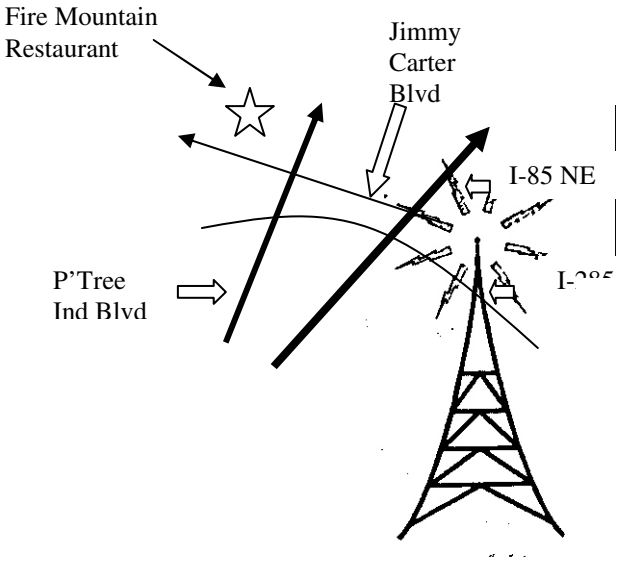
Spring 2006 Newsletter

Caution: Performing repairs on radios could be dangerous. SARS assumes no responsibility for accidents resulting from any information contained in this web site or newsletters.

JOIN SARS! Dues are $12 per calendar year. Join after June 30 and dues are pro-rated to $6.00 for the remainder of the year. Send payment to the SARS address above.

SUPPORT YOUR CLUB!
The Southeastern Antique Radio Society meets on the second Monday of each month at Fire Mountain Restaurant, 7045 Jimmy Carter Blvd. Norcross, GA 30093. Meetings start at approximately 6:30 PM. Most attendees arrive early and eat before the meeting. In addition to club business, meetings have a "Show and Tell" session where members bring in items to display and discuss. All are encouraged to participate in this activity. See the monthly schedule elsewhere in the newsletter and the map below.

ANNUAL DUES ARE NOW PAYABLE! ONLY $12! JOIN OR RENEW TODAY!



SARS RADIO CLUB

Spring BULLETIN

April, 2006

Check out our website! http://www.sarsradio.com

GENERAL INFO

Southeast Antique Radio Society
113 Laurel Ridge Drive
Alpharetta, GA 30004

Club Officers:
President: Jim DelPrincipe

Vice President: Les Cane

Publicity & Membership: Bob Niven

Secretary: Gary Beale

Treasurer: Tom Knutson

Newsletter Editor: Mark Palmquist

Webmaster: Rich Rodgers

Next Swap Meet: June 24, 2006 at 8:00 A.M.

Winder Picnic Pavilion, 113 E. Athens Street, Winder, GA
Check http://www.sarsradio.com for details.
See Directions on Page 9
Telephone (770) 867-9011

Next Meeting: Monday, May 8, 2006

Fire Mountain Restaurant Norcross 6:30 pm
Discussion Topic: TBD
Show & Tell: Your Oldest Radio

Repairing Ferrite Loop Antennas

By Mark Palmquist

Recently I have had several German Radios (Sabas, Telefunkens, Grundigs) come into the shop with broken ferrite loop antennas. Ferrite is a powdered iron material which enables antenna manufacturers to make a loop antenna in a very small space compared the large loop antennas described in Jim DelPricipe's fine article in this issue. The permeability of ferrite enables one to make a fairly large inductor with relatively few turns of wire compared to a standard "air core" loop antenna often found on the back of 40's and 50's "All American Five" (AA5) type table radios. Ferrite is hard and reasonably strong but somewhat brittle and will break if dropped with sufficient g-force on the landing. All of the dead German Radios were eBay acquisitions from sellers with packing skills or IQ's somewhere in the lower quartile.

I asked some amateur radio operators and even some Germans if ferrite loop antennas could be repaired by simply gluing them back together with super glue or epoxy. The hams said "no problem" and the Germans said "don't assume that you will have the same antenna as before when you put it back together. Of course no one had any actual data to back up their opinion so I decided to sacrifice a perfectly good ferrite loop antenna to get some actual data on what happens when you glue a ferrite rod back together.

First we should spend a moment talking about the target inductance of a ferrite loop. The loop is usually placed in parallel with the antenna section of the variable tuning capacitor. Typical variable capacitors when fully closed have a capacitance around 360 picofarads (pF). As you open the plates the capacitance decreases to a much smaller value, theoretically zero. There is usually a small trimmer capacitor present that adds a few pFs when aligning the radio so the antenna signal will max out at, say, 1500 KHz when tuning near the top of the dial on the broadcast band. The antenna coil should have an inductance that will cause the cap/coil to resonate at around 530 KHz when the tuning capacitor is closed and around 1700 KHz when the tuning plates are fully open.

The resonant frequency f of an LC "tank" circuit is given as

$$\frac{1}{2\pi\sqrt{LC}}$$

where L is the inductance in Henrys and C is the capacitance in Farads. If C is 360 pF (360^{-12}*10 Farads) and L is 250 microHenrys (250 x $^{10-6}$ Henrys) then the resonant frequency will be

$$\frac{1}{2\pi\sqrt{250\times10^{-6}\times360\times10^{-12}}} = 530{,}516Hz$$

or about 530 KHz, the lower end of the broadcast band. If the tuning capacitor is opened and the trimmer capacitor is set to about 40 pf the resonant frequency is 1591 KHz, near the top of the broadcast band. If the antenna is broken and glued back together and its inductance changes then the antenna may not do a very good job of matching the tuned station on the dial pointer.

So what follows is a description of an experiment where a perfectly good rod antenna from the junk box was measured, broken in half, glued back together and remeasured. I have no idea what

the original antenna was intended to be used for but its inductance, when measured on an ESI 253 impedance meter at 1000 Hz was 315 µH. When I glued the two pieces back together with superglue and inserted the rod back into the coil the inductance measured 306 µH, about 97.1 % of the original value. When I increased the length of the ferrite rod by gluing on another piece of scrap ferrite rod the inductance increased to close to the original value. I also could have added more turns of wire to the coil to increase the inductance back to the original value. Another observation is that if I put a piece of ferrite along side the repaired coil I could cause the measured inductance to increase to the original value. Another observation was that if I slid the coil away from the center of the rod the inductance would decrease. This means that the coil can be "tuned" easily by moving the coil with respect to the rod. This is exactly what happens when you tune IF (intermediate frequency) coils or oscillator coils in most radios.

Remember that all inductance measurements were made at 1 KHz and the coil actually operates at closer to 1 MHz so another experiment is required to determine of the effective inductance of the coil at broadcast band frequencies. I put a 364 pf capacitor in parallel with the loopstick and "broadcast" some rf into the loop with my signal generator. By placing my scope probe on the loop I could observe the resonant frequency of the antenna/capacitor tank circuit (the 364 pF includes the capacitance of the scope probe). I placed the coil in the center of the stick and at two other positions on the stick and measured the inductance at each of the three locations. I then put the capacitor in parallel with the loop and measured the resonant frequency. The results are in the table below:

Measured Inductance	Predicted Resonance	Actual Resonance	Error
306 µH	476.8 KHz	476 KHz	+0.8 KHz
304 µH	478.4 KHz	479 KHz	-0.6 KHz
272 µH	505.8 KHz	509 KHz	-3.2 KHz

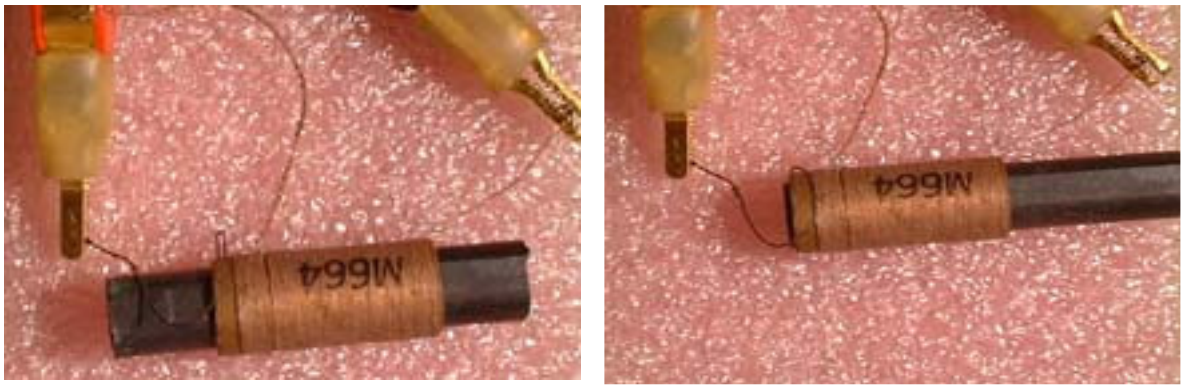


Figure 1: Inductance drops from ~306 µH to 272 µH when the coil is moved to the rod end.

Those results matched up reasonably close to theoretical so the result of all of this is that if your repaired antenna inductance drops below its original value you might want to tweak the trimmer on the antenna portion of the tuning capacitor to try to compensate at the high end of the dial. The lower end of the dial will still be detuned somewhat. If we go back to the original example of a 250 µH coil and reduce its inductance to 97.5% of its original value (243.75 µH) the antenna circuit of the radio will now tune to around 537 KHz at the bottom of the dial when the tuning cap is fully closed. Antenna tuning at the lower end of the dial is pretty broad so an error here is not as critical as an error at the top end of the dial. Some radios have a "padder" coil to assist with tuning at the lower end of the dial, usually tweaked at 600 KHz.

Construction of the Loop Antenna

By Jim DelPrincipe

Basic, un-tuned loop

This is a simple, two evening project. It requires a minimum of components or tools and costs very little. The loop can give you rewarding performance and is just fun to construct.

Tools required: Basic hand tools, a small saw for cutting wood, sandpaper, a utility knife, file, clamp and a drill with bits.

Materials: Wood, ½ " X 24" Basswood purchased at Hobby Town USA -2 pieces
Glue, carpenters
Brass brads, ½" long for the spider web version (my favorite) lots of 'em
Brass #6 X 2" machine screws, washers and knurled nuts (Box version)
1" X #6 nylon bushings (Box version) -4 required
1" X #6 brass machine screws, washers, nuts and knurled nuts for
Terminals. – All versions
Base block – Your choice – decorative block or plinth block
Wire - #22, 24 or 26 magnet wire from Radio Shack
Stain – Your choice.

Start by cutting one length of wood to 20". This will be the cross arm of the loop.
Sand both pieces of wood until smooth.
Carefully cut a notch in the middle of the cross arm and centered 10" from one end of the other piece of wood. This means the vertical member will be 4" longer at one end to insert into the base. Cut carefully and check to see the fit. They should just go together with some pressure so it fits tightly. This will make the joint secure. You can file or use sandpaper to make the final fit. Be sure it forms a 90 degree angle, and is not crooked.

Using a wood file and then sand paper, round off the longer end so that it can be inserted into a 3/8th " hole you will drill into the base.

Hopefully, you have determined what type of loop you will construct, box or spider web. If you want a box version, drill the end of each piece of wood to insert the 2" long brass machine screws. Drill two additional 1/16th " holes to pass the wire through. Locate just below the outermost winding.

Stain the wood your choice of color. I used golden oak to match a favorite radio.

After it dries, you can insert the brass brads if you are making the spider web antenna.
Be careful not to drive them in too deeply and try to get them the same length.

At this point you will glue the two pieces together. Use a minimum of glue. Secure some scrap wood to sandwich between the clamp or vise, so the wood is not marred by the pressure and also use wax paper between the scrap wood and your work piece. This is to keep any excess glue from sticking the pieces together. Allow the joint to sit overnight for the glue to dry and set.

While the glue is drying, you can prepare the base by drilling a 3/8" hole to insert the vertical member into later. Also, drill for the #6 terminal screws and two 1/16th " holes to pass the wires under the base.

When fully dry, check the security of the joint. It should be quite strong if you fit the wood carefully.

Now for the fun part, stringing the wire.

Thread one end of the wire through a 1/16th " hole in the vertical member and leave enough to connect to a terminal on the base. Wind the wire around the nylon bushings for the box antenna and be sure not to cross the windings. If you are making the spider web antenna, wind around the brads and loop the wire once around each brad to ensure it is taut.

When the desired amount of wire is on, finish by passing the remaining end through a second 1/16th " hole in the vertical member and then into the base to be connected to the second terminal.

Be certain to remove the varnish from the ends of the wires using fine sandpaper, to ensure good electrical contact.

When it is fully assembled, connect the antenna to your radio using suitable lengths of wire. This can be line cord, zip wire, twisted pair or any other convenient lead.

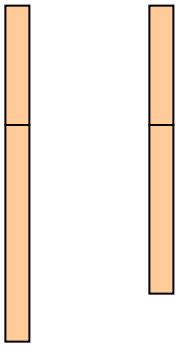
Now select a known station and after tuning it in, rotate the loop antenna. Notice how it peaks and nulls the signal. There will be two peaks and two nulls for a full rotation. The peak should be 90 degrees from a null.

A very strong local station will not have as pronounced a peak as the receiver's AGC (AVC) will try to compensate the volume level. However, for weaker stations, the difference will amaze you. Have fun 'locating' various stations. Do they come from the direction you thought they would?

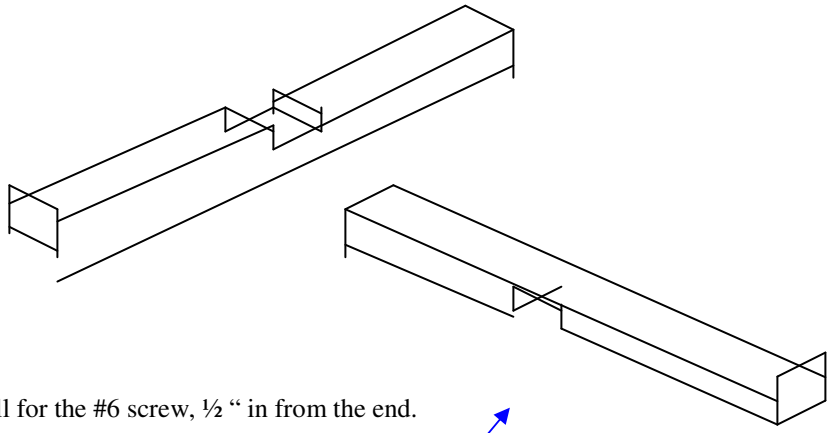
Construction details:

1. Wood pieces: ½" square by 24 inches long Basswood. Cut one piece to 20".

Measure down 10" and make a pencil mark on both pieces.
This is where the notch will be made.



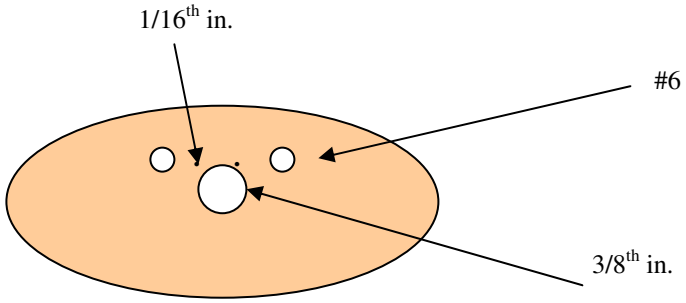
2. Notch both pieces so they fit together.



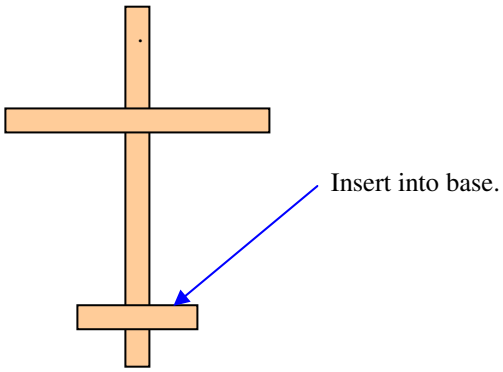
3. If you make the box version, drill for the #6 screw, ½ " in from the end.

If you make the spider web, insert a brad, starting ½ inch in and repeat ever half inch. Add 10 brads to each end except the lower vertical piece, which needs 11 brads.

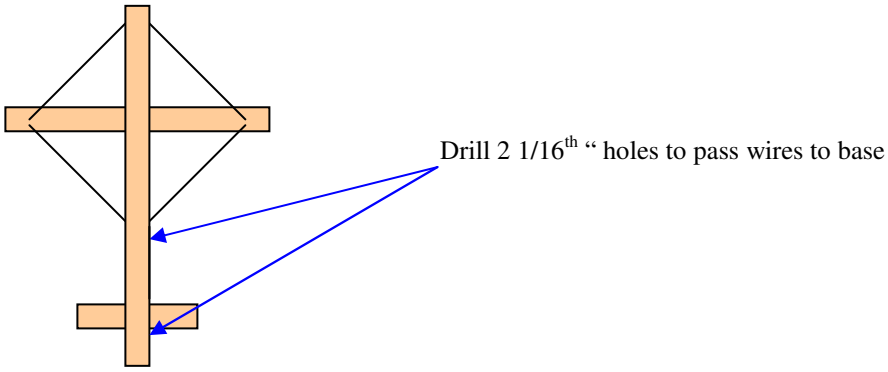
4. Prepare the base by drilling for the arms, wires and terminals.



5. Assemble the vertical and cross arm to make a cross shape and insert into the base.



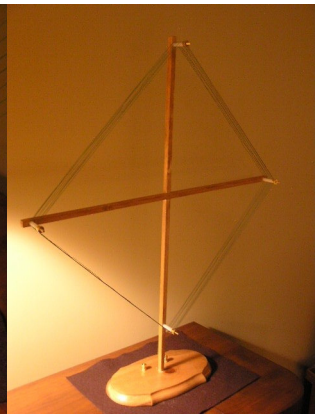
7. Add the appropriate hardware, depending upon which antenna you are constructing.



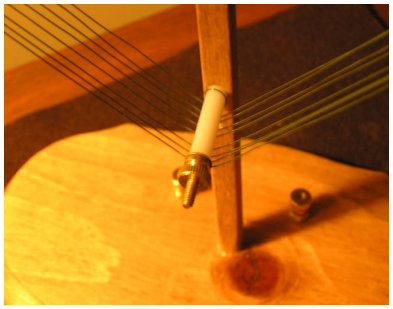
8. String the wire carefully around the brads or screws with bushings. Connect to terminals. Tighten all the hardware. Check it out and you are ready to test.

Spider Web Loop

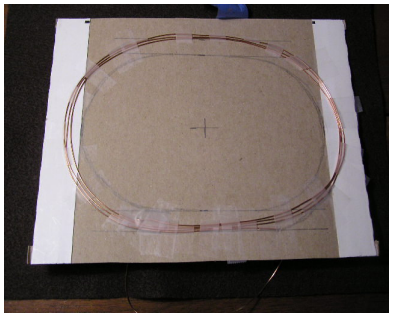
Loop Detail



Helical Box Loop



Box Loop Detail



2ND Loop

Handy formula:

XL = 2 Pi x F x L XC = 1 / [2 Pi x F x C]

F = 1 / {2 Pi x [L x C] ½}

Where:

XL = Inductive reactance - Ohms
XC = Capacitive reactance - Ohms
F = Frequency – CPS or Hertz
L = Inductance in Henrys
C = Capacitance in Farads
Pi = 3.14 so 2 Pi = 6.28

SARS Meeting Dates for 2006 - Mark Your Calendars!

Date	Show & Tell Topic	Meeting Topic	Speaker
May 8, 2006	Your Oldest Radio	TBA	TBA
Jun 12, 2006	Early Kit Radios	TBA	TBA
Jul 10, 2006	Family Heirloom Radios	TBA	TBA
Aug 14, 2006	Radios with Tuning Eyes	TBA	TBA
Sep 11, 2006	Your Largest Table Radio	TBA	TBA
Oct 9, 2006	Radios with chrome grills	TBA	TBA
Nov 13, 2006	Radios with colorful dials	TBA	TBA
Dec 11, 2006	Anything Goes	TBA	TBA

Upcoming Radio Events

Date	Event	Location	Contact
April 29, 2006	Calhoun Hamfest	Calhoun, GA	http://www.qsl.net/k4woc
May 8, 2006 6:30 pm	SARS Monthly Meeting 6:30	Norcross Fire Mountain Café	http://www.sarsradio.com
May 13, 2006	Heart of Georgia Hamfest	Byron, GA	http://members.cox.net/cgarc/
June 3, 2006	Atlanta Convention	Jim Miller Park Marietta	http://www.atlantahamfest.com
June 24, 2006 8:00 am	SARS Spring/Summer Swap Meet	Picnic Pavilion Winder, GA	http://www.sarsradio.com
August 12, 2006	Ellijay Hamfest	Ellijay, GA	http://www.qsl.net/w4hhh/

Map to Winder Swap Meet June 24, 2006 8:00 am