

Practical Antenna Systems for the Radio Collector

Beyond Wire Antennas

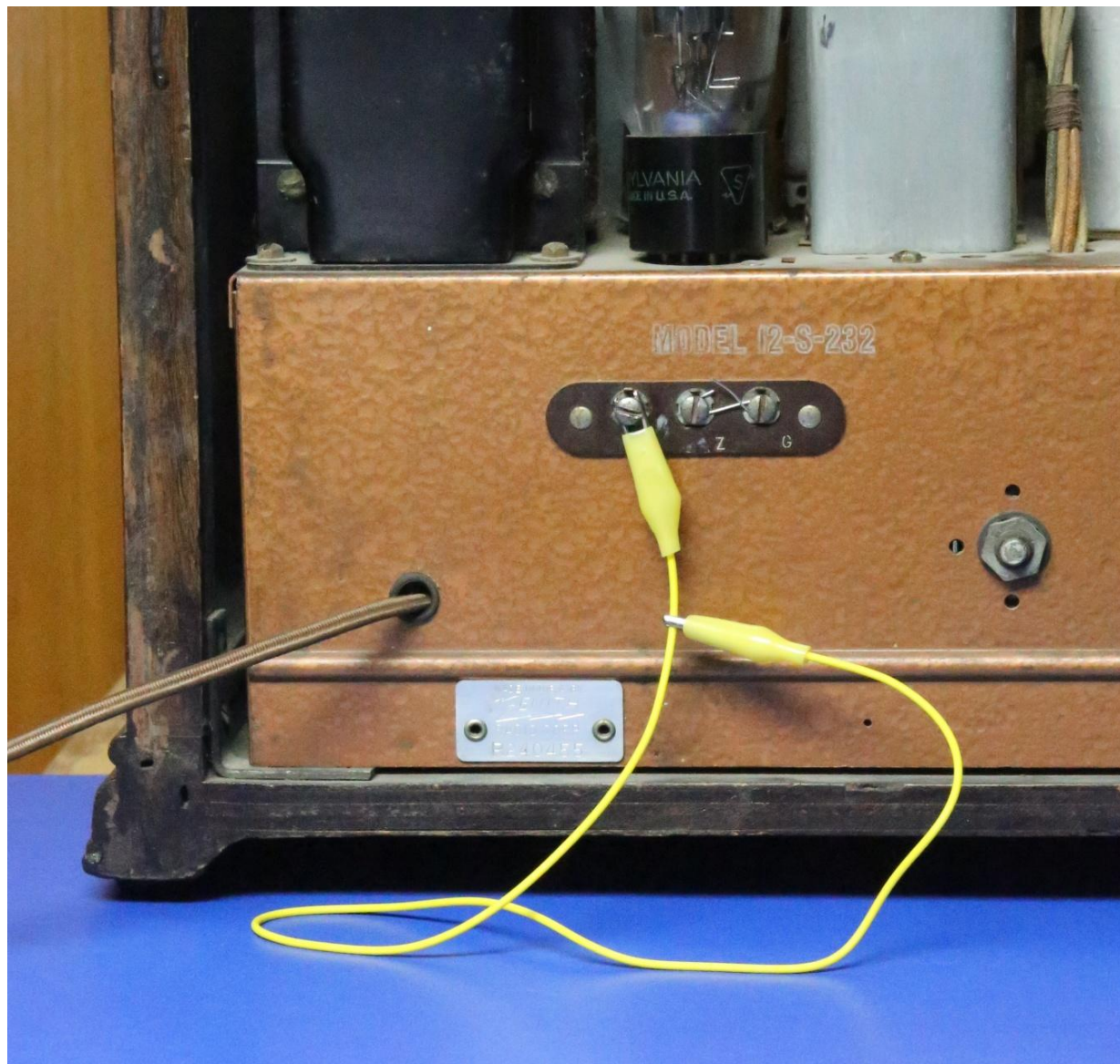
AI Klase – NJARC

10 Aug 2018

Your Dream Radio



Your Antenna



Motivation

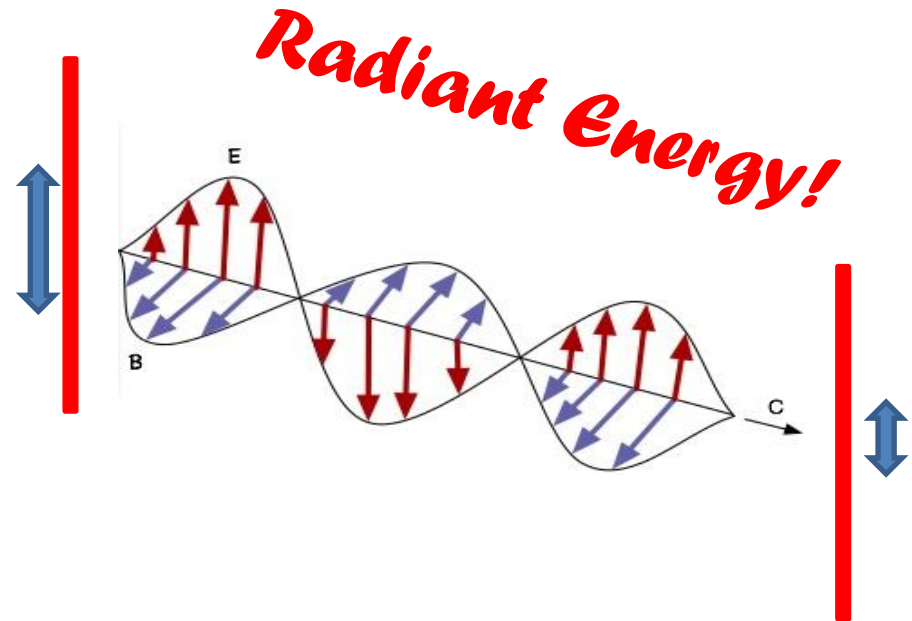
A lot of us have acquired some really nice radios from the 1930's, and then hang three feet of wire down the back of the table for an antenna. In this presentation we'll take a look at antennas systems in general with an eye to modern solutions such as active antennas, that better fit a 21st Century life style. Both commercial and homebrew setups will be considered.

Why?

- 900 CHML – Hamilton, ON
 - Old radio programs after 10PM
- 740 – Toronto
 - Oldies
 - Old programs
- 650 WSM – Nashville
 - Quintessential Country
- Short Wave is not completely dead!

Antennas Launch and Intercept Radio Waves

- It's a Transducer
- Converts Electro-Magnetic Energy to Current in an Electrical Circuit.
- And Vice Versa



The Hertzian Antenna or Dipole

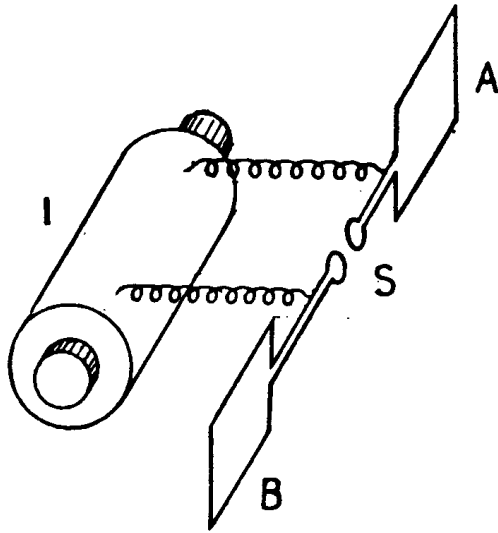


FIG. 9.—A Hertzian oscillator (AB) charged by an induction coil I.

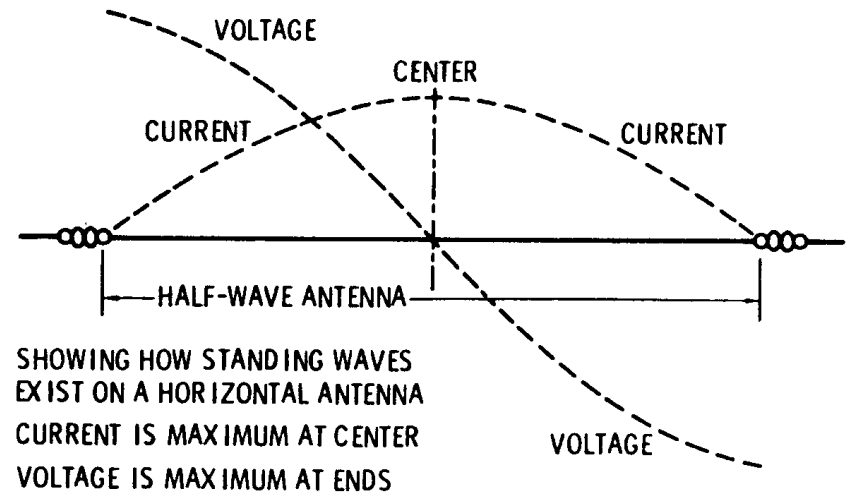
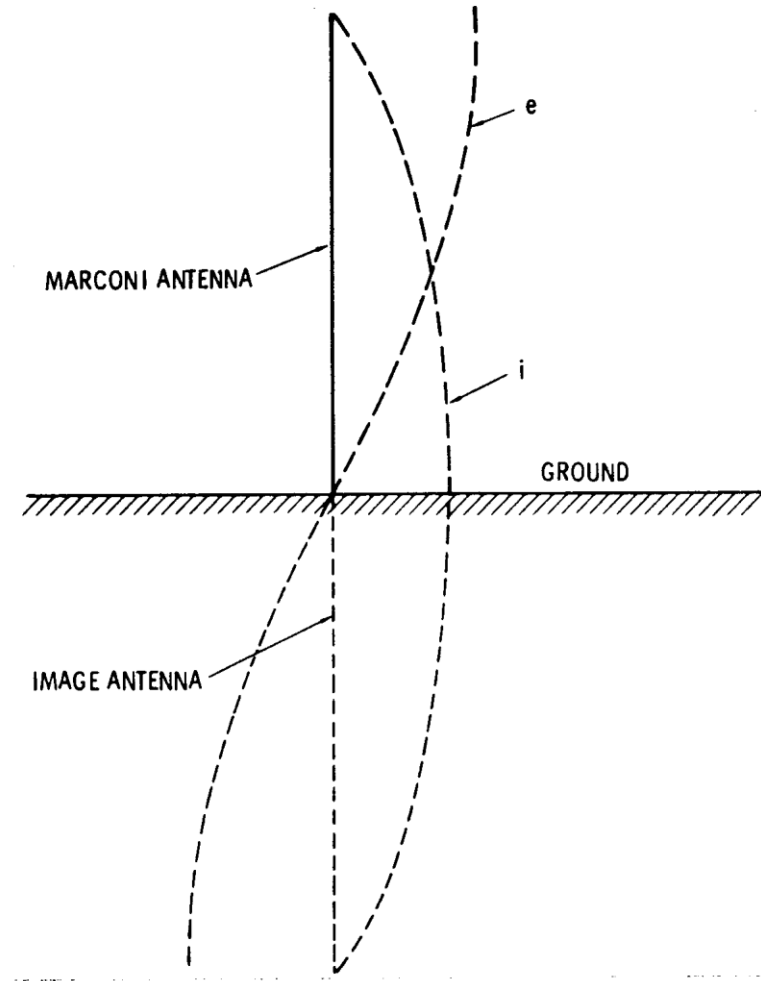


Figure 7. The Resonant Antenna

The greatest amount of current flows in the antenna when it is resonant. The shortest conductor that is self-resonant at a given frequency is one that is about a half-wavelength long. The reflection pattern on the antenna creates a standing wave of both voltage and current. The half-wave, center-fed antenna is often called a "doublet."

The Marconi Antenna



Hence, the well known antenna-ground connections.

Engineering is not a Four-Letter Word

- Make measurements.
- Make decisions.
- Repeat as necessary.

**Designing and building usable antennas
is a lot easier than designing radios.**

Testing

- Building a good antenna system is an experimental proposition. Careful testing is essential.
- Arrange an A-B switch to compare your new antenna to the old "reference" antenna.
- It's usually best to work in daylight when atmospheric noise is lower and ground-wave signals are available. (minimum fading)
- Chose a marginal AM station and work for improved reception. (In my case WMTR, 5KW, 21 miles.)
- A communications receiver with an S-meter is helpful but not essential.

A/B Switch

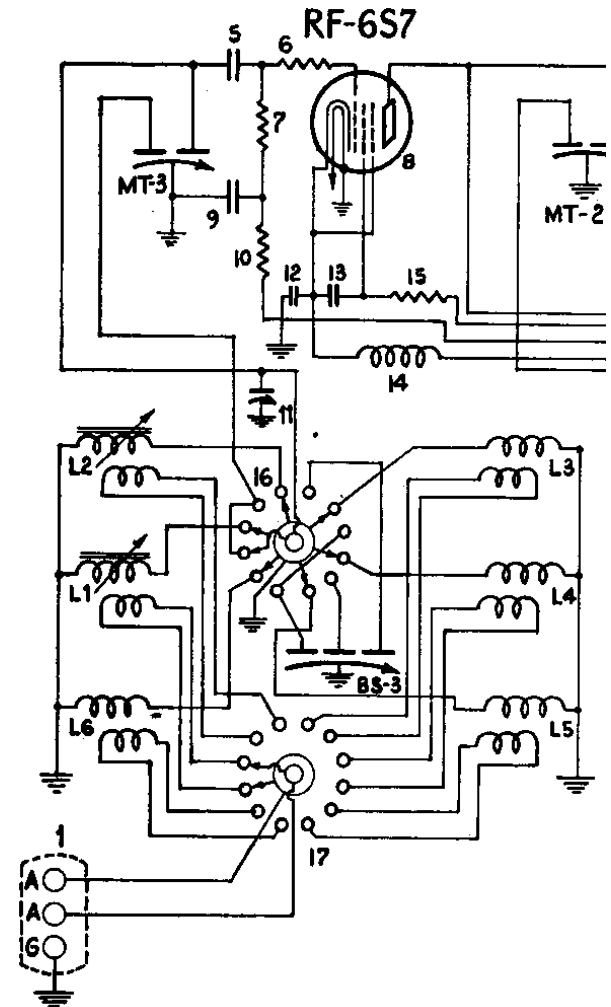


Connection to the Receiver



- You know what to do in this case.
- “G” is generally connected to chassis ground.

Many Multi-Band Sets



- These radios were designed to directly support balanced antenna feedlines.
- Add a jumper for an unbalanced feed.

Anything is Better than Nothing



Considerations

- **Problem:**
 - A half wavelengeth at 1500 KHZ is over 300 feet.
 - A quarter wavelength at 600 KHZ is over 375 feet.
- **The Saving Grace:**
 - Because background noise is high, and receivers are fairly sensitive, a receiving antenna does not need to be highly efficient.
 - Signal to noise ratio is far more important than absolute signal level.
 - A modest size skywire can give excellent results.

An Indoor Antenna

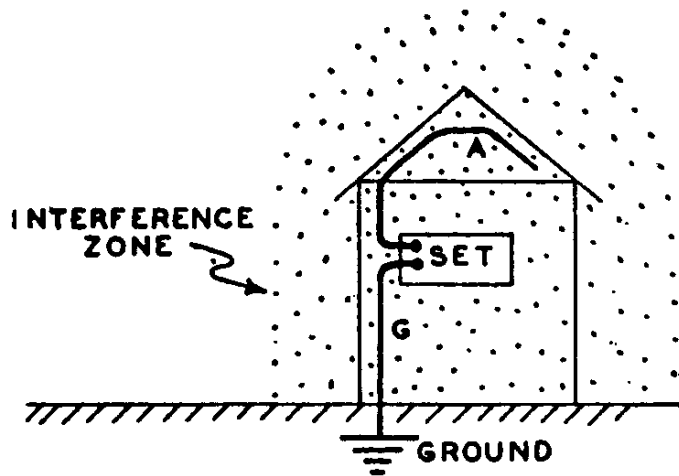


FIG. 30-24.—A typical example of an indoor aerial installed in a location full of interference. Both the indoor aerial, the lead-in and the ground wires run right through the strong interference zone and all of them pick up the disturbances. Noisy reception is bound to result.

The Interference Zone

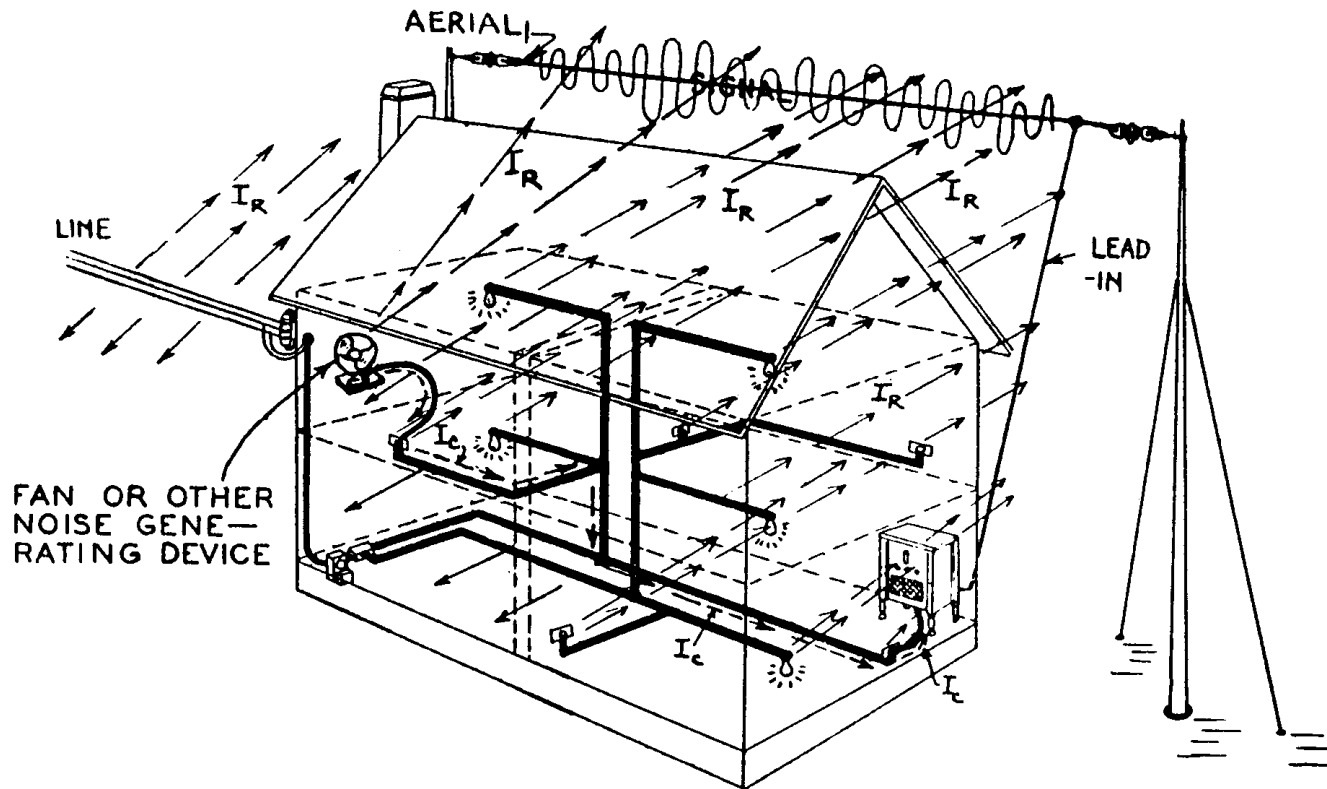
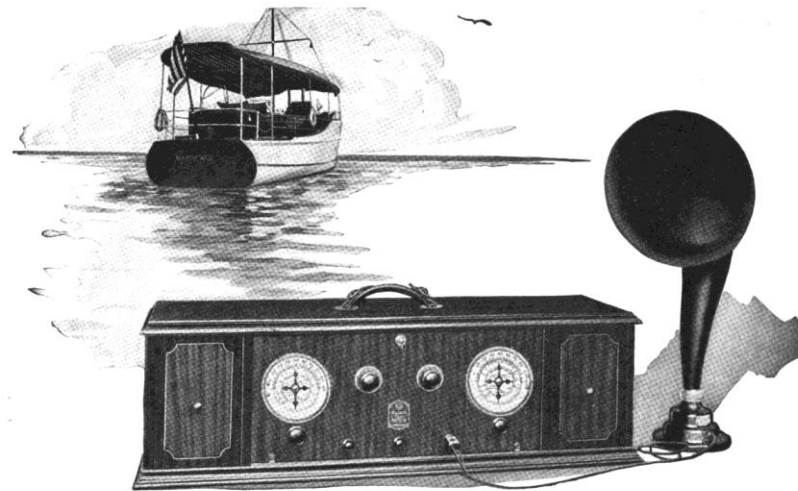
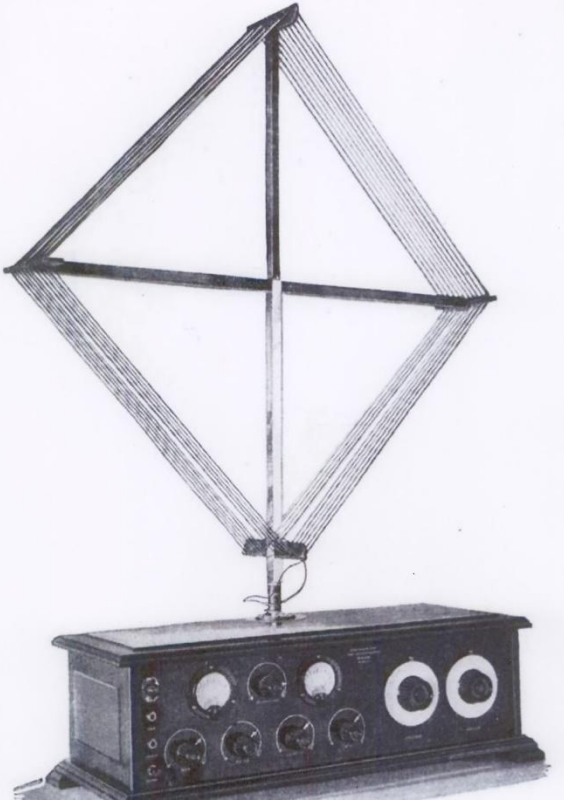


FIG. 30-4.—How an electrical device located in one part of a building can produce electrical interference part of which (I_c) is conducted directly through the electric light wiring to radio receivers operating from the same lighting line; the other part (I_R) may be radiated either directly from the device or from the electric light circuit wiring in the building to the aerial, lead-in and ground wires of the receiver, inducing interference voltages in them. These are heard in the radio receiver as disturbing noises of a certain character depending upon the nature of the interfering device (see Art. 30-16).

Loops

- Respond only to the magnetic field.
- Household interference is generally an electrical field.
- Tuned: part of the radio front end.
- Less pickup than outdoor wire.
- Needs a high-gain receiver, i.e. superheterodyne.

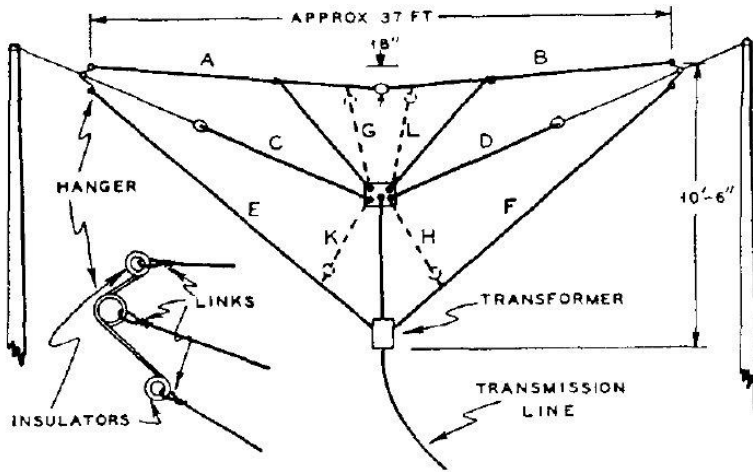


Take It Aboard

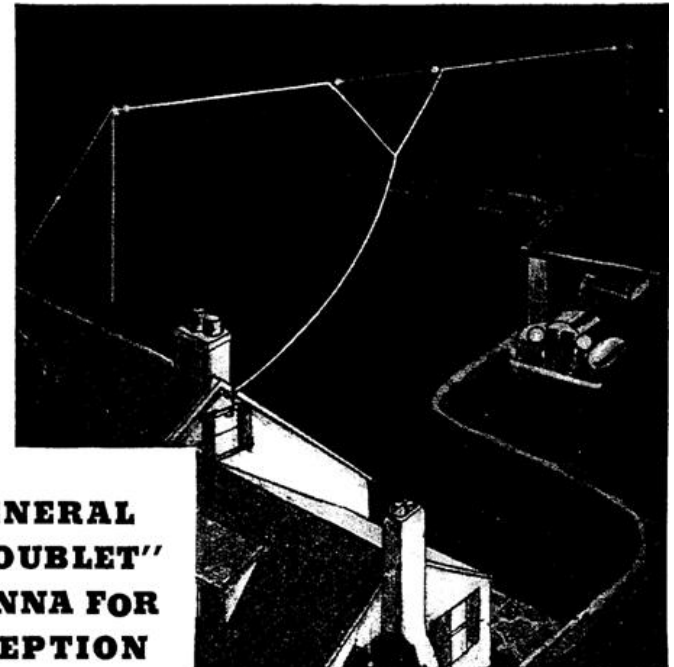
So, why don't we see many loops between 1930 and 1940?

- **Short-Wave!!**

- Outside wire antennas remained the standard.
- Sophisticated designs appear on the market.



RCA Spiderweb



**INSTALL A GENERAL
ELECTRIC "V-DOUBLET"
ALL-WAVE ANTENNA FOR
SUPERIOR RECEPTION**

Loops



- Respond only to the magnetic field.
- Household interference is generally an electrical field.
- Usually tuned:
 - Part of the radio front end.
 - External control on the antenna.
- Broad-band (untuned) Active Loops are possible.

Commercial Tuned Loops



\$30 on Amazon

Homebrew Tuned Loops

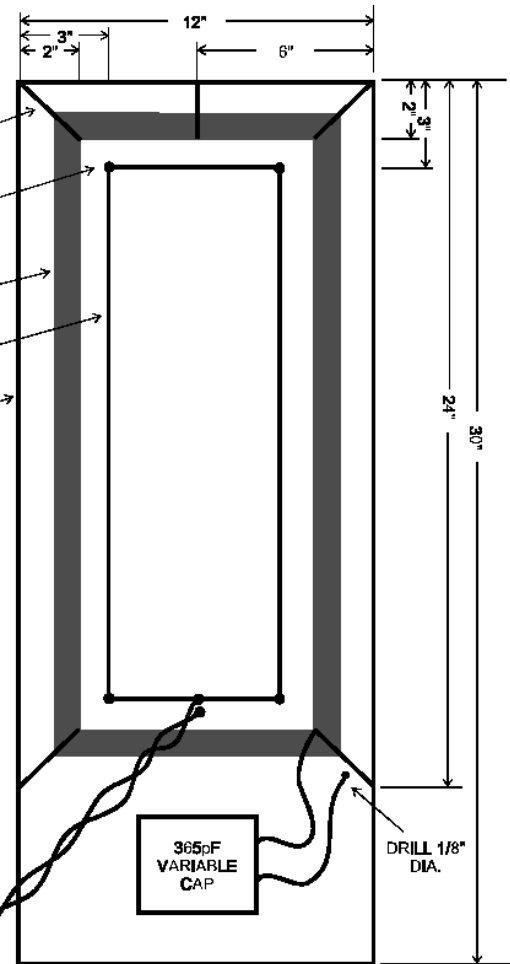
SkyWaves Basic BCB Loop Antenna

Copyright 2002 - Alan R. Klase, N3FRQ

This is a simple loop antenna that will improve the performance of almost any radio. Construction is quite simple, the wire is simply woven onto the plywood. About 135 feet of wire is used. Be sure every turn of each coil is wound in the same direction. Draw some arrows to remind yourself. The antenna is intended to be mounted in a vertical orientation, and should be rotated to achieve best reception. The mounting arrangement is left to the builder.



Insert a short scrap of wire in the kerf after every two turns to achieve proper spacing.



SAW KERF
5 PLACES

DRILL 1/4" DIA.
6 PLACES

16 TURNS
#22 INSULATED

4 TURNS
#22 INSULATED

1/4" PLYWOOD

365pF
VARIABLE
CAP

TWISTED PAIR
TO RADIO

www.njarc.ar88.net/LOOP.PDF

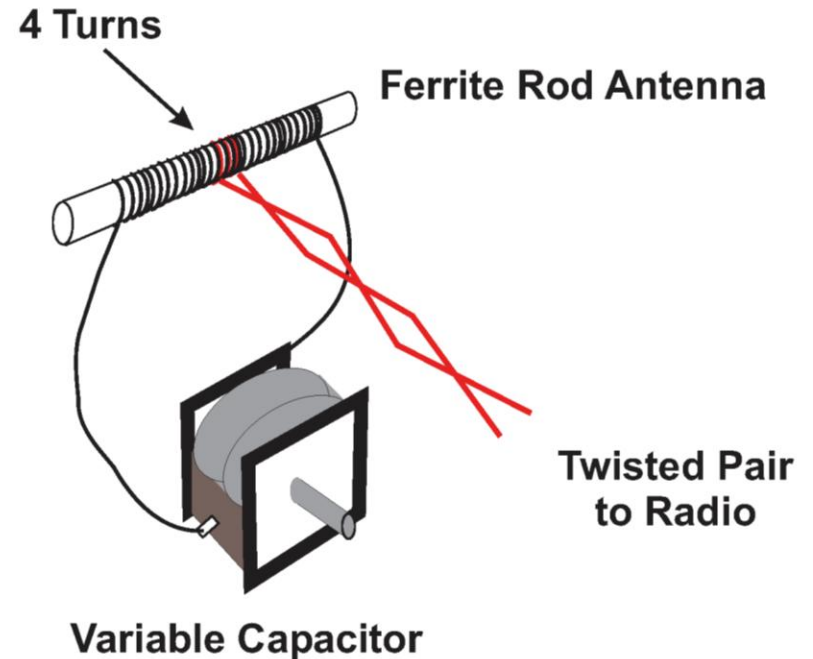


UTT-WILLIAMS AEROLOOP

Homebrew Tuned Loops



Simple Loop Antenna



Use antenna rod and variable cap (approx. 365pF) from 1950's table radio. Wrap four turns of hook-up wire around center of rod. Twist leads (3-6 feet), and attach to antenna and ground terminals of your radio.

www.njarc.ar88.net/LOOP/Easy_loop.pdf

Even a caveman can do it!

OUTDOOR ANTENNAS

Improving the signal to noise ratio

FIG. 30-25.—A typical example of an outdoor aerial installation in which part of the aerial and the entire lead-in and ground leads are in the strong interference zone localized about the building. Since only a small proportion of the antenna system lies in a noise-free zone the signal-to-noise ratio will be low and noisy reception will result.

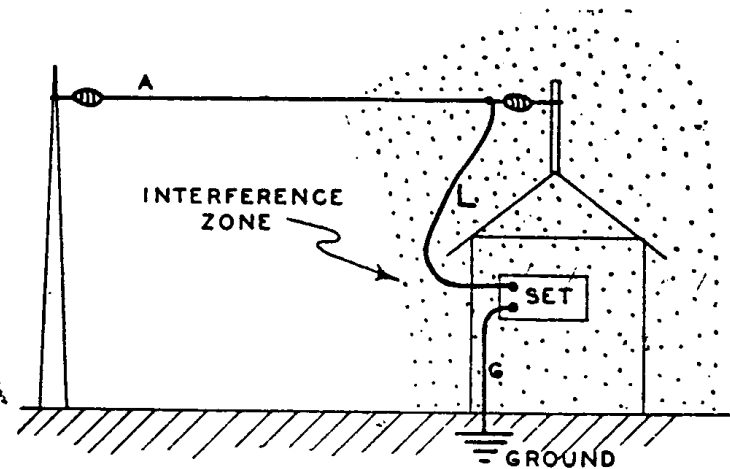
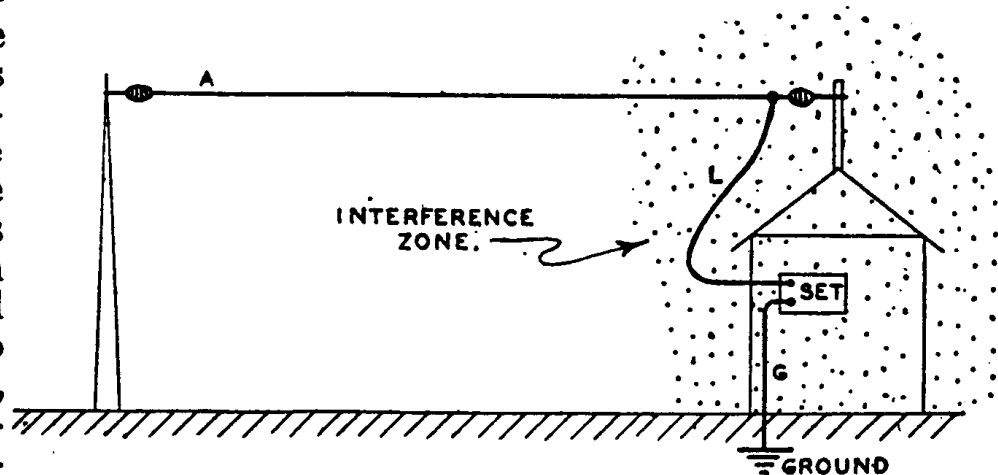


FIG. 30-26. — Lengthening the aerial wire as shown here, often improves the signal - to - noise ratio, for it adds more wire which picks up signal impulses but no noise impulses, since it lies outside of the interference zone.



BASIC INVERTED-L

BY THE BOOK:

#14 antenna wire
8-foot UL ground rod bonded
to electrical service ground.
#8 Aluminum ground wire
3-inch standoffs on lead in.
Approved "discharge device." at
point of entry.
Insulating bushing through wall.

MATERIALS

WIRE

Any wire will work.

#14 stranded, *a la* Radio Shack, is a good bet for permanent installation.

Insulation may help among tree branches.

INSULATORS

Not critical in receiving antennas.

Commercial: glass, plastic, or ceramic.

Homemade: plastic pipe etc.

ROPE

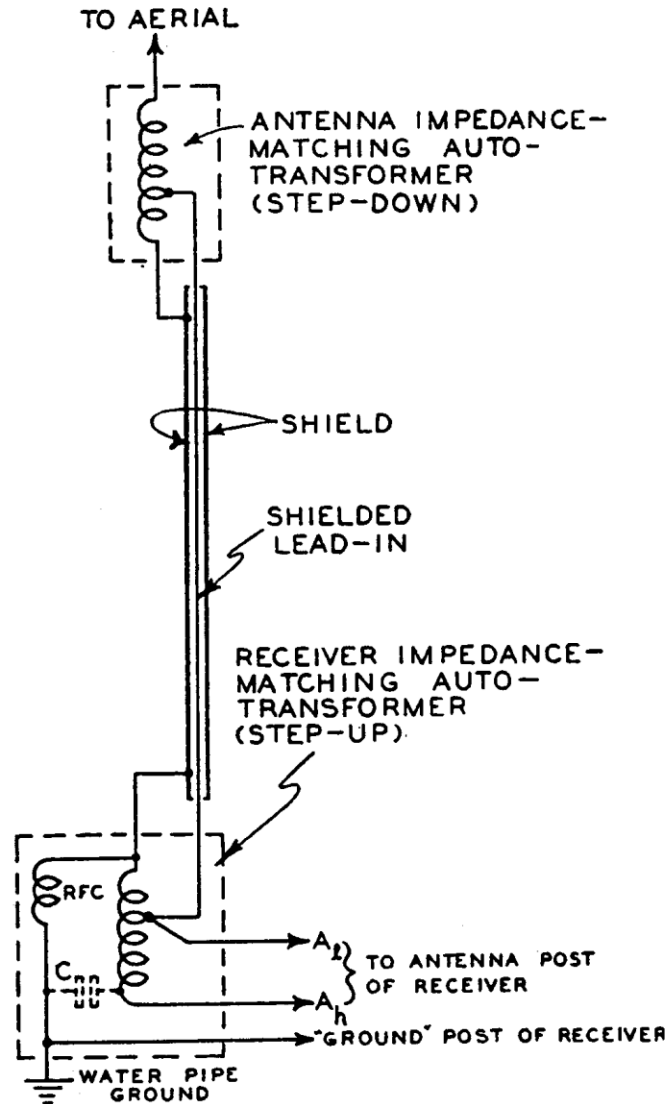
White synthetic rope will come apart in sunlight after a year or two. Look for “antenna rope” or at least pigmented cordage.

***Radio Shack** is a shadow of its former self.

Try these guys: [DX Ebngineering](#)

RANDOM WIRE

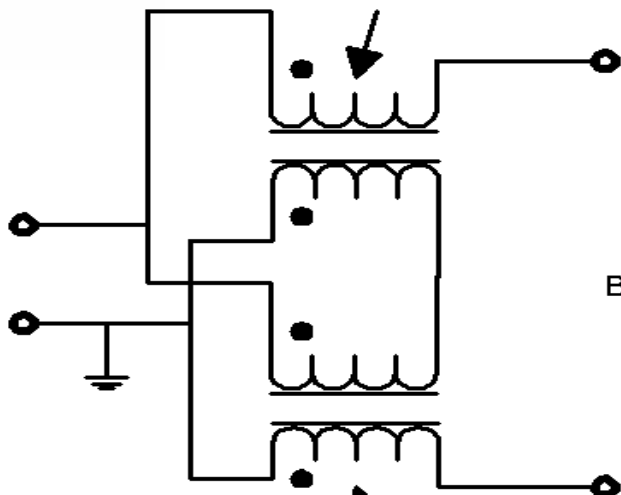
With shielded lead in and matching transformer



DIY Broadband Transformers



5 BIFILAR TURNS
IN ONE APATEUR OF
BN-43-202 CORE

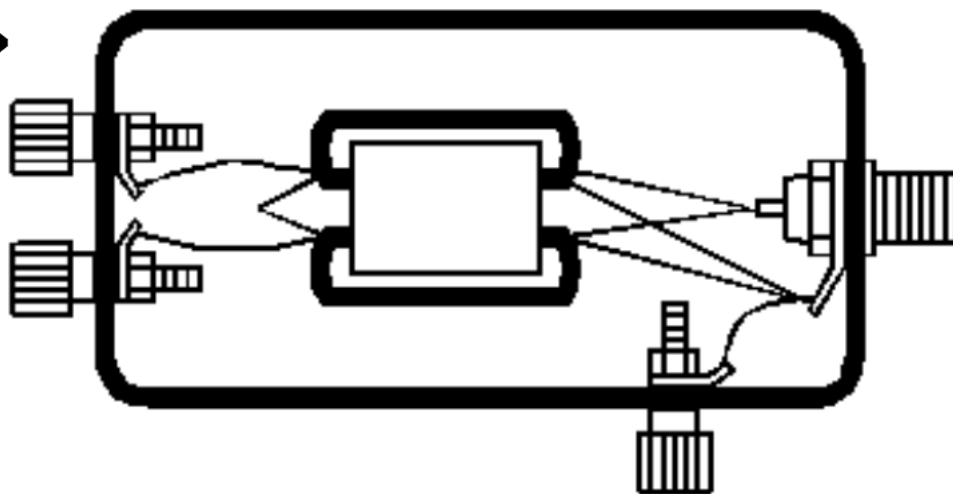
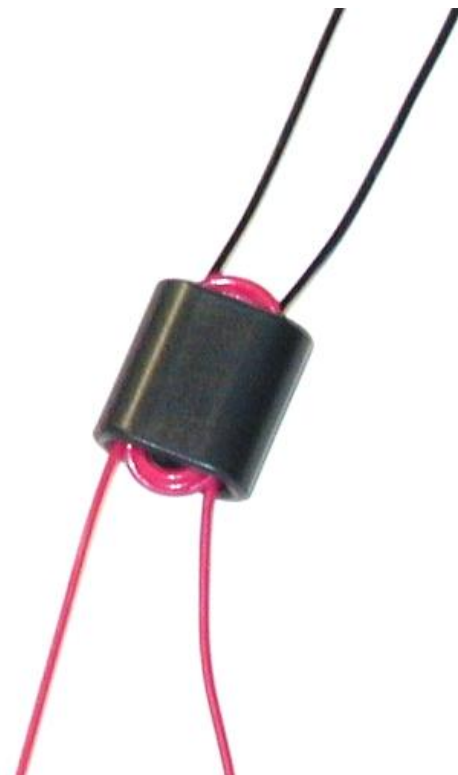


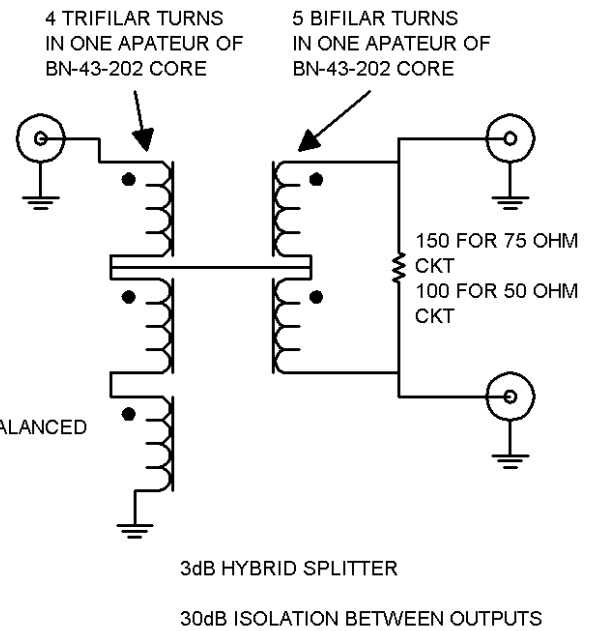
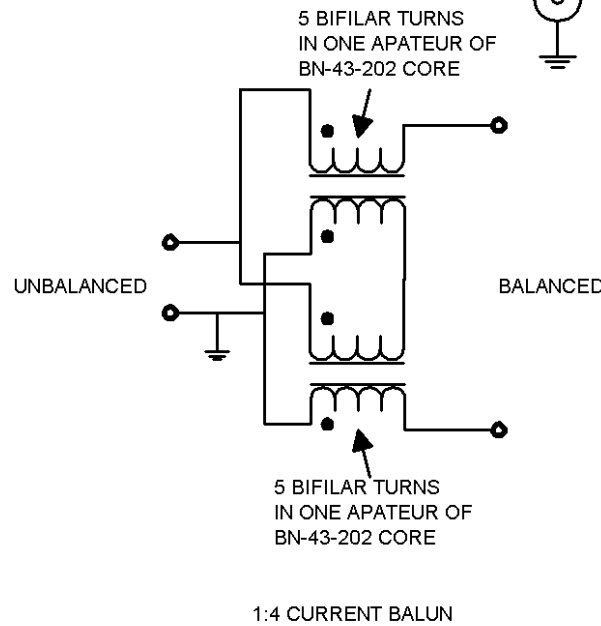
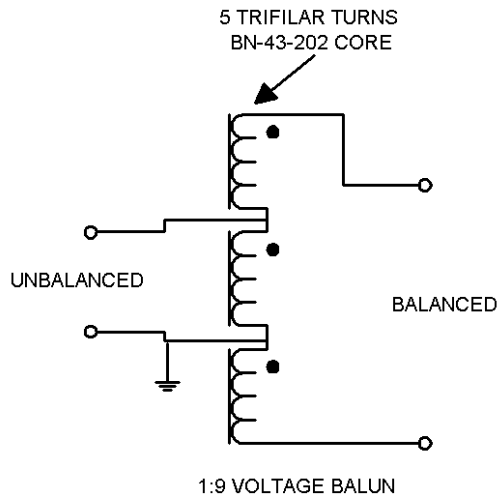
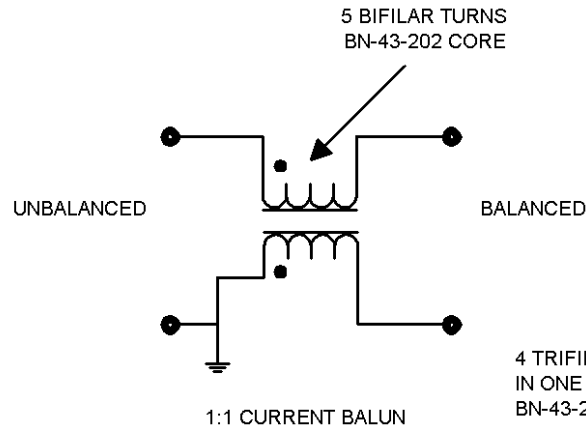
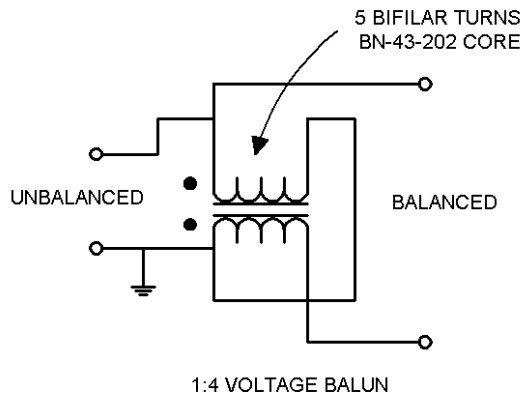
UNBALANCED

BALANCED

5 BIFILAR TURNS
IN ONE APATEUR OF
BN-43-202 CORE

1:4 CURRENT BALUN

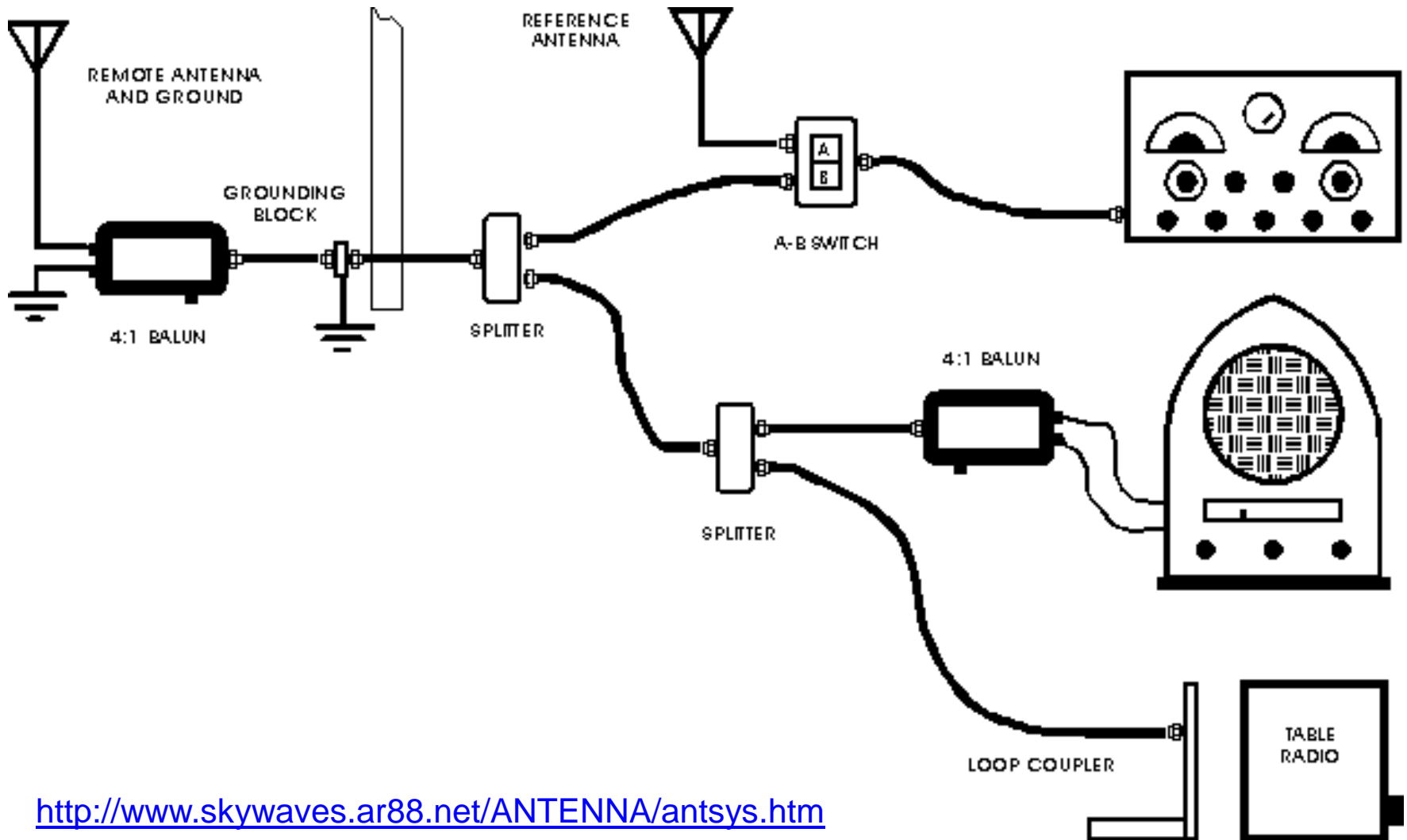




FREQUENCY RANGE OF ALL TRANSFORMERS
APPROXIMATELY 100kHz TO 30MHz

N3FRQ Broad-Band Transformers

Antenna System



<http://www.skywaves.ar88.net/ANTENNA/antsys.htm>

The Doublet Antenna

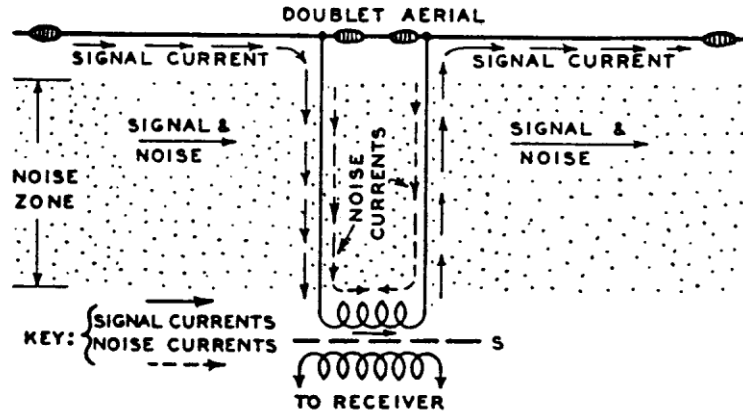


FIG. 30-46. — How the noise voltages induced in a parallel-feeder lead-in are cancelled out in the primary impedance-matching transformer. The signal voltages induced in the two halves of the doublet are additive.

- Two random wires balanced above ground.
- Noise picked up by the feedline is cancelled out.
- Performance drops off drastically below the half-wave resonate frequency.
- Great for Short Wave.
- No very good for BCB.

THE DOUBLE DOUBLET / TEE

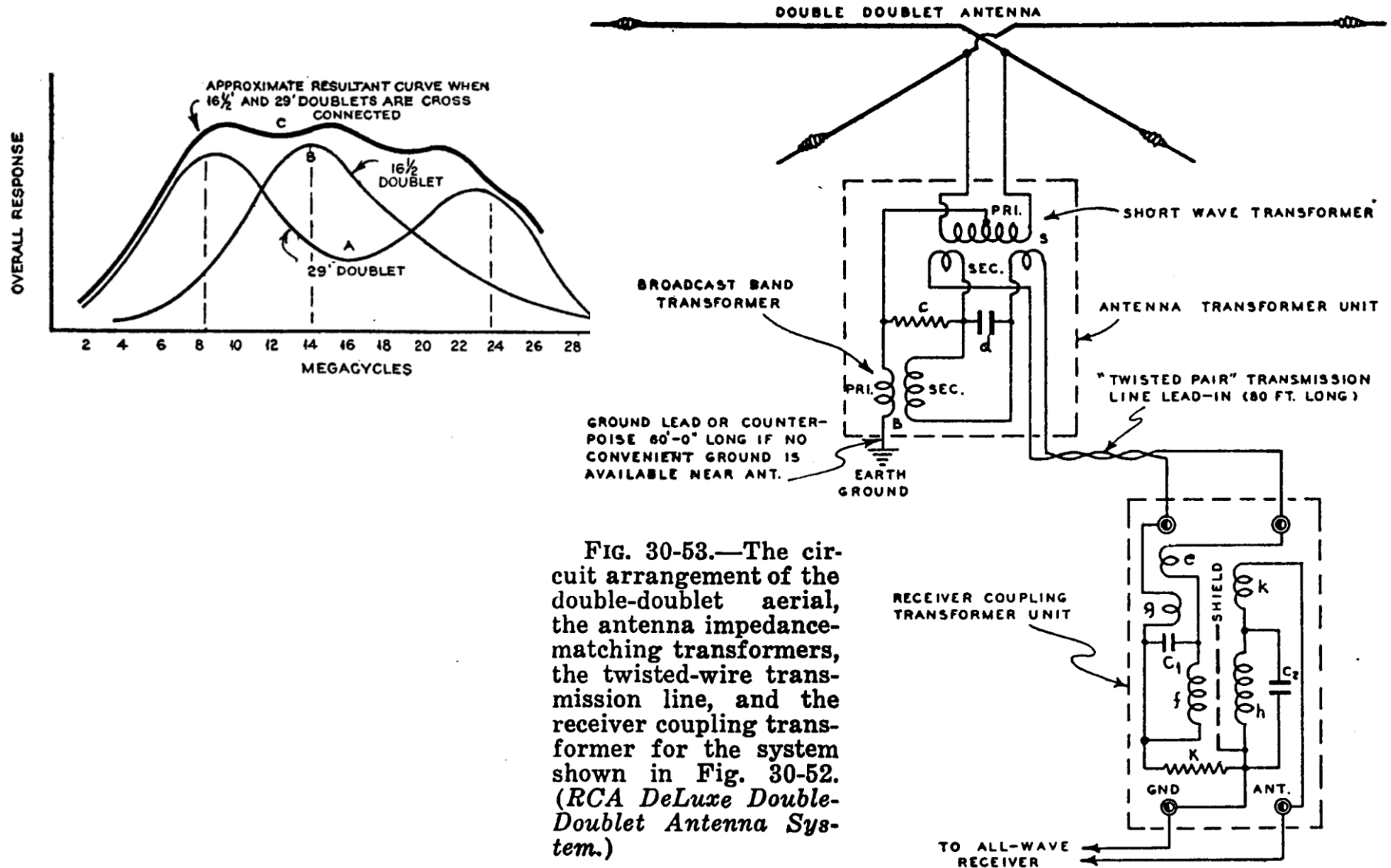
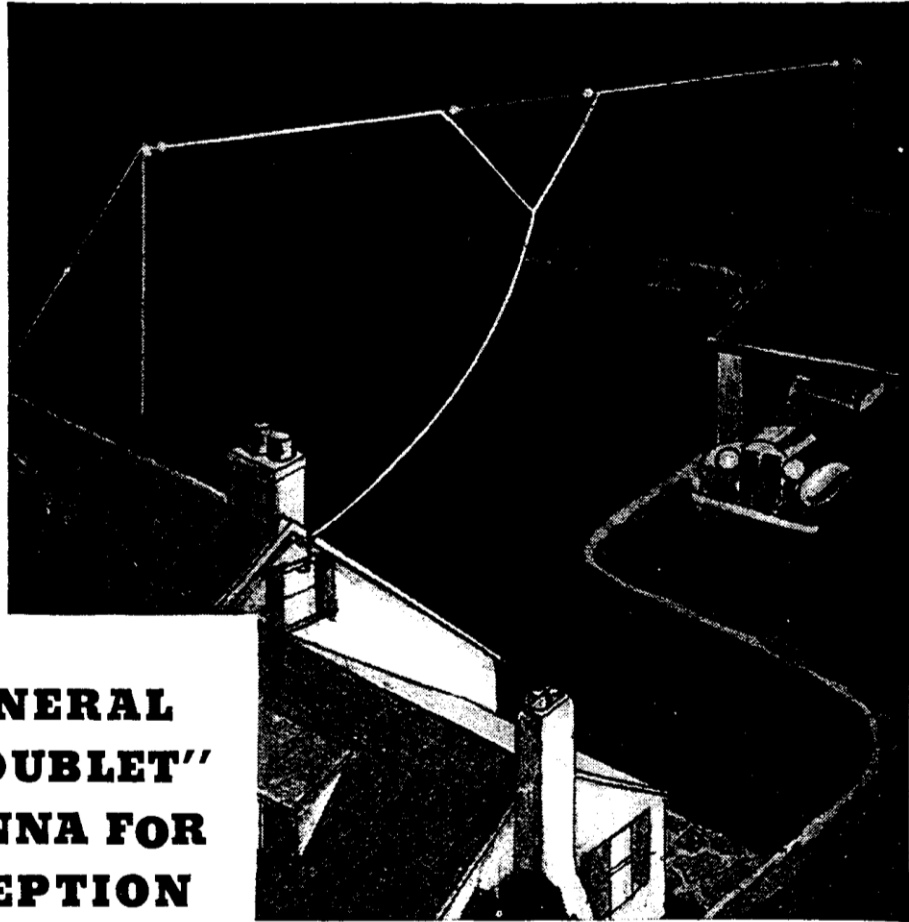


FIG. 30-53.—The circuit arrangement of the double-doublet aerial, the antenna impedance-matching transformers, the twisted-wire transmission line, and the receiver coupling transformer for the system shown in Fig. 30-52. (RCA DeLuxe Double-Doublet Antenna System.)

GENERAL ELECTRIC V-DOUBLET



**INSTALL A GENERAL
ELECTRIC "V-DOUBLET"
ALL-WAVE ANTENNA FOR
SUPERIOR RECEPTION**

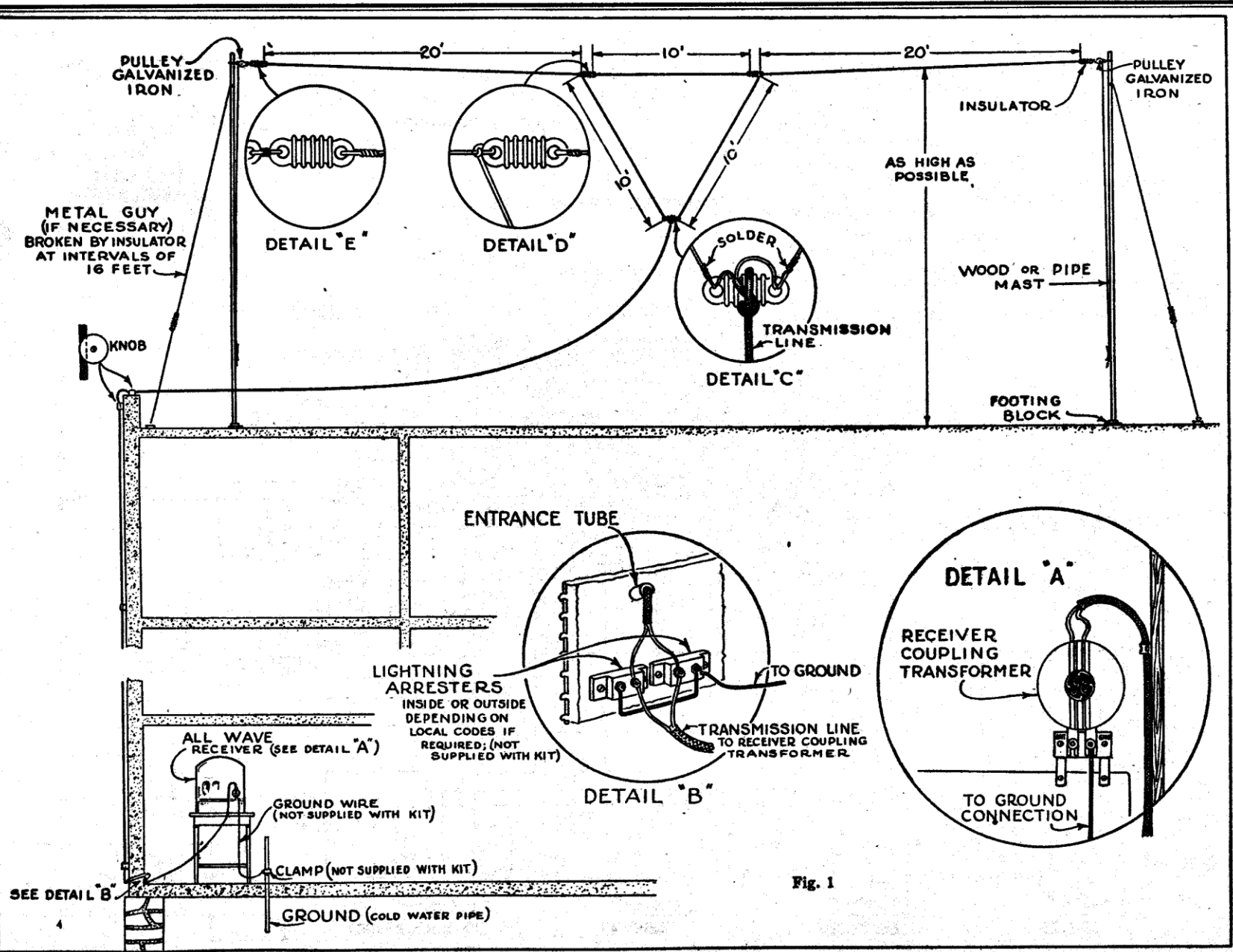
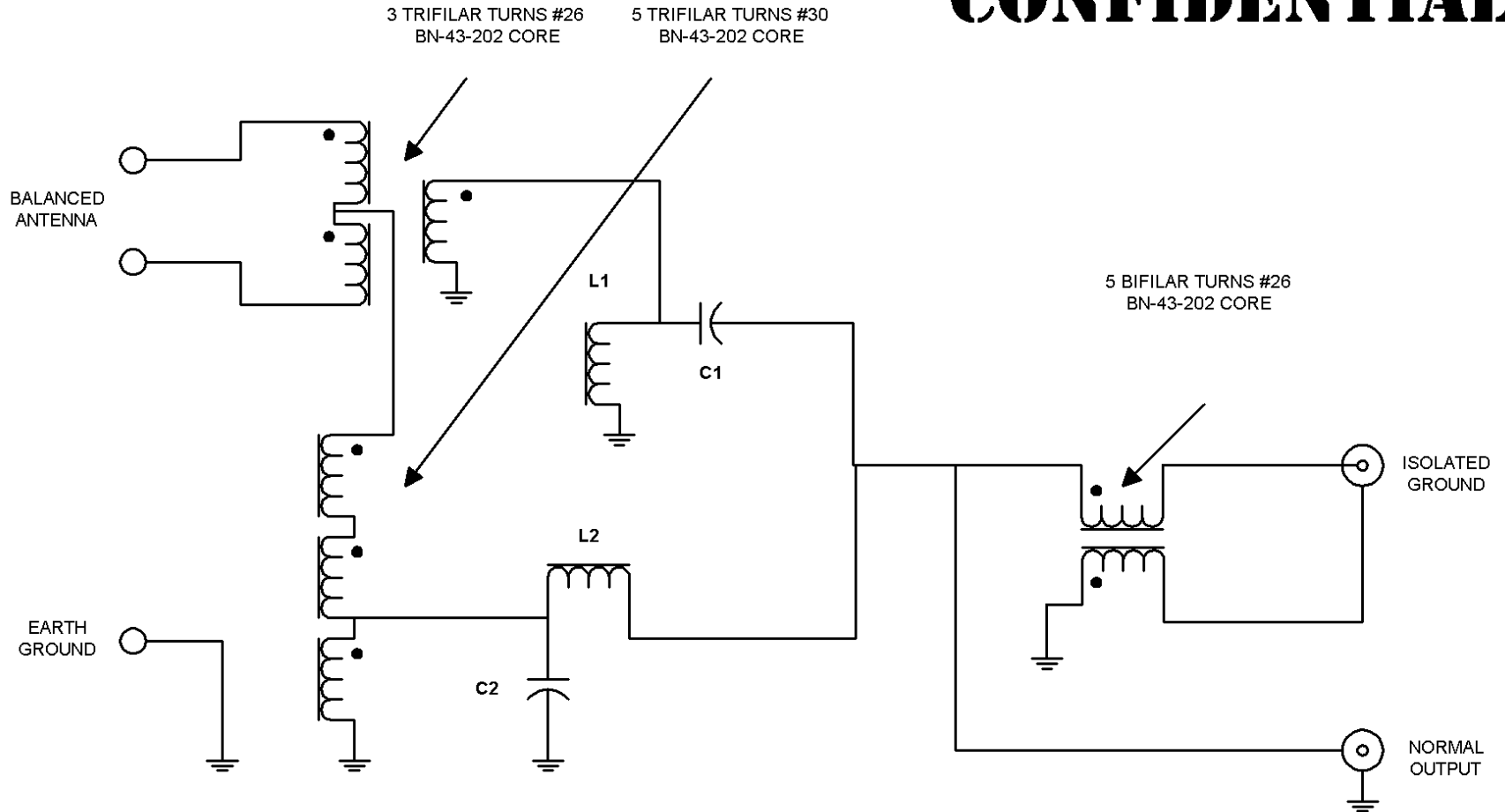


Fig. 1

CONFIDENTIAL



X-OVER	C1	L1	C2	L2
2.7 MHz	470 pF	6.8 uH	750 pF	4.7 uH
5.5 MHz	250 pF	3.3 uH	390 pF	2.0 uH

CONFIDENTIAL

Skywaves Antenna Coupler

AI Klase - 2 May 06

Probe Antennas

- Use a small antenna, in an advantageous position, to capture a small sample of the desired signal.
- Make up the difference with a wide-band amplifier before the receiver.
- Loops: Sample the magnetic field.
- Whips: Sample the electrical field.



Commercial Active Whip

Universal Radio
NTi GA3005
Wideband Antenna
Order #1343
List Price: \$495.00
Your Price: **\$399.95**



Homebrew
Instructions

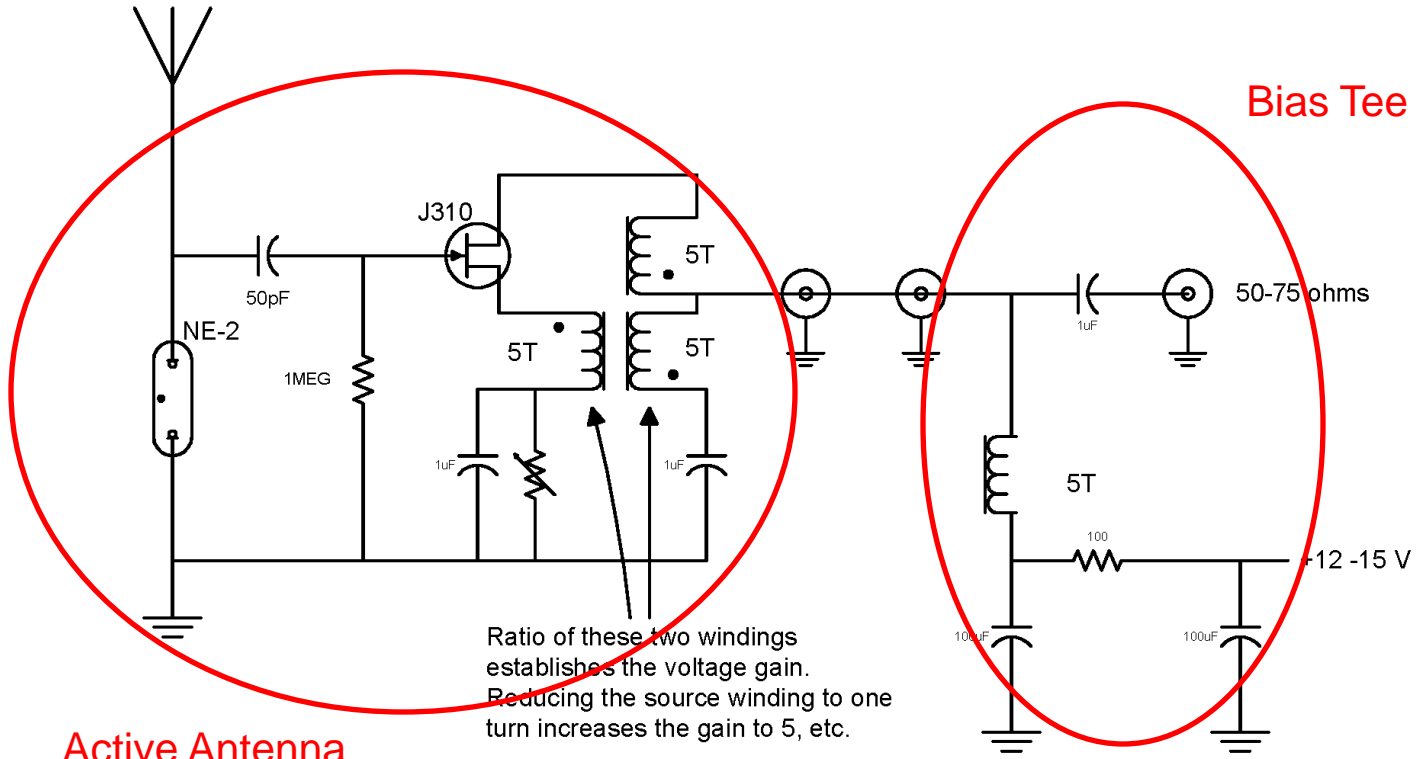


Roelof Bakker, PA0RDT

http://www.kiwisdr.com/docs/pa0rdt_whip.pdf

\$42 – Ebay – F/Ukraine

N3FRQ Active Antenna



Active Antenna

Bias Tee

Ratio of these two windings establishes the voltage gain. Reducing the source winding to one turn increases the gain to 5, etc.

Use unity gain with 8' whip.

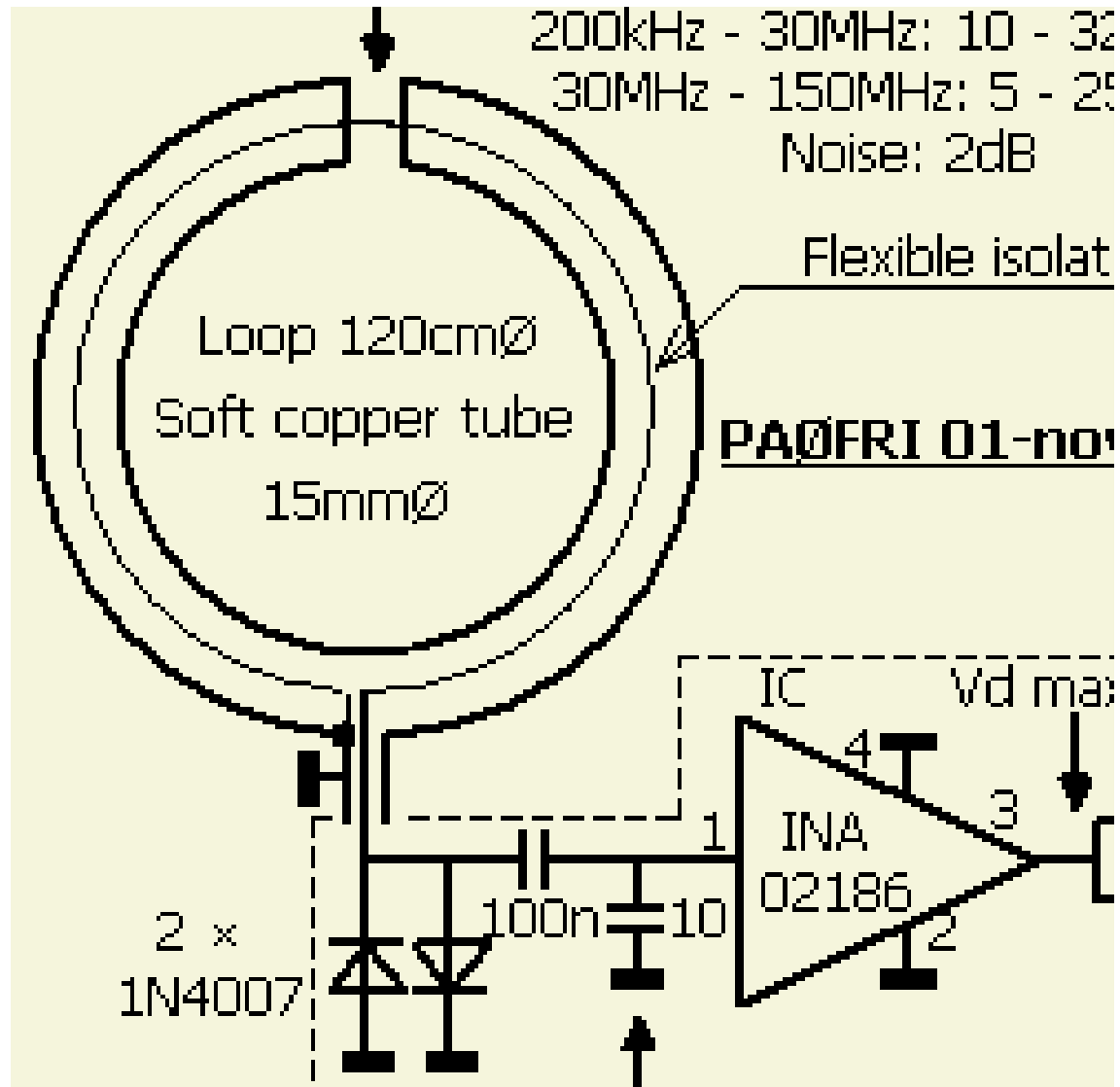
All cores Amidon BN-43-202

Adjust source resistor for 25mA. (2.5V across the 100-ohm resistor in the power feed.)

Frequency range approx. 100Khz to 30MHz.

N3FRQ Active Antenna
AI Klase - 13 Jun 05

Untuned Shielded Active Loop



Commercial Active Loops

- DX Engineering - RF-PRO-1B - \$500



- Wellbrook ALA 1530 – £264



- W6LVP active loop - \$250
- Experimenter's Kit - \$160

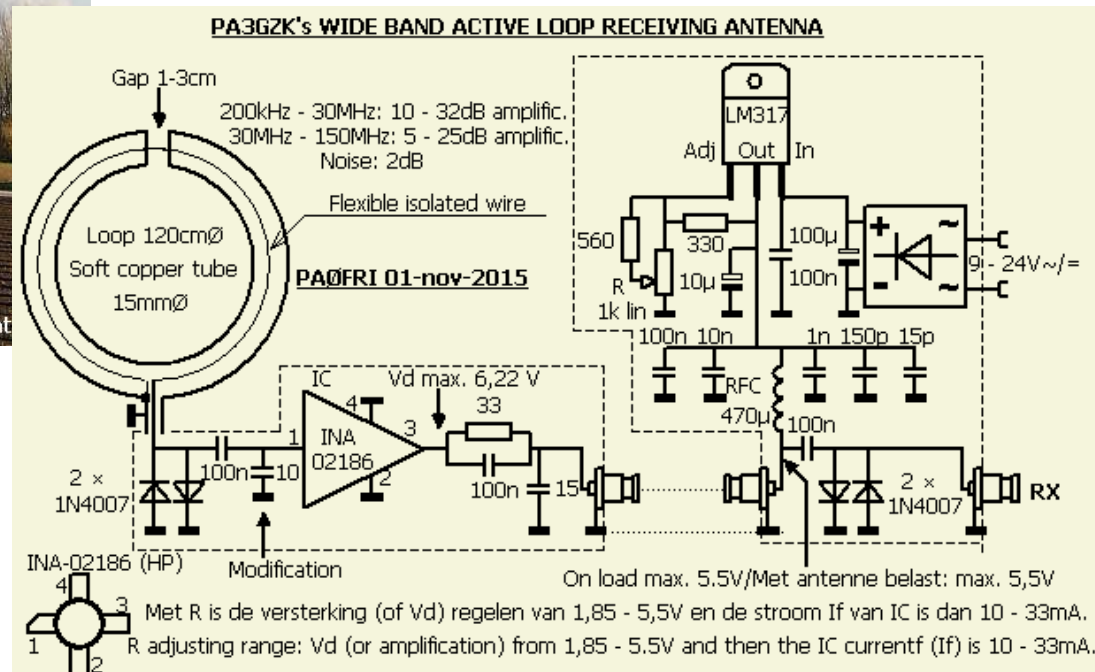
<https://www.w6lvp.com/>



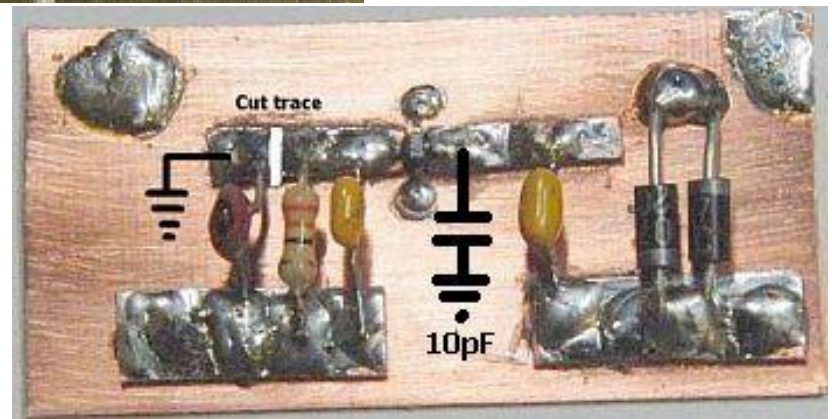
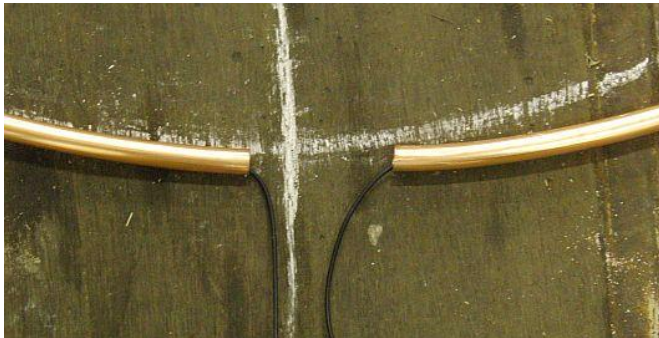
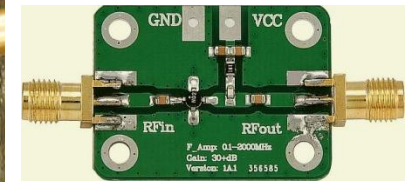
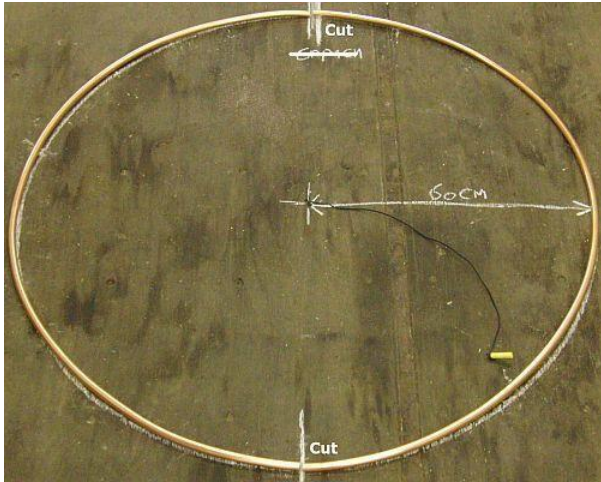
Homebrew - PA3GZK



[PA3GZK Loop Instructions - English](#)



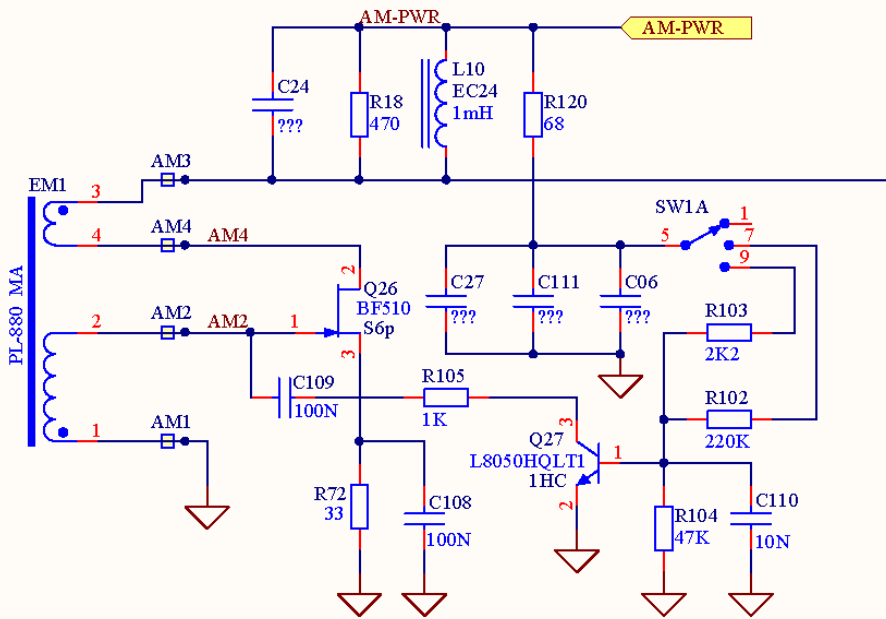
Homebrew - PA3GZK



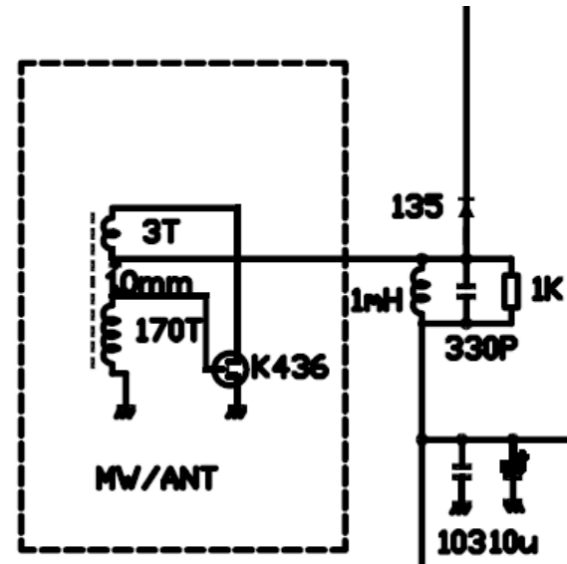
<https://pa0fri.home.xs4all.nl/Ant/Active%20antenna/Active%20receiving%20%20loop%20antenna%20eng.htm>

Bleeding-Edge Technology

- Active Ferrite Loop Antenna
- Modern portable radios use untuned ferrite-rod antennas.

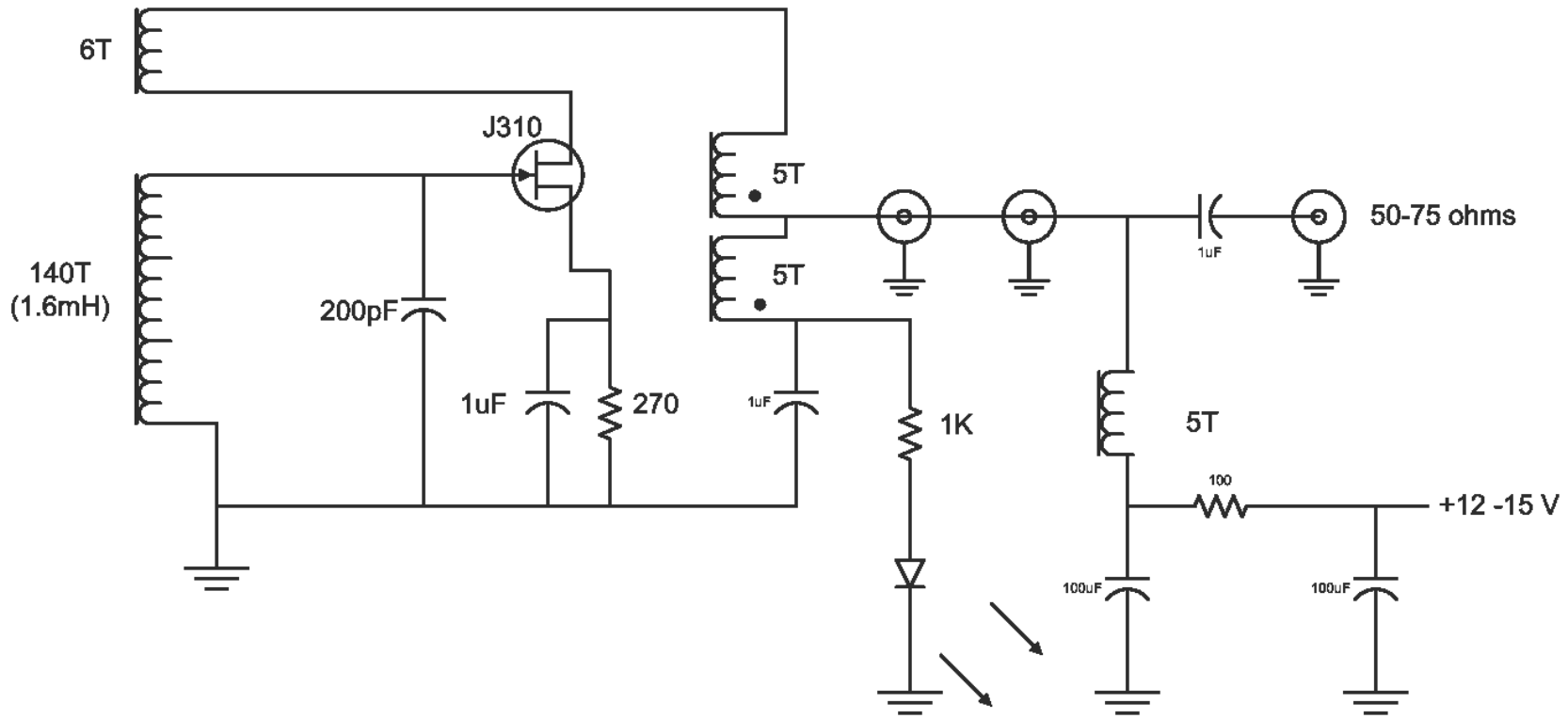


Tecsun PL-880



Tecsun PL-660

N3FRQ Active Ferrite Loop



Adjust source resistor for 25mA.
(2.5V across the 100-ohm resistor in
the power feed.)

Let Your Radio Play!

