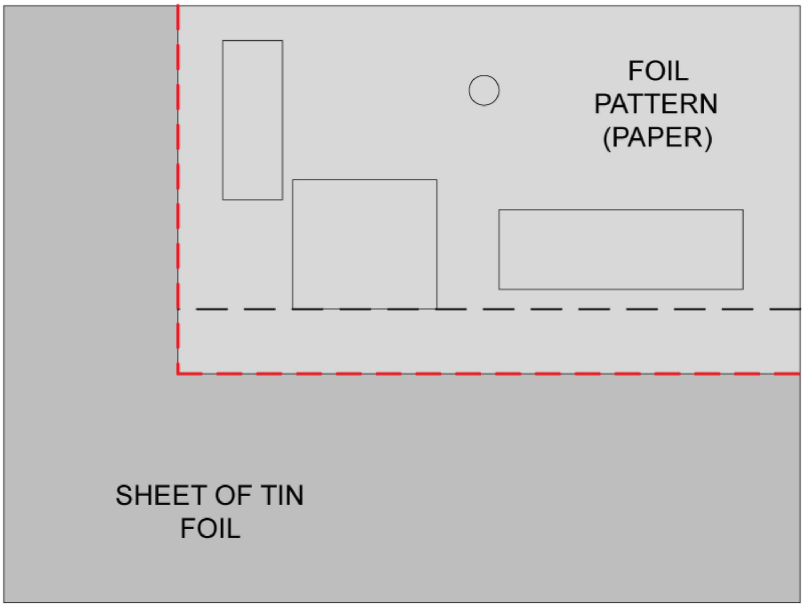


Cut the foil pattern from the paper it is printed on along the outside edge.



Step 2

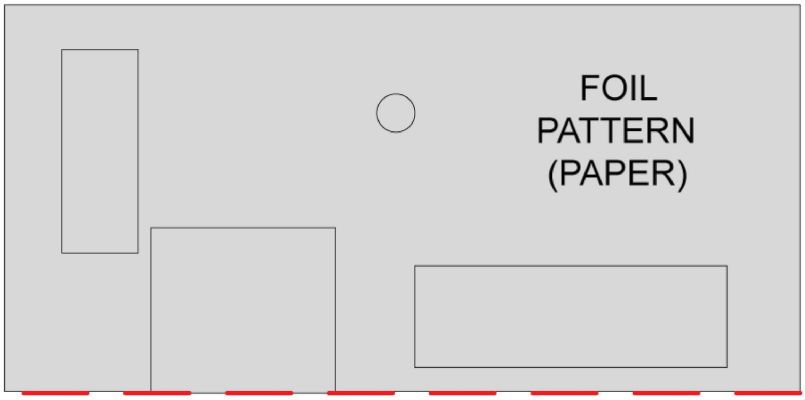
Place the foil pattern paper over the sheet of tin foil and trace along the foil pattern edge.



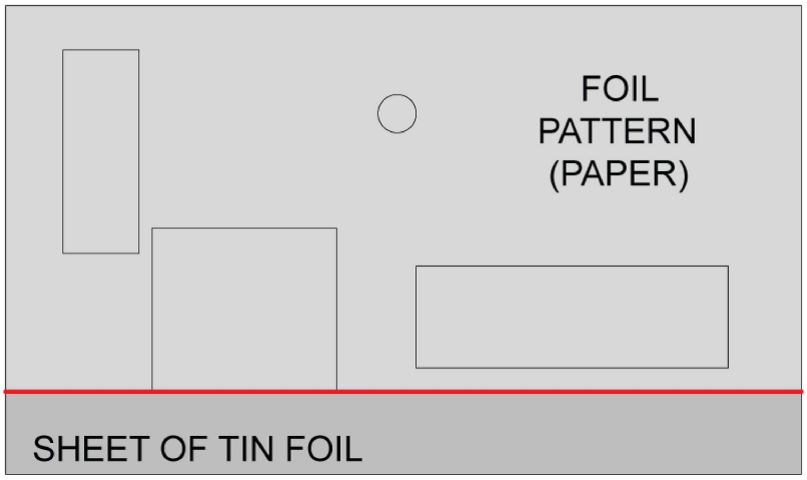
Cut the sheet of tin foil along your traced lines. You should now have a piece of tinfoil the same dimensions as the printed foil pattern

Step 3

Cut the paper foil pattern along the dotted line.

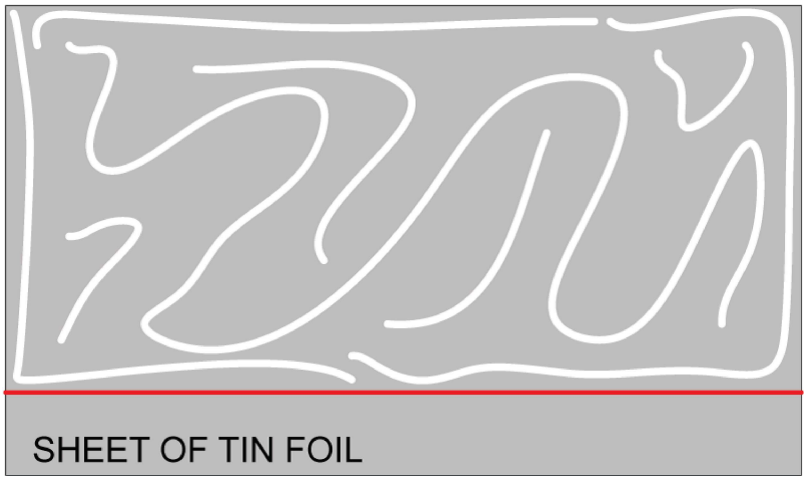


Place the foil pattern over sheet of tin foil lining its top edge to that of the foil. Trace along the edge where the dotted line was.

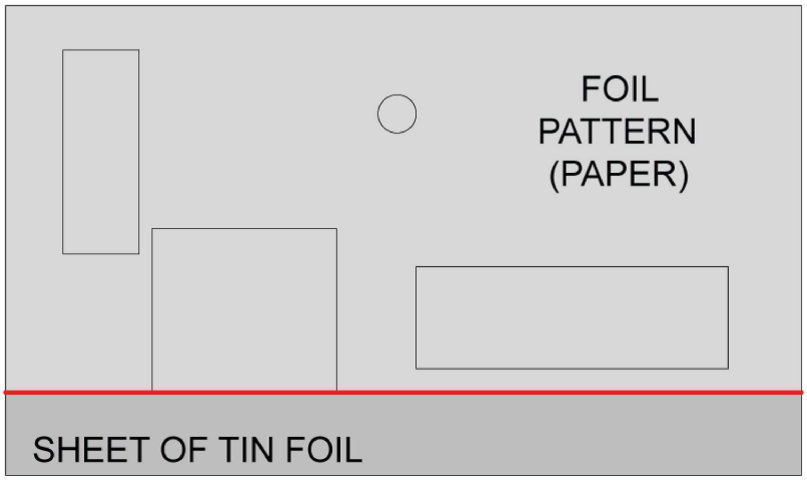


Step 4

Remove the paper foil pattern. Cover the tin foil with glue above the traced line.

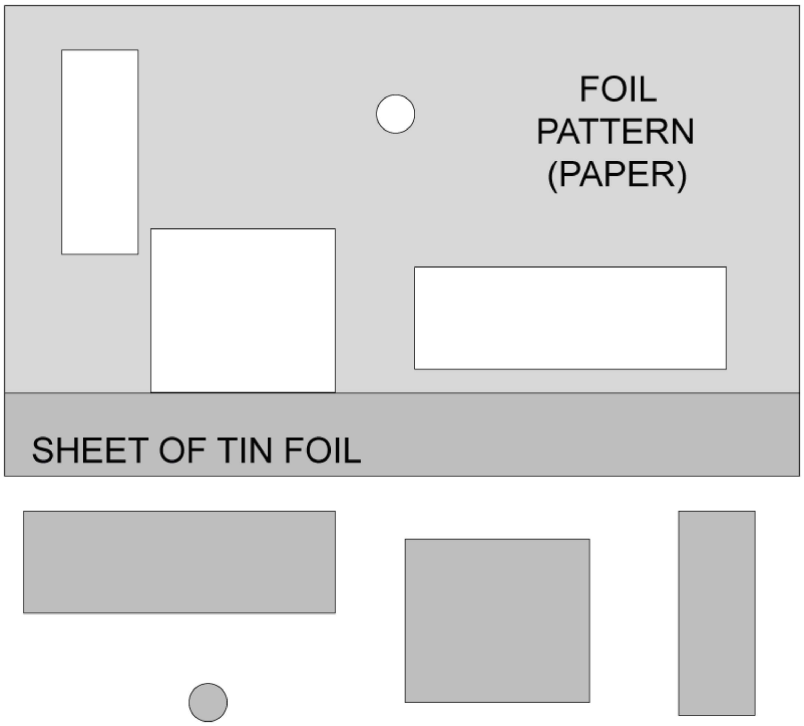


Place the paper foil pattern back on to the tin foil where the glue is and allow the glue to dry.



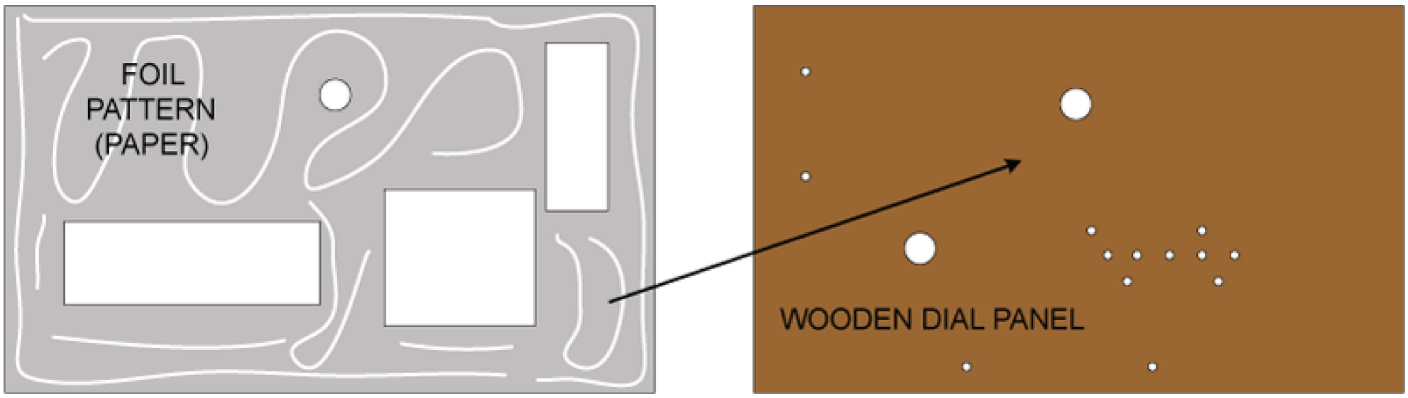
Step 5

After the glue has dried, cut out the pieces indicated on the paper foil pattern. Use either a pair of scissors or precision blade to remove both tin foil and paper where indicated on the foil pattern.

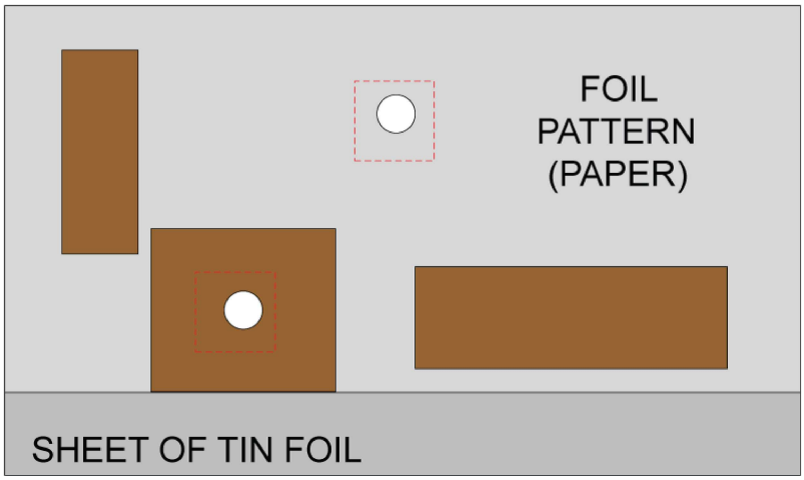


Step 6

Apply glue to the tin-foil-only side of the paper and tin foil pattern.



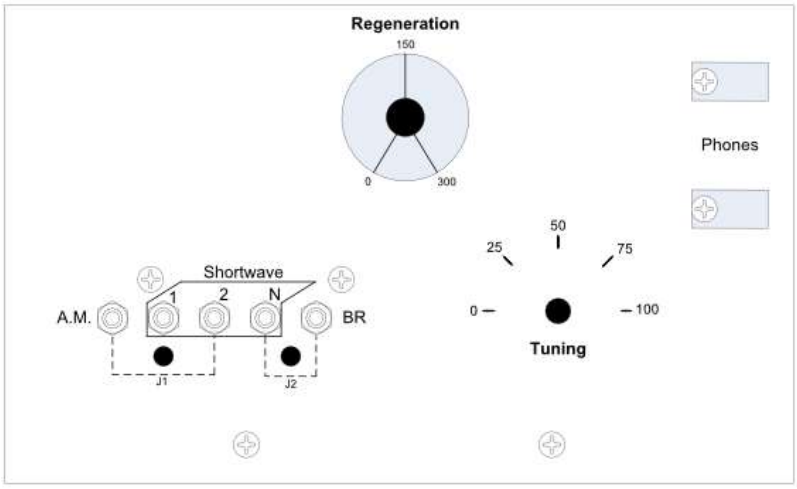
Lay the glue side of the paper and tin foil pattern on to the wooden front panel and allow the glue to dry. Make sure to line up the two large holes in the front panel as shown. The shaft of the variable capacitor should fit through the “Tuning” hole.



Step 7

Click here to download the `regenerative-radio-drill-template-faceplate.pdf` front panel template file to be used below.

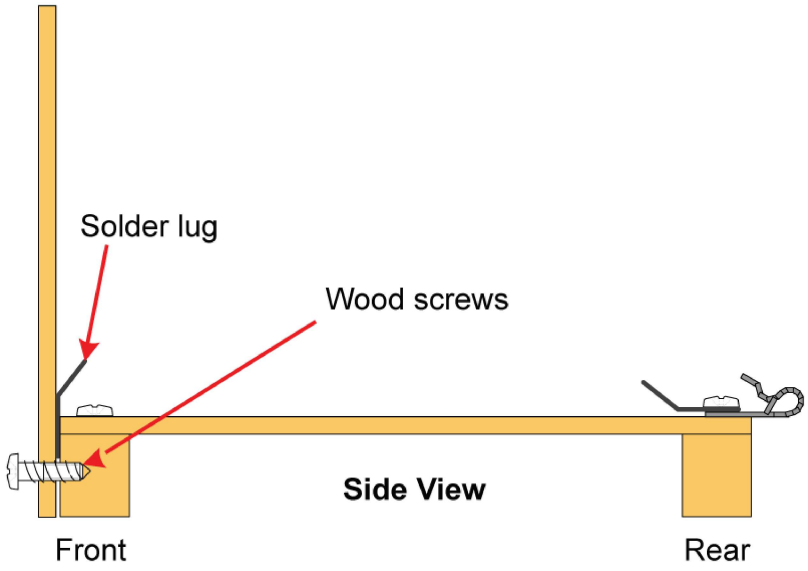
The faceplate template file above can now be applied to the front panel board in order to label your radio properly. Feel free to design your own labels as desired!



Step 8

Fasten the front panel to the chassis front by drilling in two wood screws through the front chassis rail where indicated on the face plate.

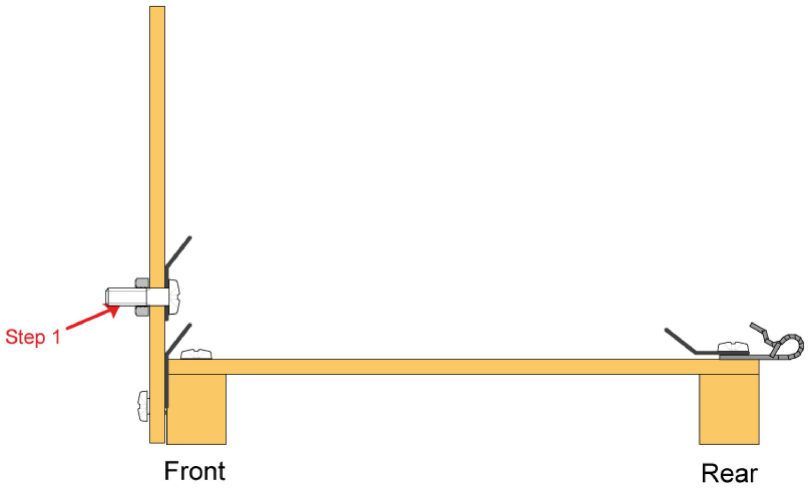
Place a solder lug in between the front panel and chassis floor and make sure it stays in place while you tighten the wood screw.



Assemble the Front Panel Components

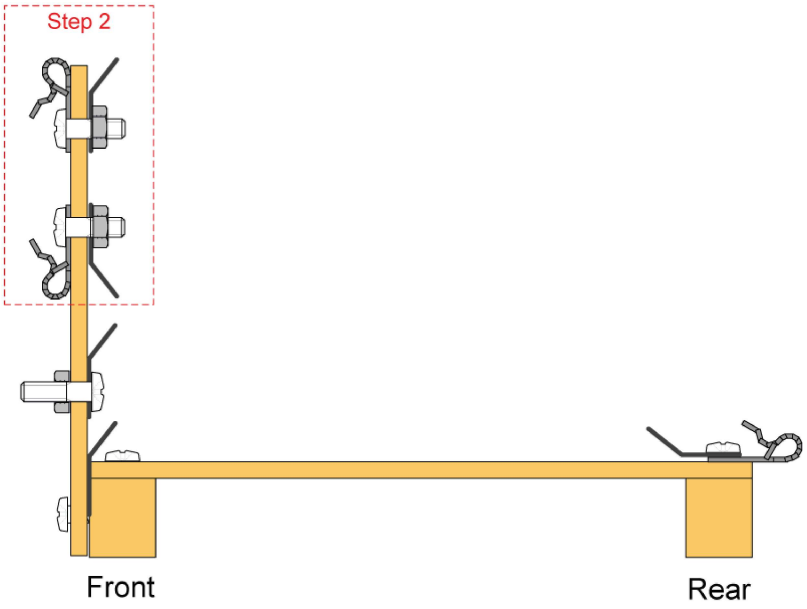
Step 1

Mount the five band select terminals (“A.M., 1, 2, N, BR”) with ½” machine screws, solder lugs and hex nuts. Point the lugs upwards to facilitate soldering to them.



Step 2

Mount the two “Phones” Fahnestock clips to the front panel with two 3/8” machine screws, solder lugs and hex nuts.



Step 3

Mount the R5 “Regeneration” potentiometer to the front panel with its solder lugs pointing towards the chassis floor. Use the mounting hardware provided on the potentiometer. Place the flat washers on both sides of the wood front panel. (It may be necessary to clip or bend back the small locating tab on the pot).

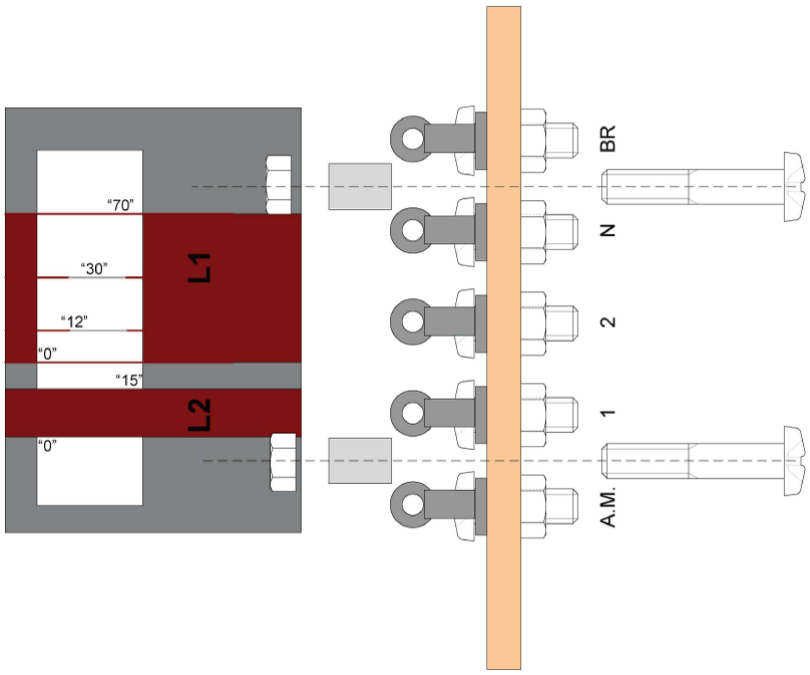
Step 4

Mount your knobs to the potentiometer and variable capacitor.

Step 5

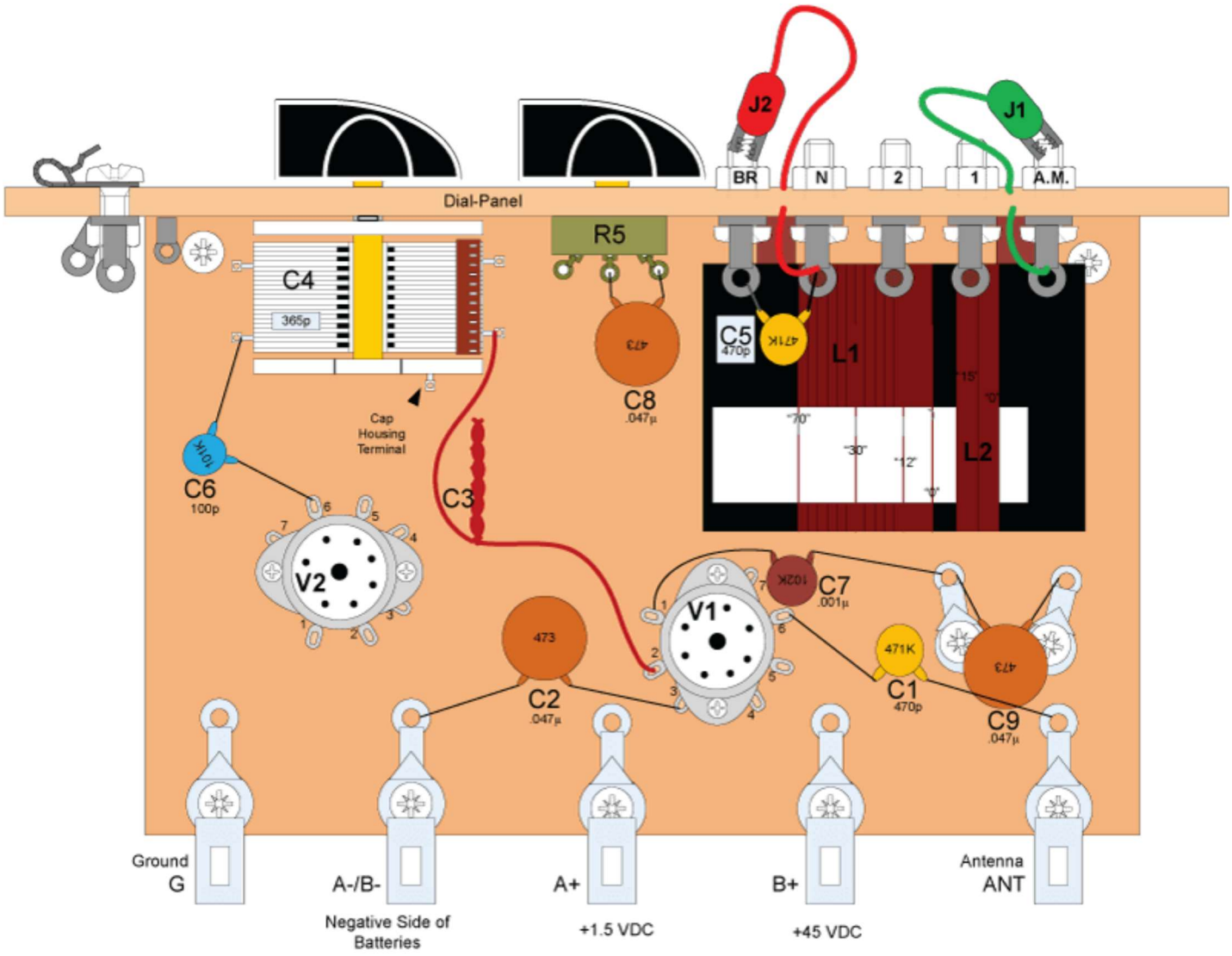
After the coil has dried, carefully peel off the scotch tape covering the “12” and “30” taps.

Fasten the coil to the front panel using two spacers, 1" machine screws, and hex nuts (as in the drawing). Be careful not to pinch any of the windings when tightening the nylon spacers.

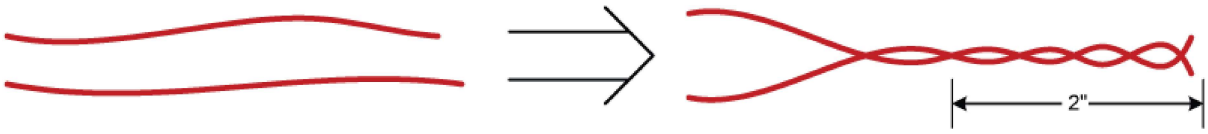


Connect Capacitors

Connect all of the capacitors (C1 – C9) as in the drawing below.

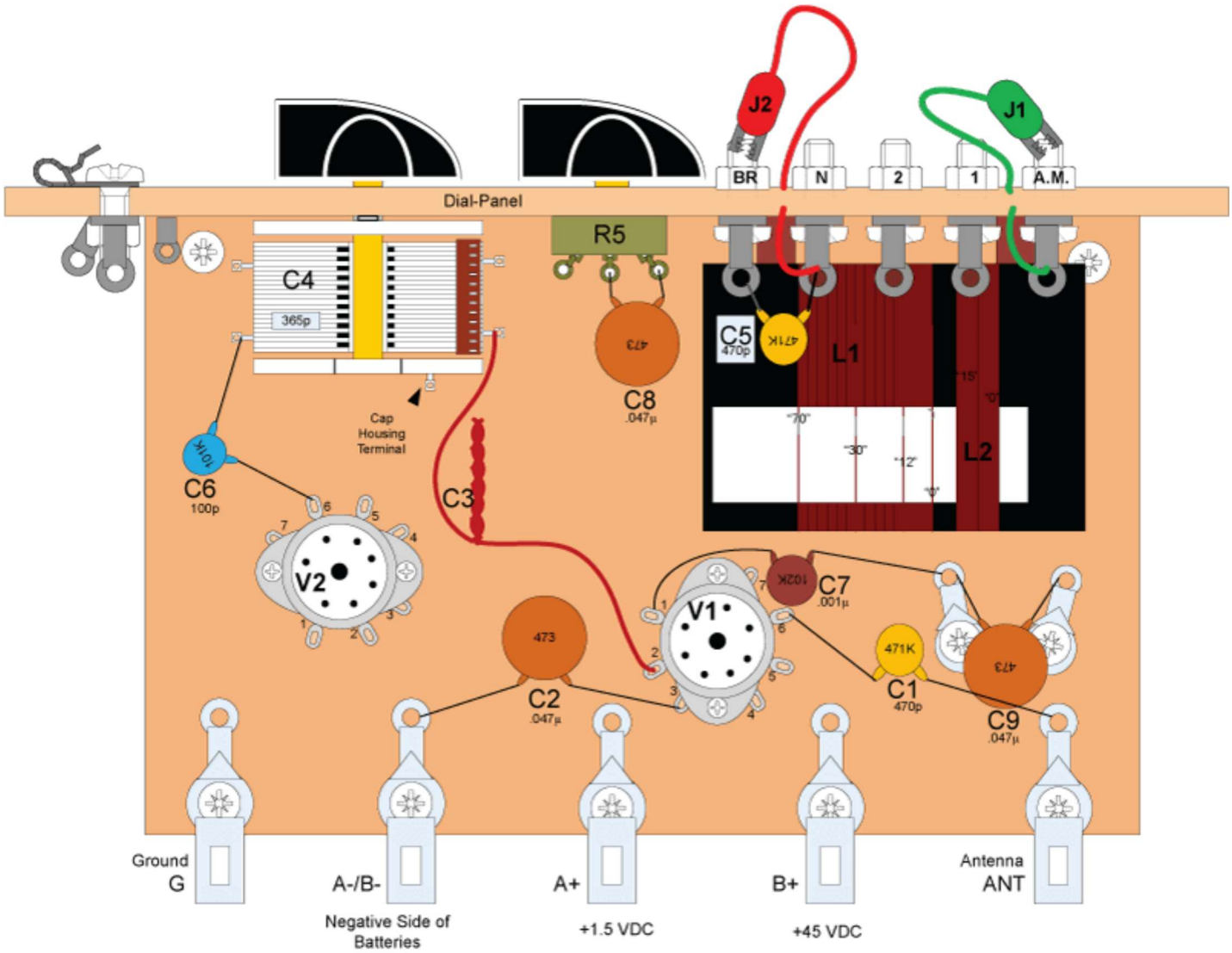


C3 is made by twisting together two pieces of 22AWG magnet wire for about two inches. Do not allow the ends to “short” electrically to each other. (They should be physically held together but not electrically connected to each other).



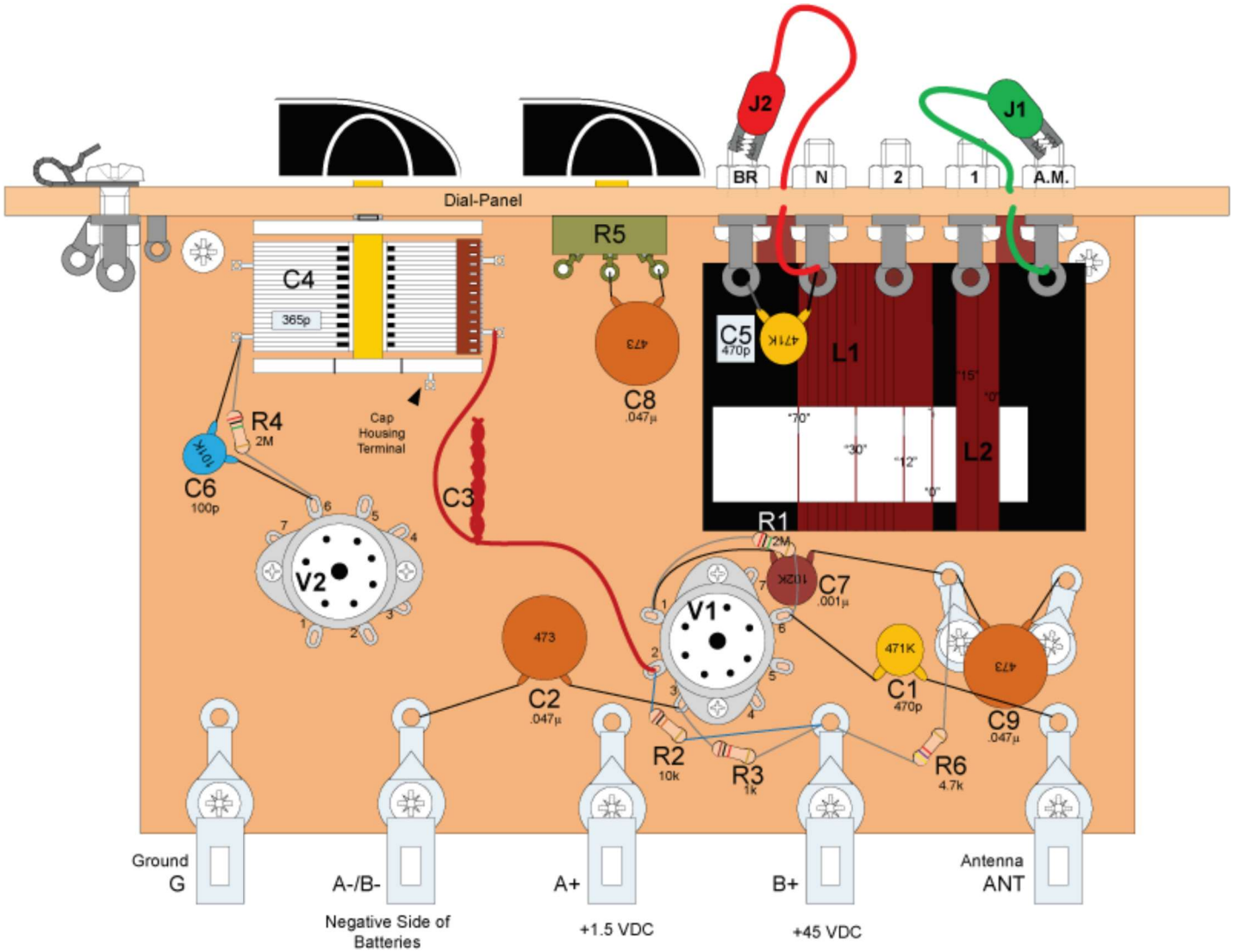
Connect Alligator Clips

Connect J1 and J2 alligator clips as in the drawing. They should be inserted through their respective holes in the front panel before soldering their connections.



Connect All Resistors (R1 – R6)

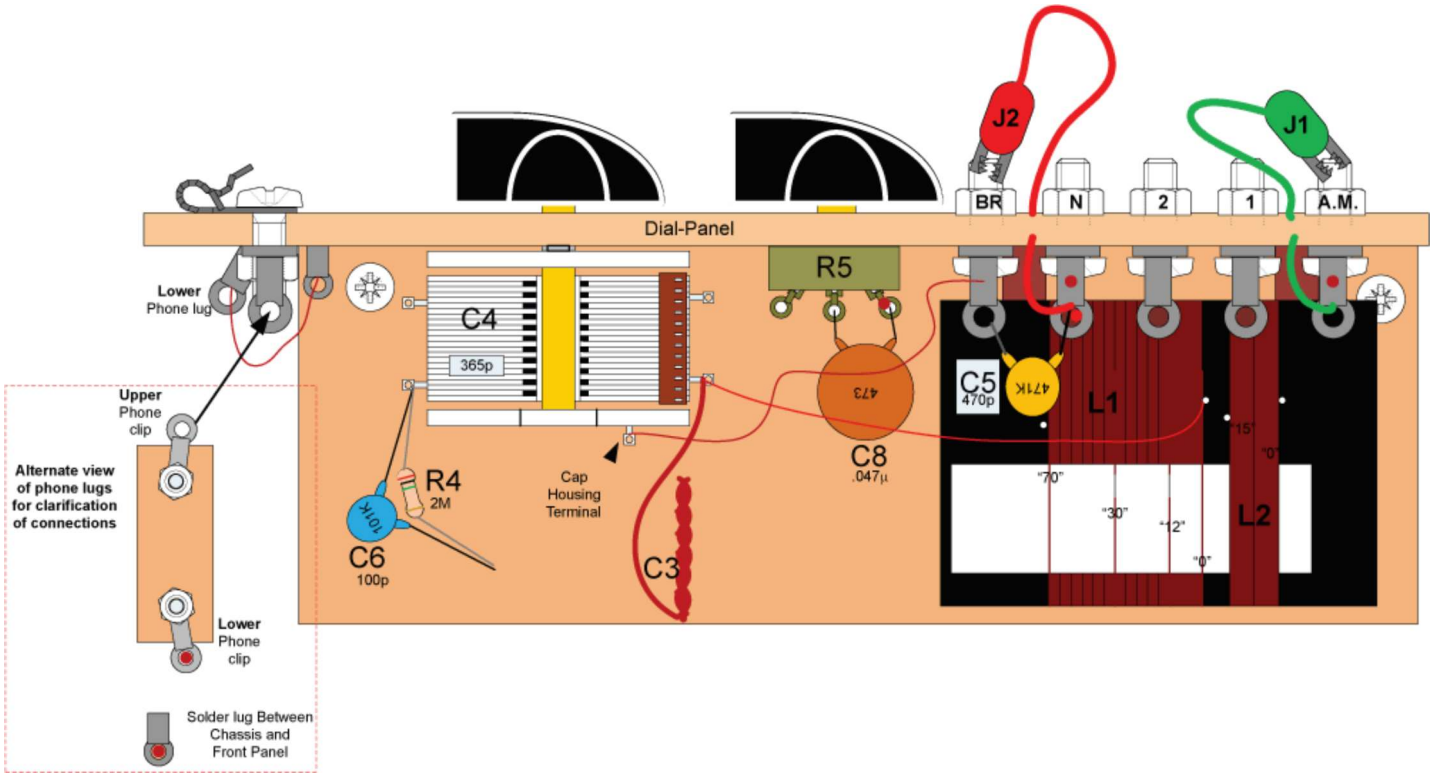
Connect resistors R1 - R6 as shown below.



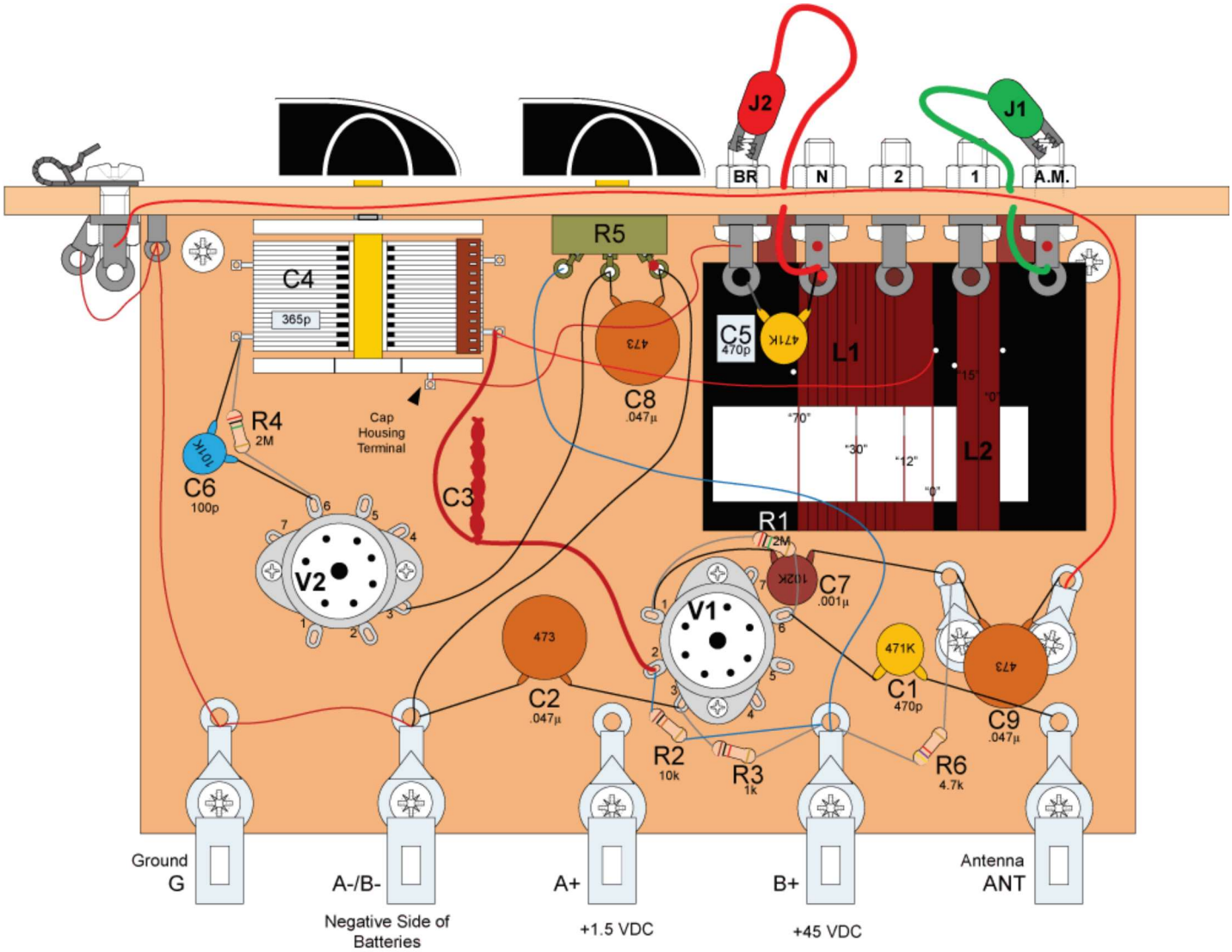
Connect Front Panel Wires

Connect front panel wires as shown below.

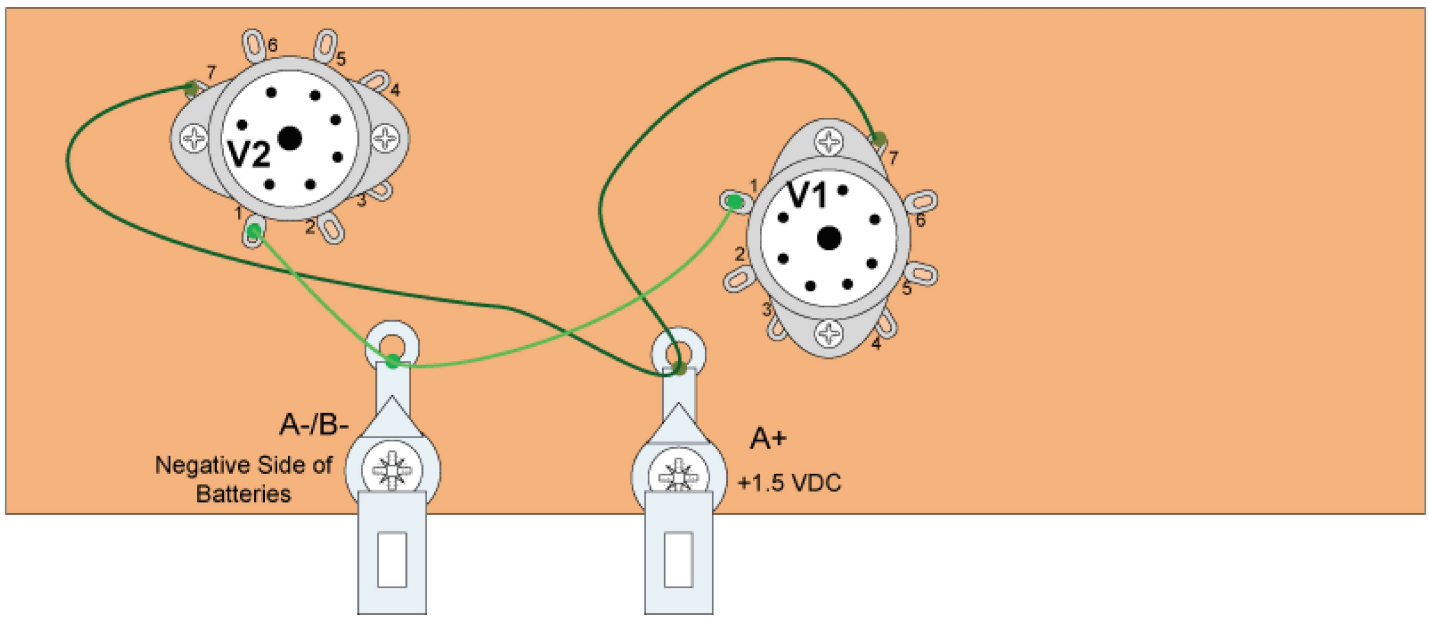
Step 1


J2
J1
BR
N
2
1
A.M.
Dial-Panel
R5
Lower
Phone lug
C4
365p
C5
470p
47K
L1
L2
"15"
"0"
"70"
"30"
"12"
"0"
C8
.047µ
Upper
Phone
clip
Alternate view
of phone lugs
for clarification
of connections
R4
2M
10K
C6
100p
Cap
Housing
Terminal
C3
Lower
Phone
clip
Solder lug Between
Chassis and
Front Panel

Step 2



Connect Tube Filaments

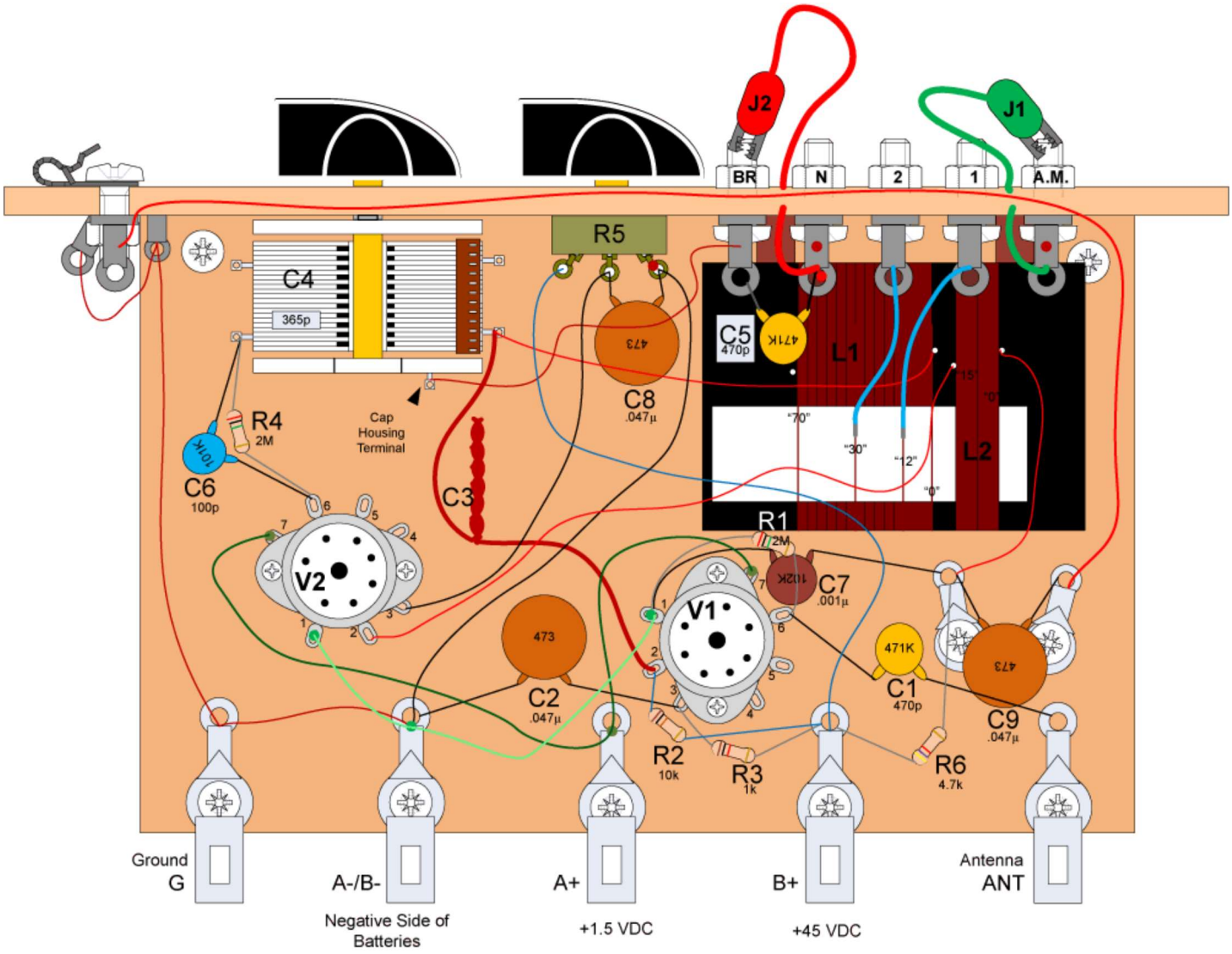


Finish Connecting Coils

How to connect to the taps:

Use hookup wire for the “12” and “30” L1 taps.

1. Strip the ends of the hookup wire.
2. Tin the end of the hookup wire to be connected to the taps.
3. Place the hookup wire right beside the tinned portion of the tap so that they are touching.
4. Heat them up and let it cool down so that the hookup wire is now connected to the tap.



Double Check Your Connections

At this point, assembly should be completed. Always double check your work before applying power

Powering Up Your Radio

Step 1

Install the tubes into the sockets

Step 2

Connect your antenna, ground and headphones to the correct terminals.

Step 3

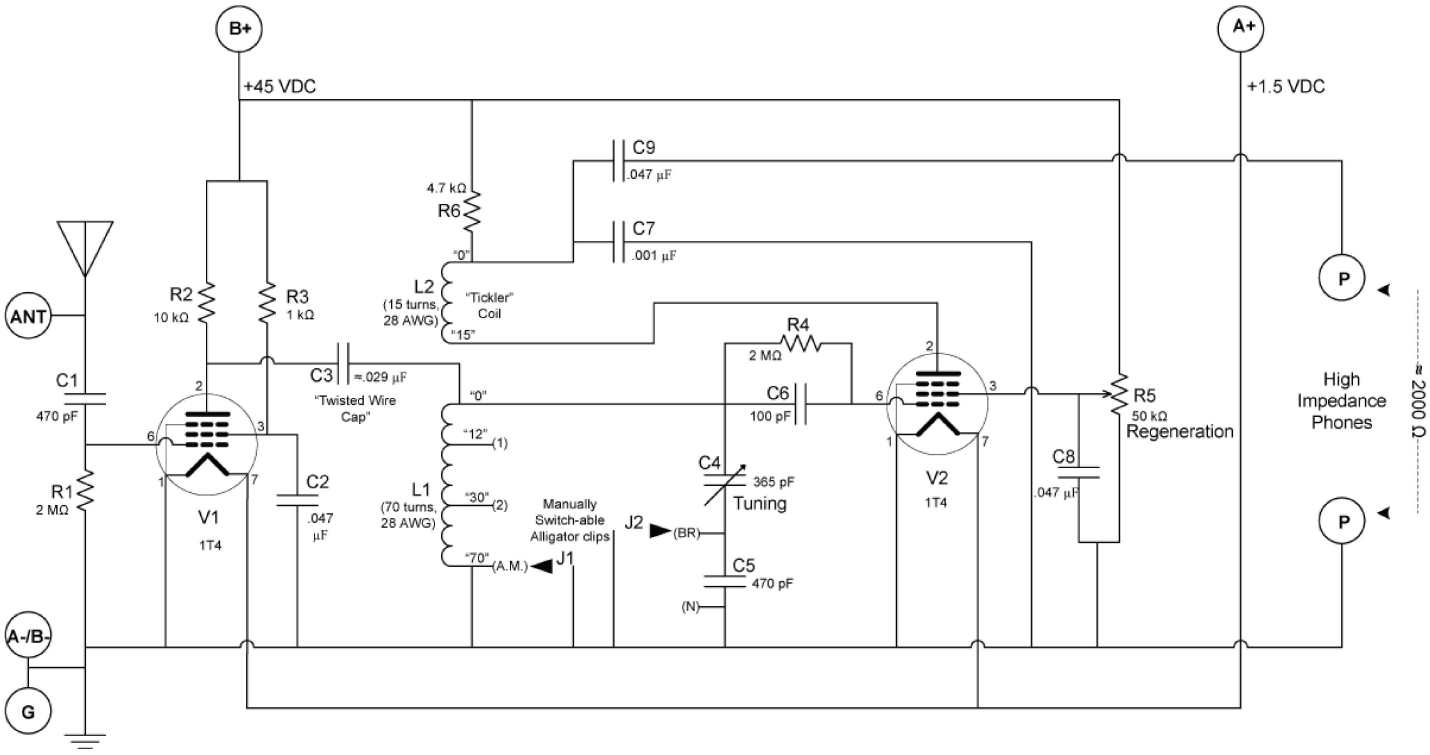
Connect all the battery terminals.

Step 4

1. Clip J1 to “A.M” and J2 to “BR”.
2. Put on your headphones.
3. Turn the “Regeneration” control all the way clockwise.
4. Slowly rotate the “Tuning” knob until you receive a station or a squeal.
5. Fine tune the station by trying different “Regeneration” positions and slightly turning the “Tuning” knob to find where the station is the loudest and/or clearest.

The same method is used for the shortwave bands. Use the “N” (narrow) terminal for adjusting the two shortwave bands. This will help to “spread” the stations. (If you want to listen to single-sideband, adjust the Regeneration knob to a squeal setting).

Schematic



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