

# **Practical Antenna Systems for the Radio Collector**

Beyond Wire Antennas

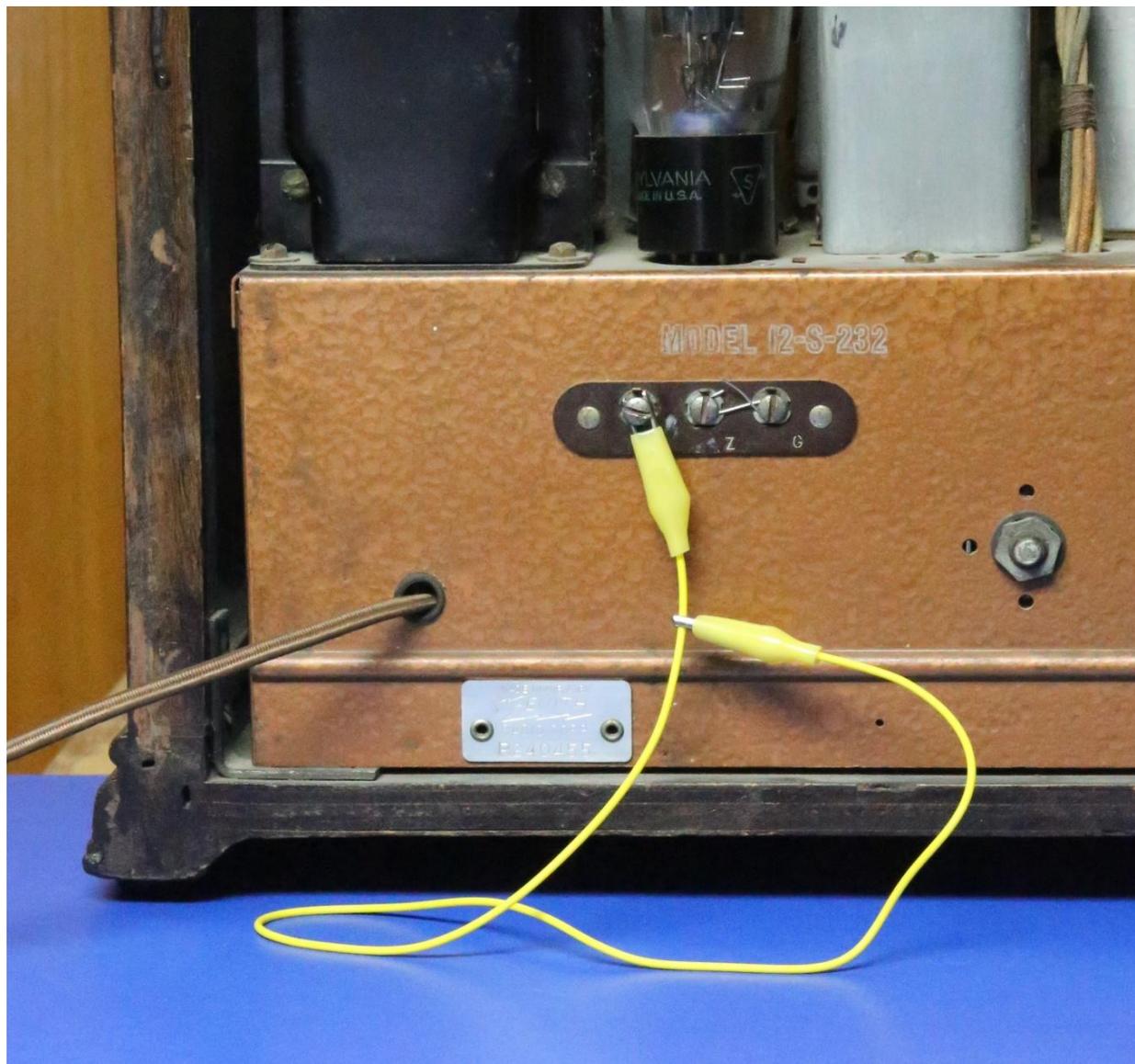
AI Klase – NJARC

10 Aug 2018

# Your Dream Radio



# Your Antenna

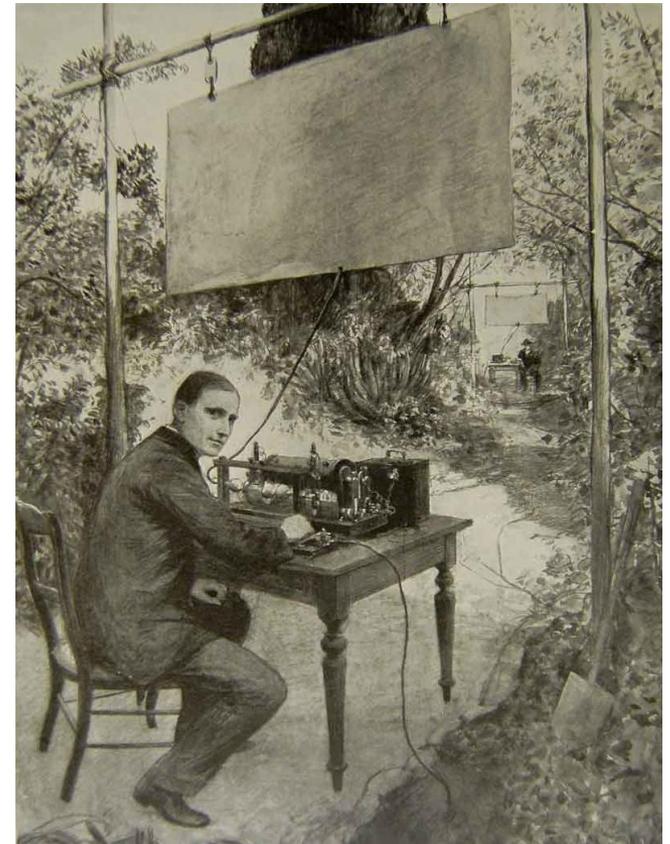
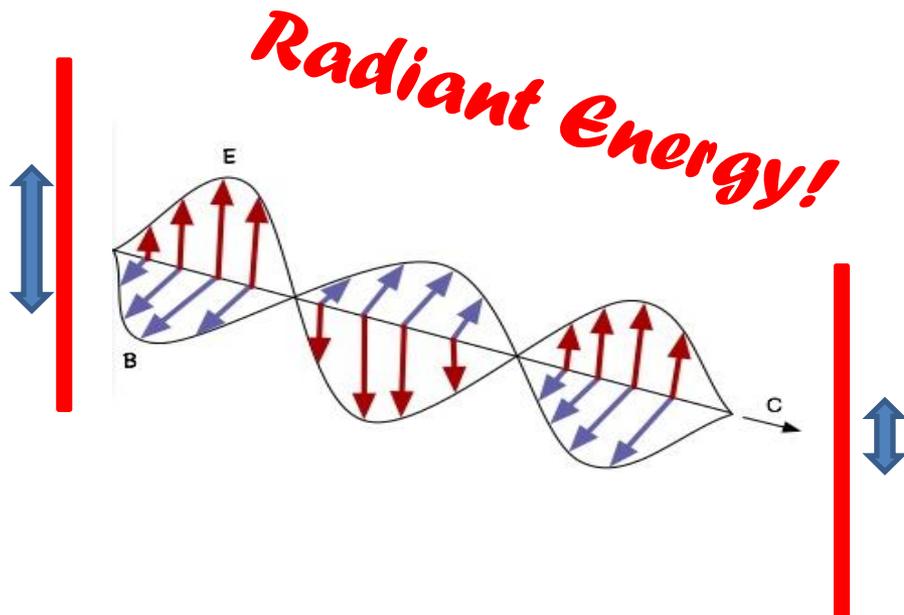


# Why?

- 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



# **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



# An Indoor Antenna

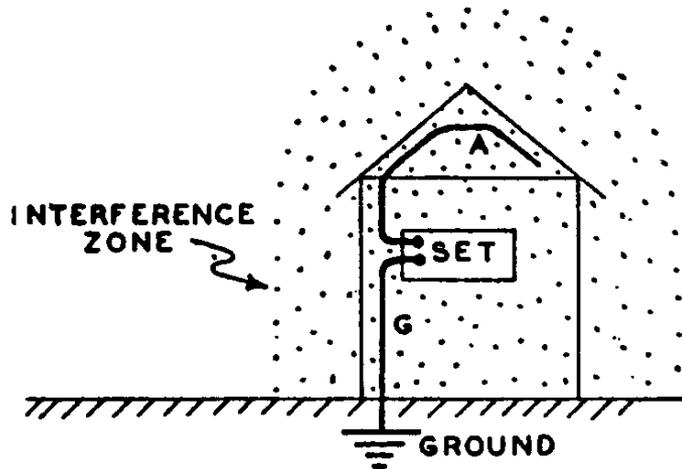
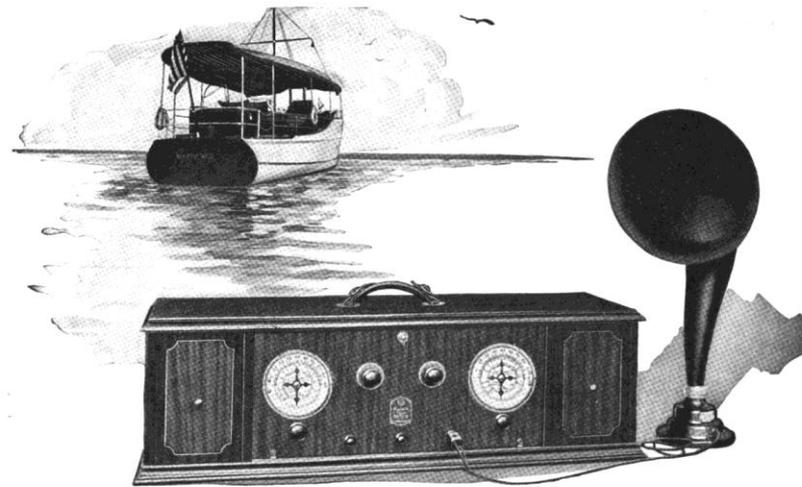
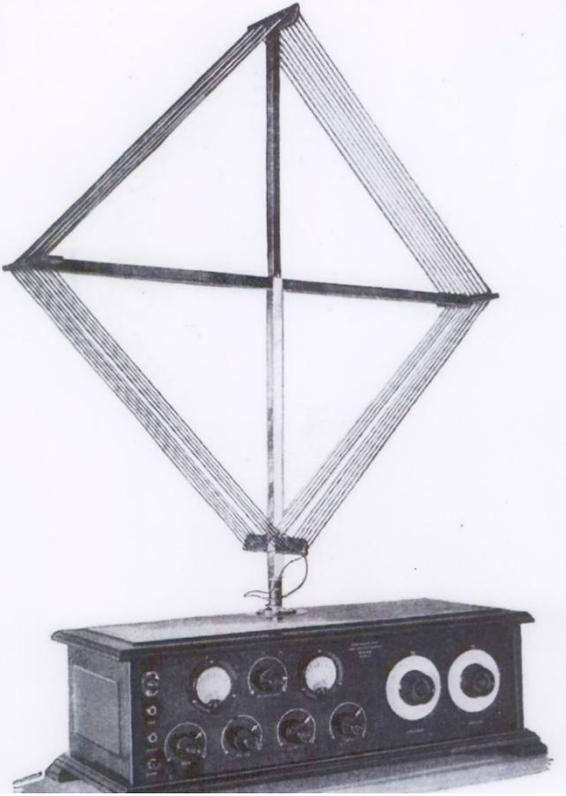


FIG. 30-24.—A typical example of an indoor aerial installed in a location full of interference. Both the indoor aerial, the lead-in and the ground wires run right through the strong interference zone and all of them pick up the disturbances. Noisy reception is bound to result.

# 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.

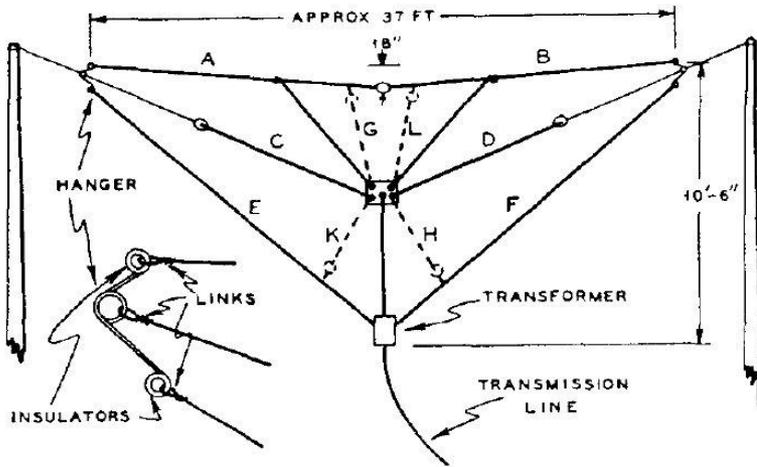


Take It Aboard

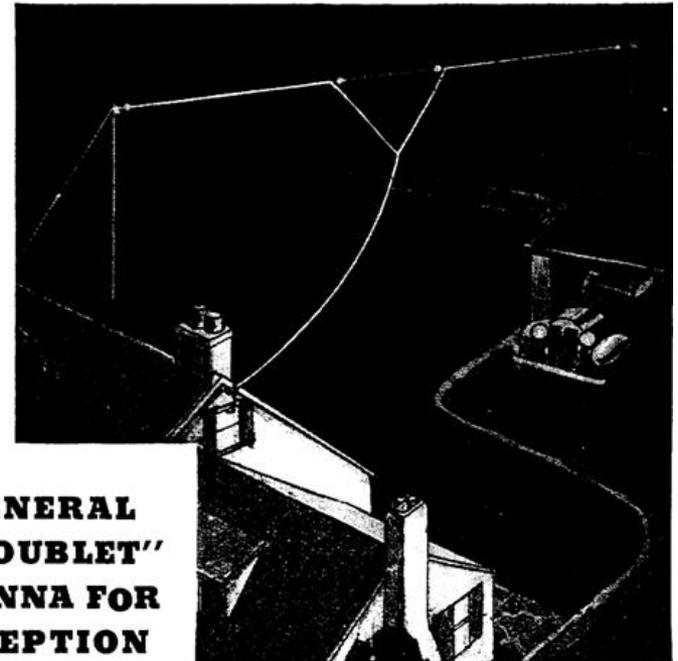
# So, why don't we see many loops between 1930 and 1940?

- **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

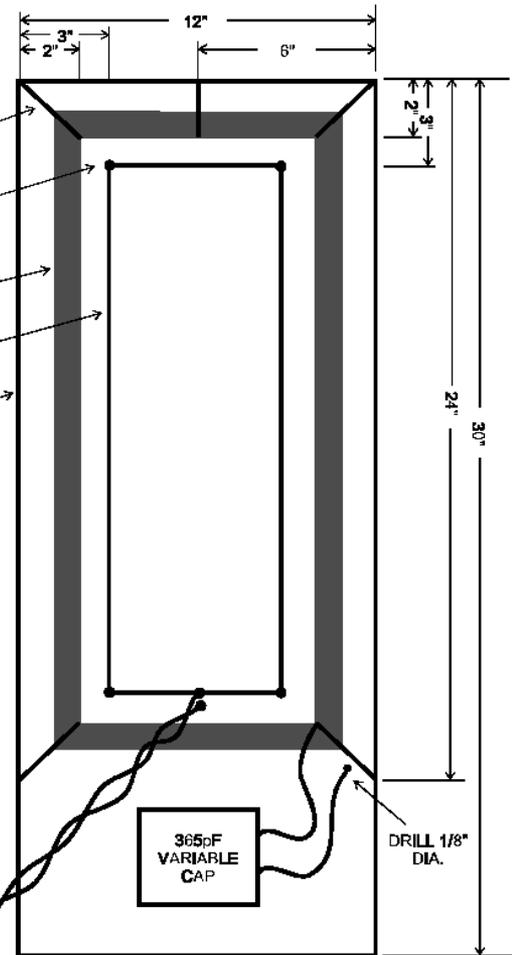
## SkyWaves Basic BCB Loop Antenna

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.

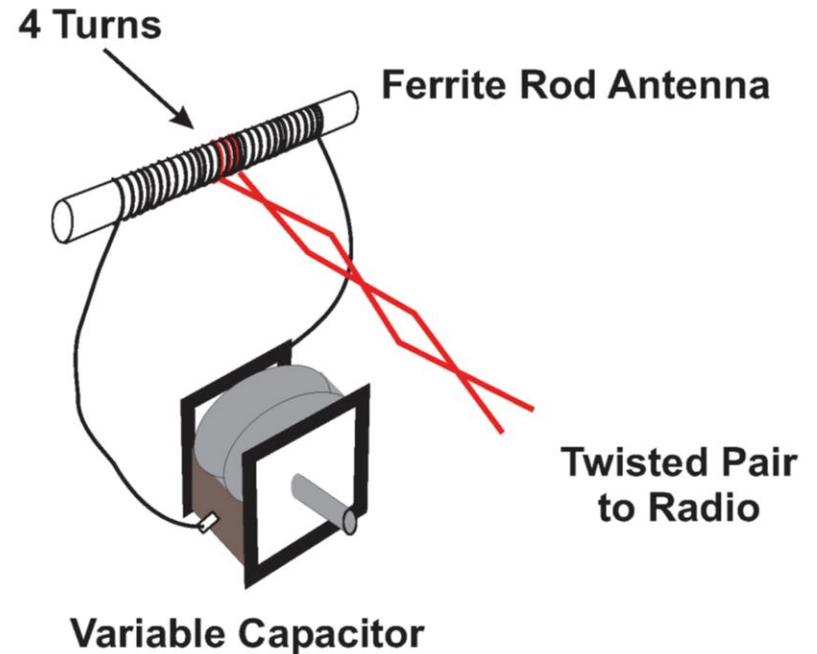


UTT-WILLIAMS AEROLOOP

# 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.

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.

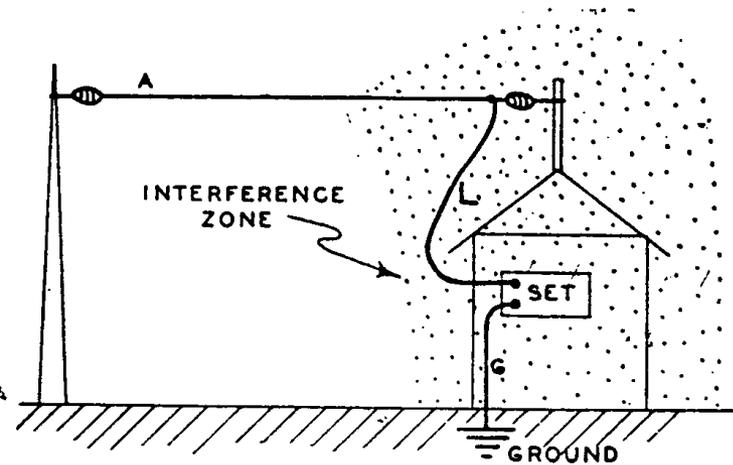
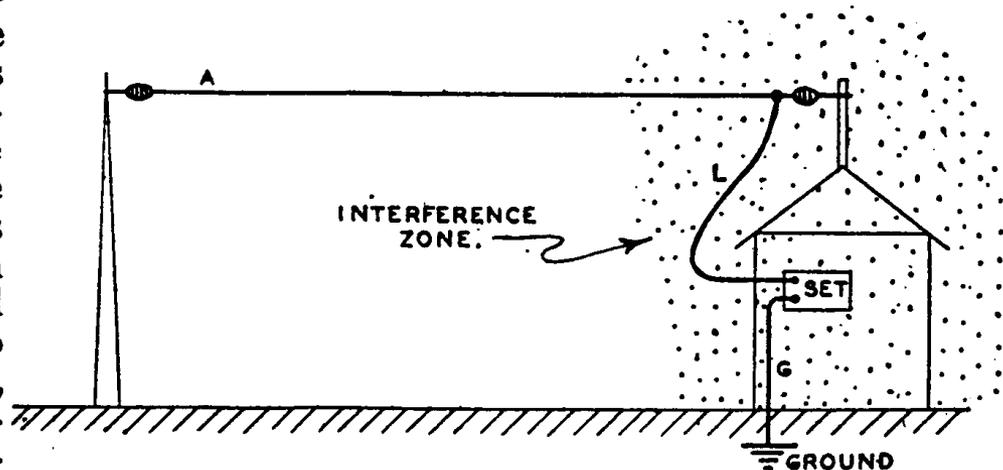
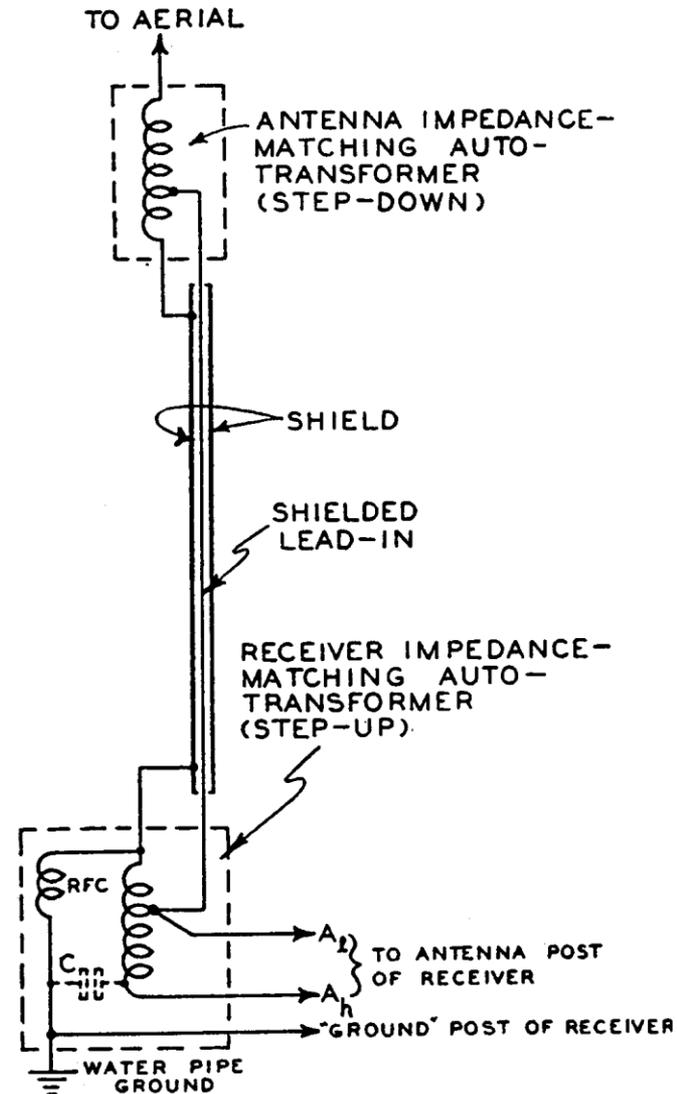


FIG. 30-26. — Lengthening the aerial wire as shown here, often improves the signal - to - noise ratio, for it adds more wire which picks up signal impulses but no noise impulses, since it lies outside of the interference zone.



# RANDOM WIRE

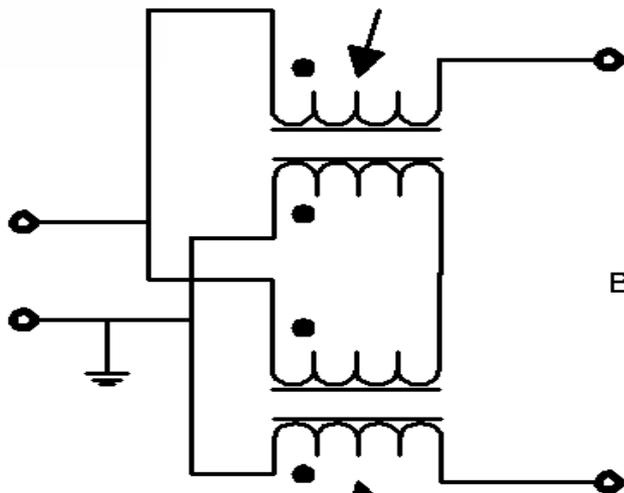
With shielded lead in and matching transformer



# DIY Broadband Transformers



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

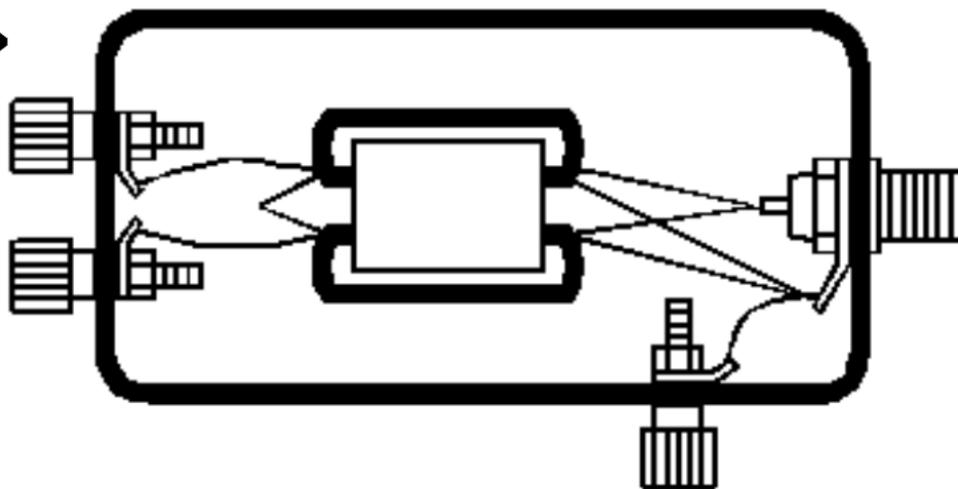
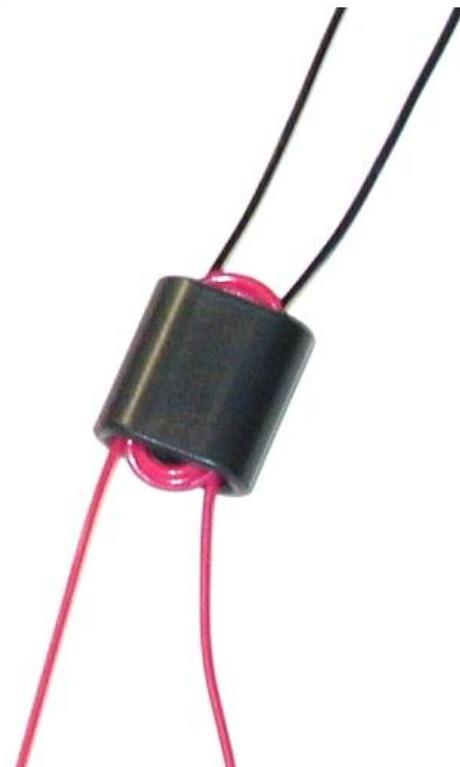


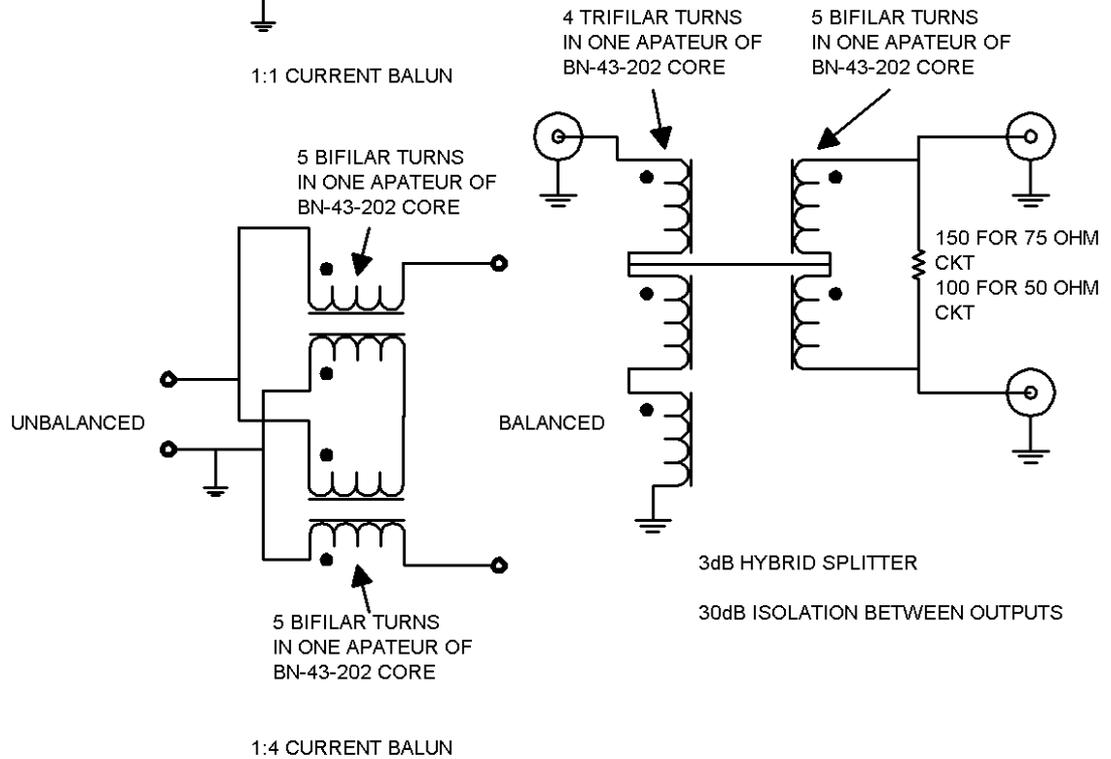
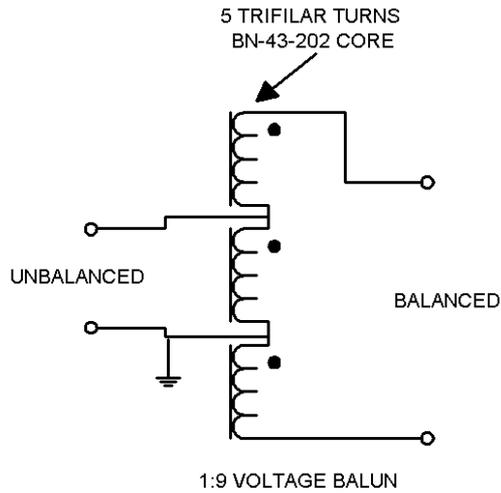
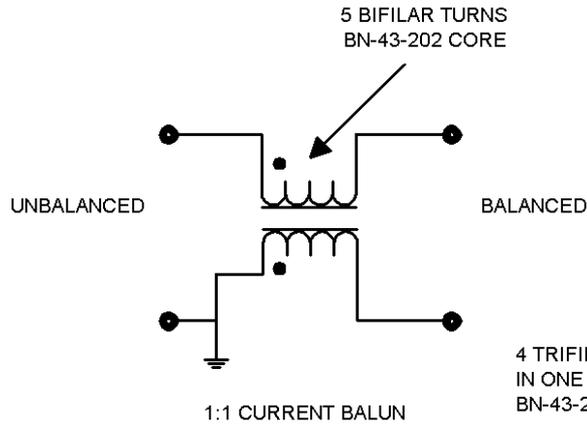
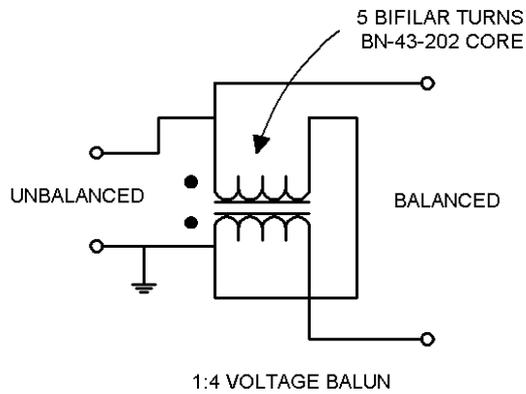
UNBALANCED

BALANCED

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

1:4 CURRENT BALUN



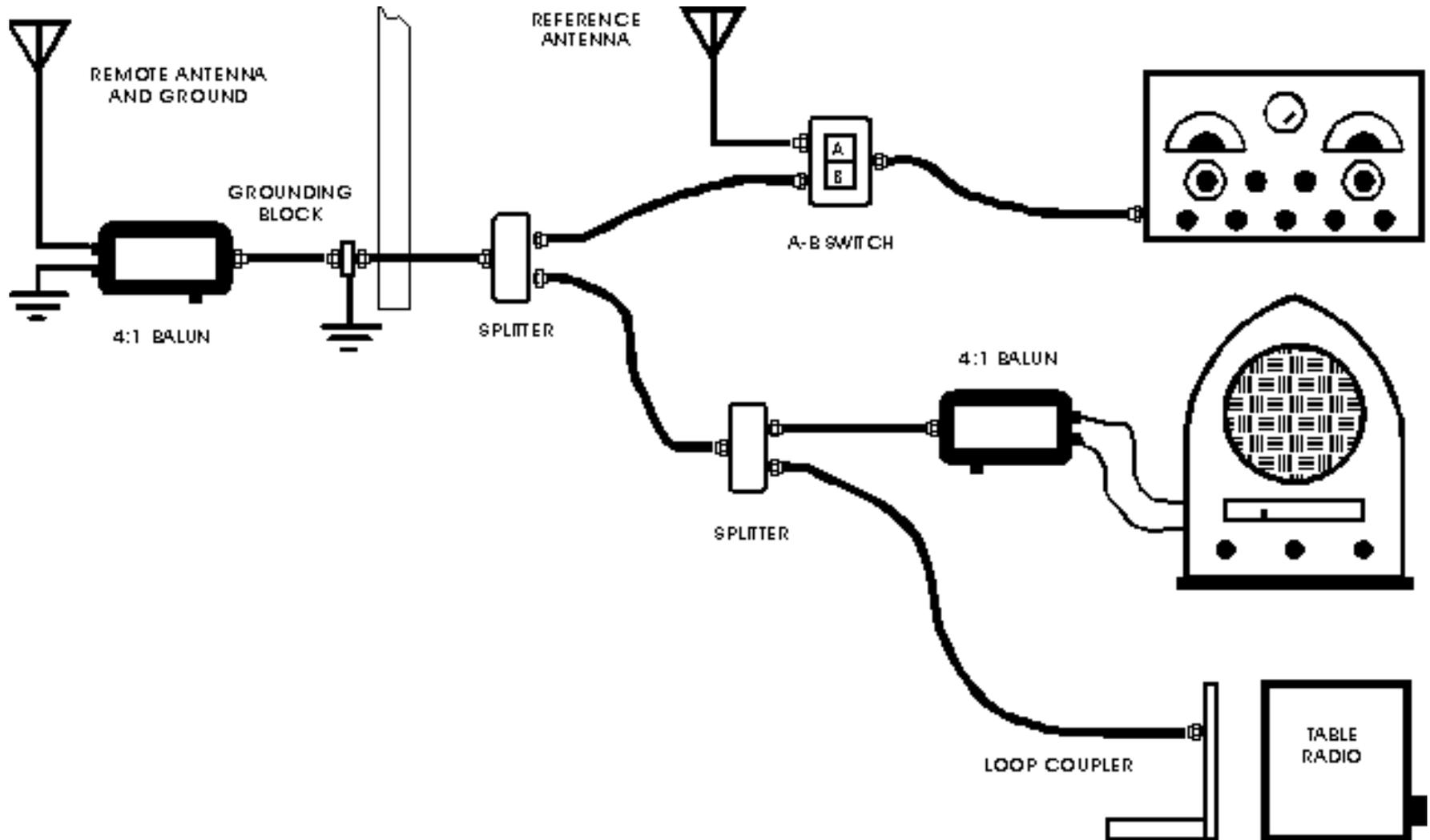


FREQUENCY RANGE OF ALL TRANSFORMERS  
APPROXIMATELY 100kHz TO 30MHZ

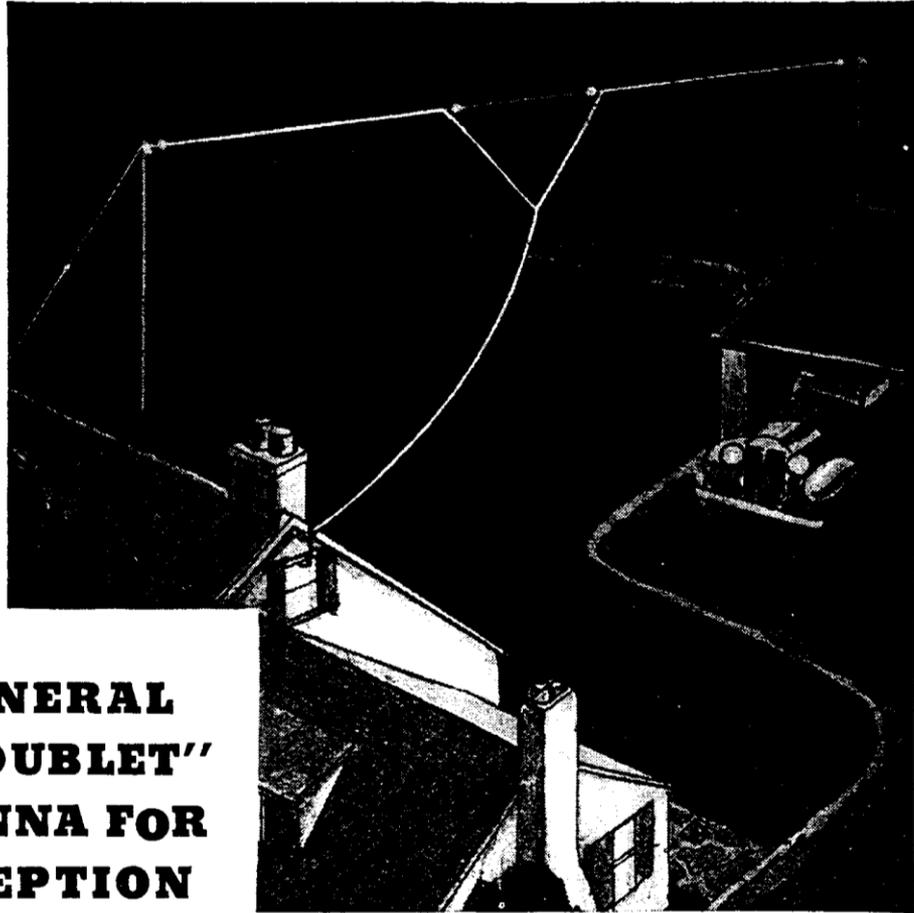
N3FRQ Broad-Band Transformers

AI Klase - 13 Jun 05

# Antenna System



# GENERAL ELECTRIC V-DOUBLET



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

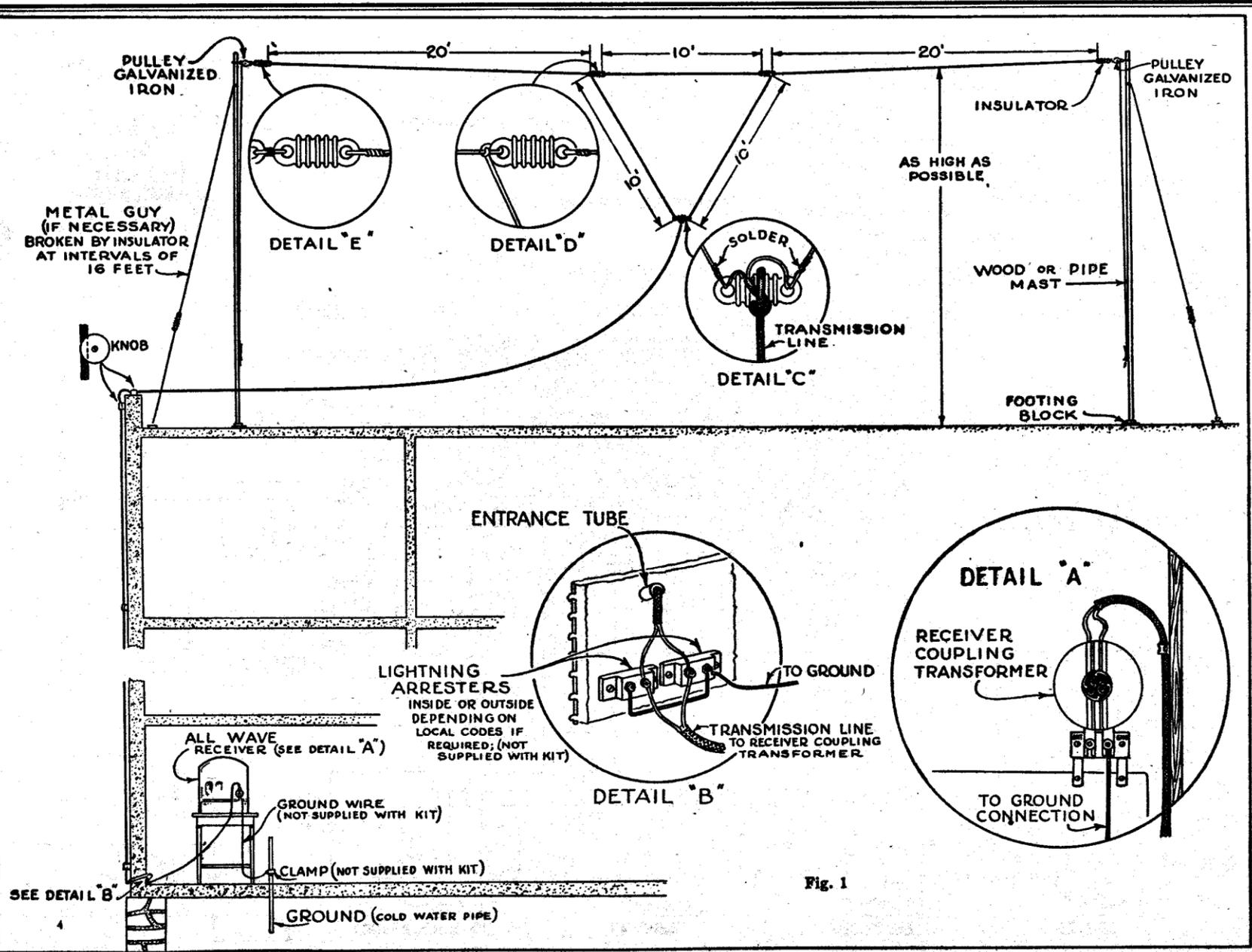
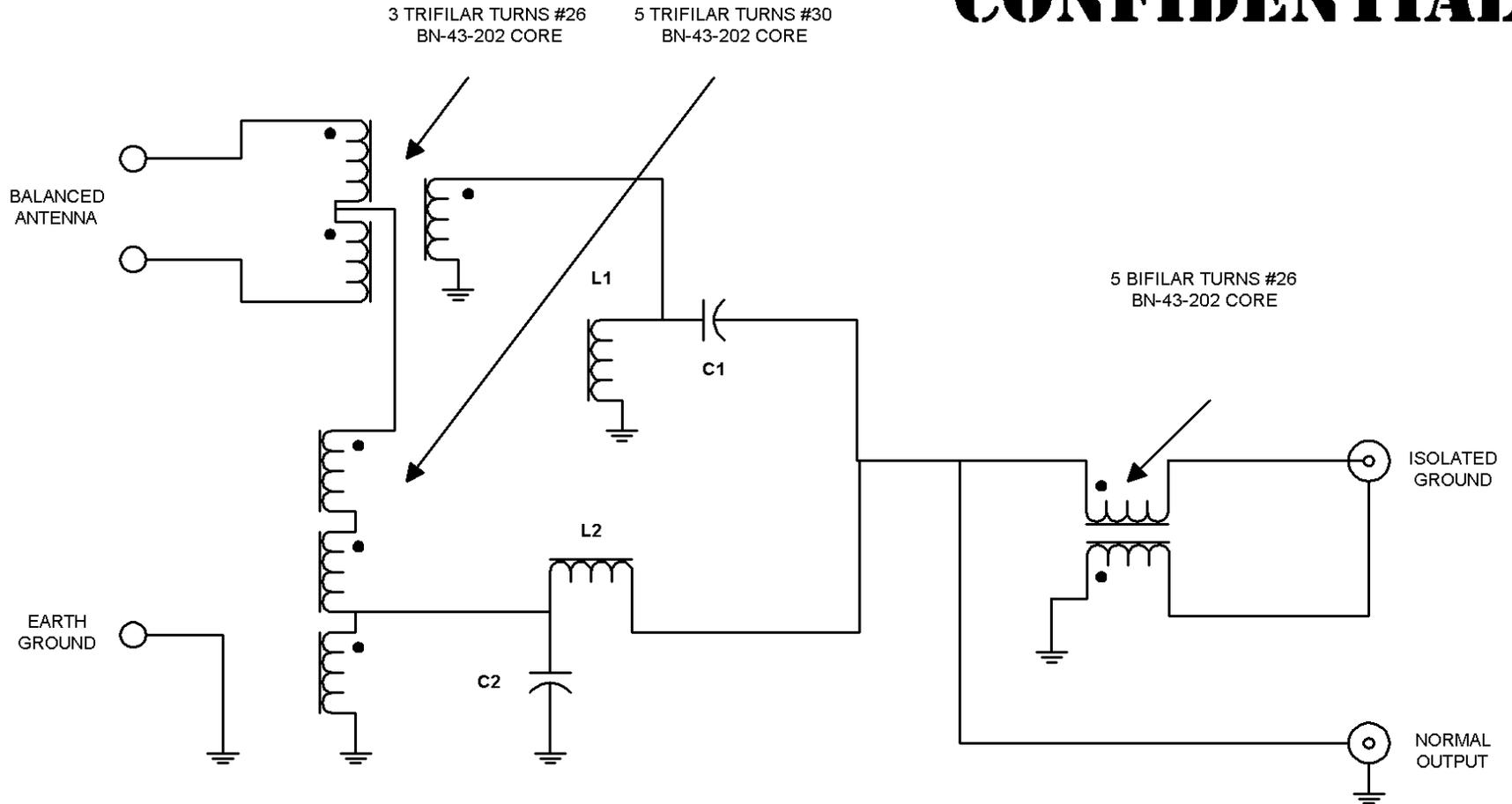


Fig. 1

# 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

Al 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**

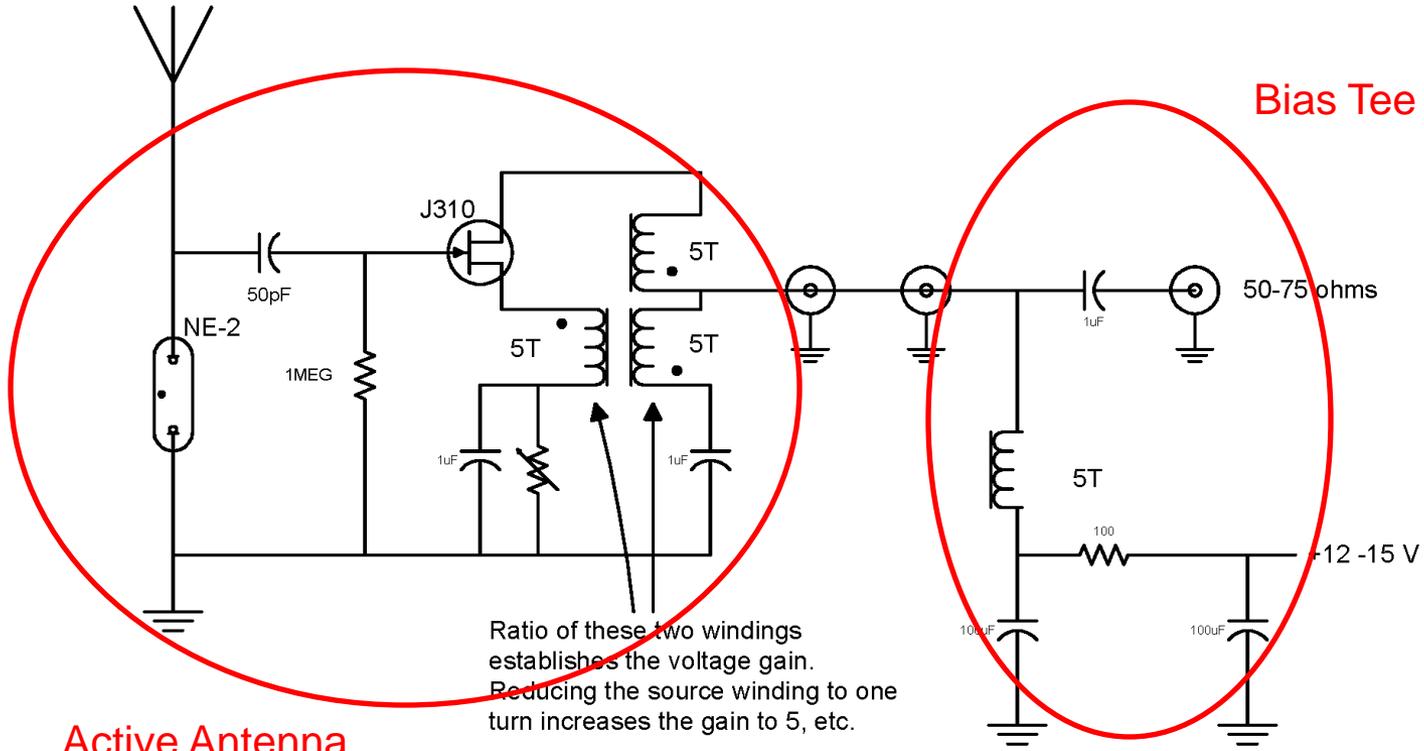


**\$42 – Ebay – F/Ukraine**

Roelof Bakker, PA0RDT

[http://www.kiwisdr.com/docs/pa0rdt\\_whip.pdf](http://www.kiwisdr.com/docs/pa0rdt_whip.pdf)

# N3FRQ Active Antenna



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.

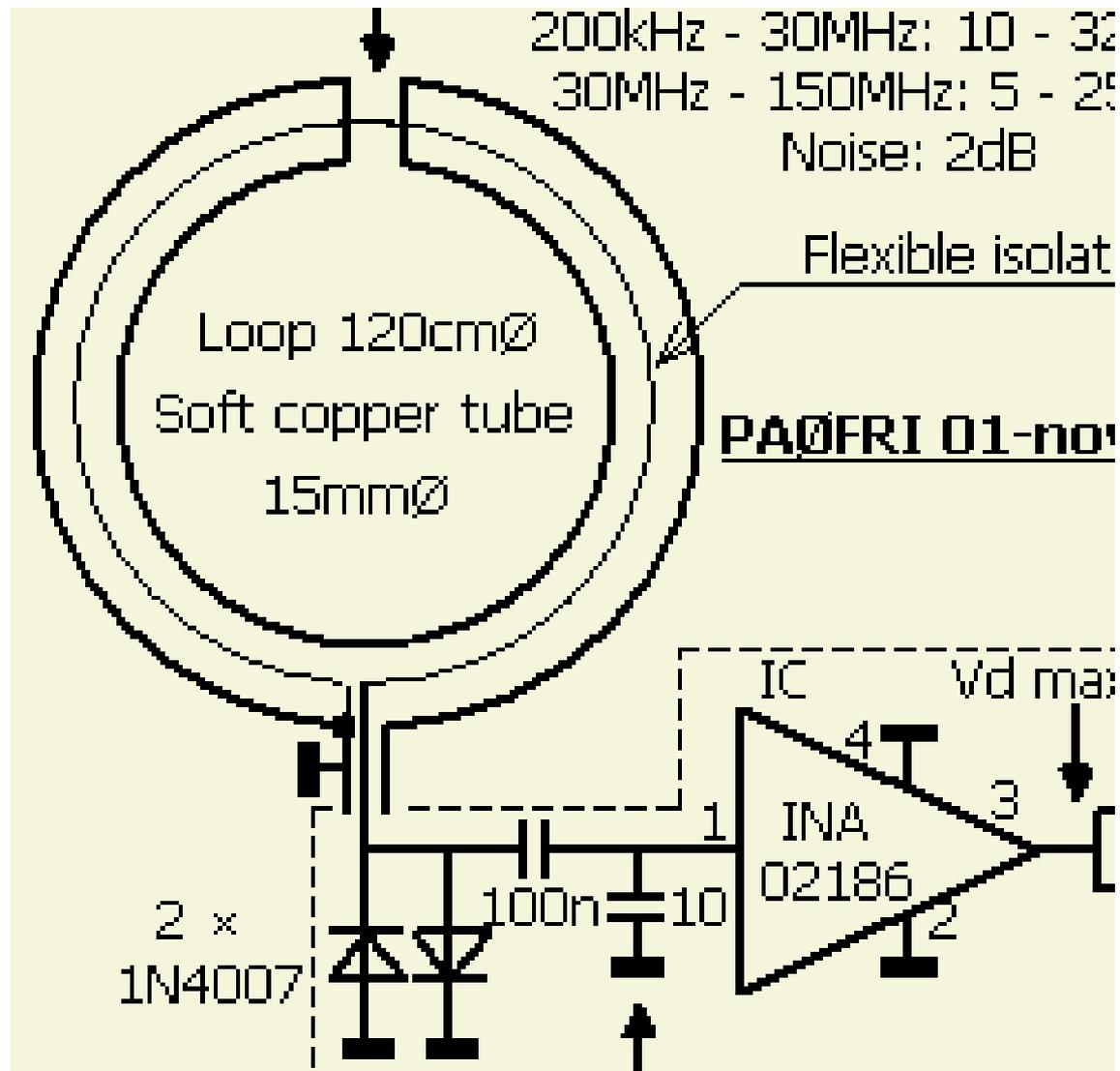
All cores Amidon BN-43-202

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

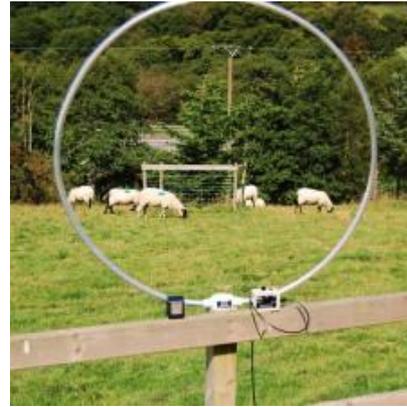


# Commercial Active Loops

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



- Wellbrook ALA 1530 – £264



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

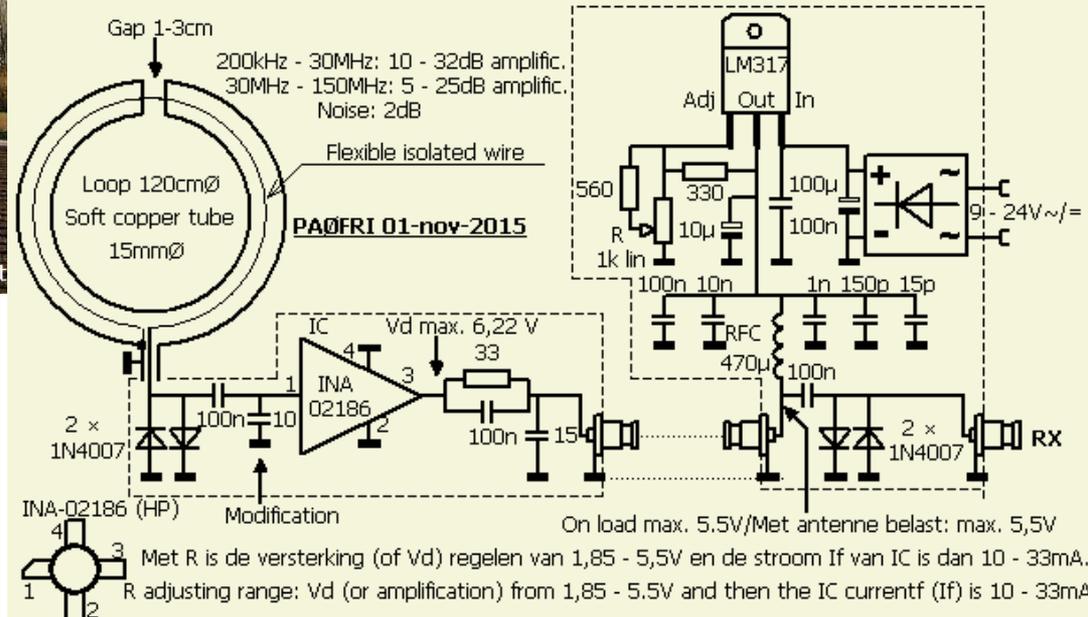


# Homebrew - PA3GZK

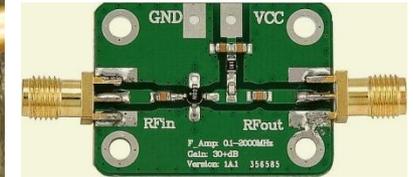
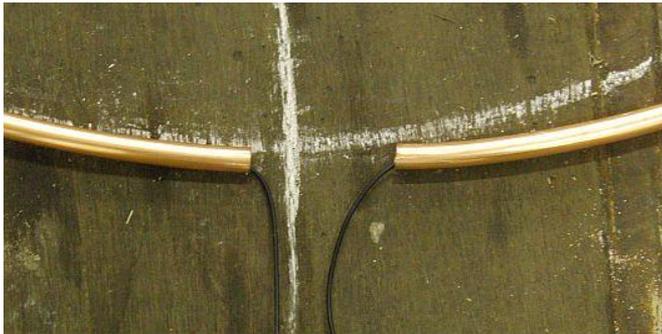
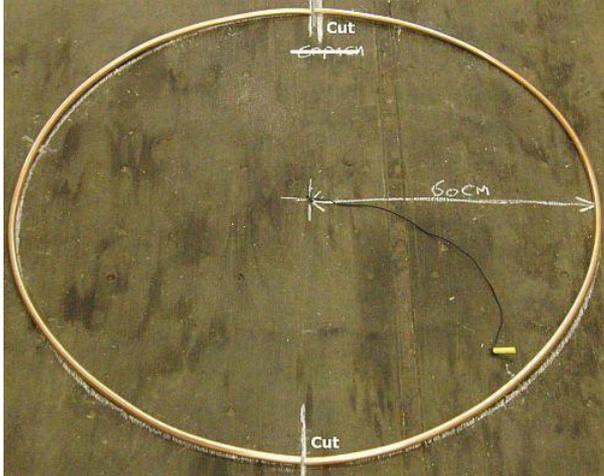


PA3GZK's ant

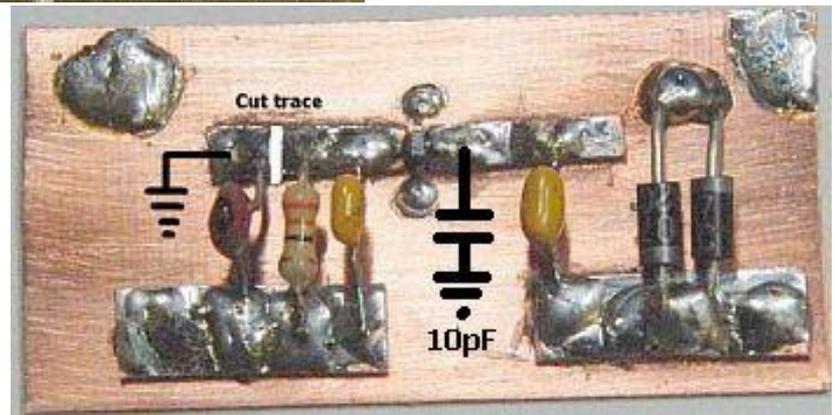
## PA3GZK's WIDE BAND ACTIVE LOOP RECEIVING ANTENNA



# Homebrew - PA3GZK

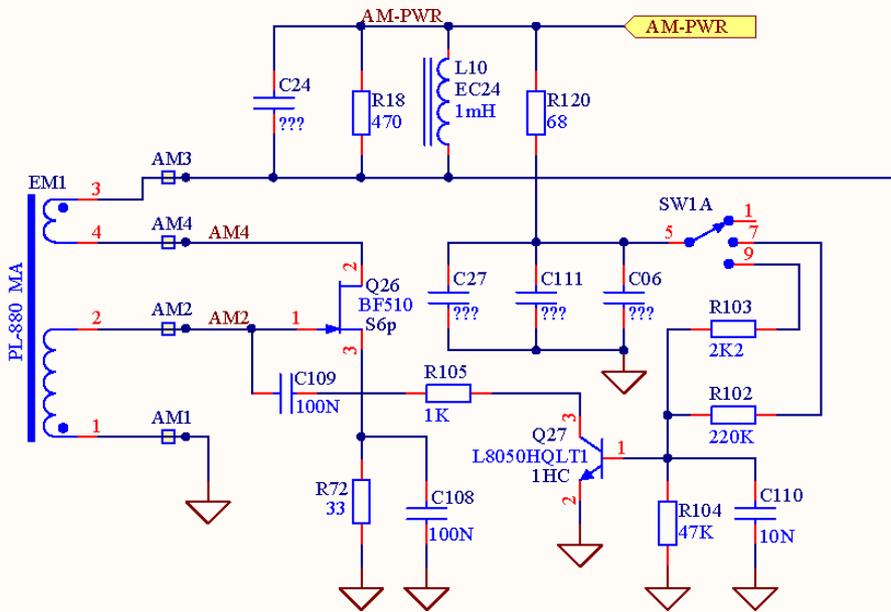


<https://pa0fri.home.xs4all.nl/Ant/Active%20antenna/Active%20receiving%20%20loop%20antenna%20eng.htm>

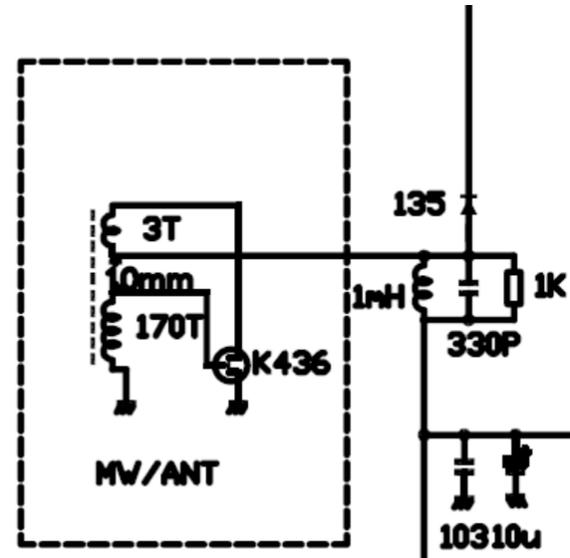


# Bleeding-Edge Technology

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

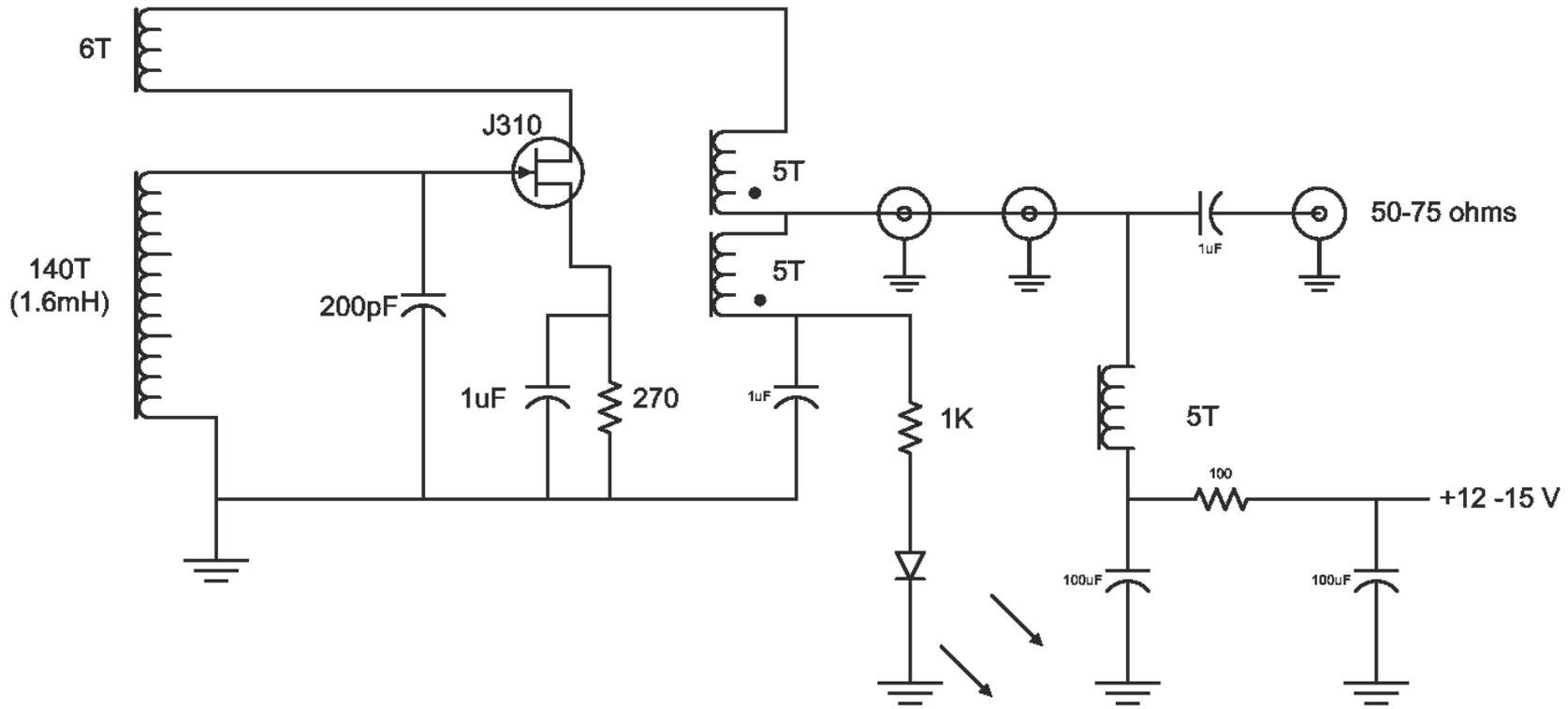


Tecsun PL-880



Tecsun PL-660

# N3FRQ Active Ferrite Loop



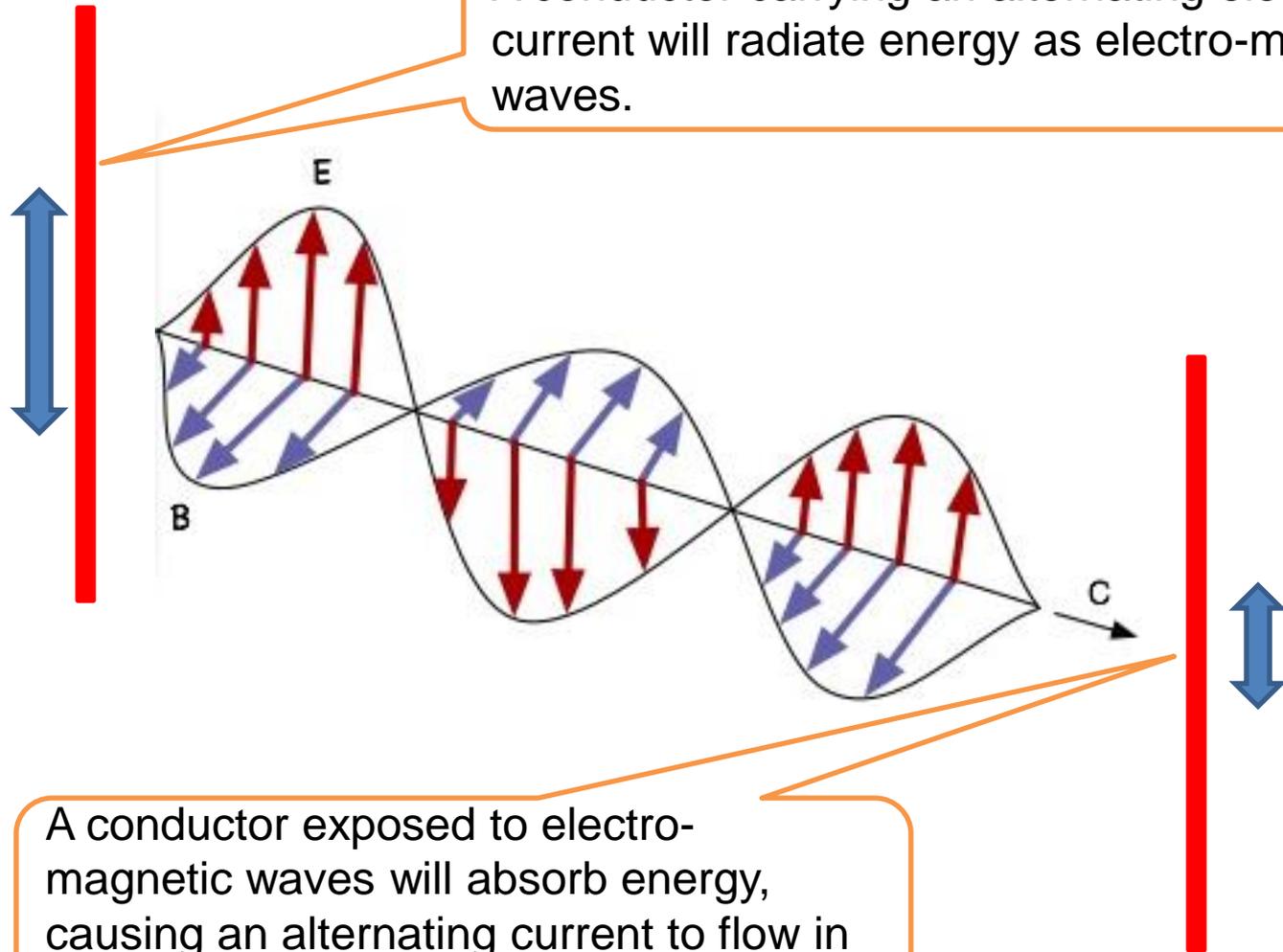
Adjust source resistor for 25mA.  
(2.5V across the 100-ohm resistor in  
the power feed.)

# Let Your Radio Play!



# Antennas Launch and Intercept Radio Waves

A conductor carrying an alternating electric current will radiate energy as electro-magnetic waves.



A conductor exposed to electro-magnetic waves will absorb energy, causing an alternating current to flow in the conductor.

# The Hertzian Antenna or Dipole

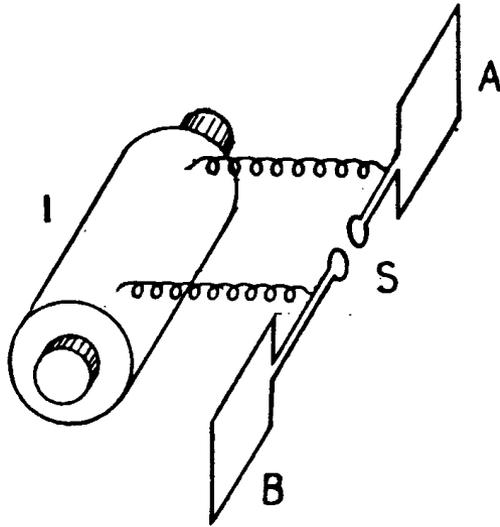


FIG. 9.—A Hertzian oscillator (AB) charged by an induction coil I.

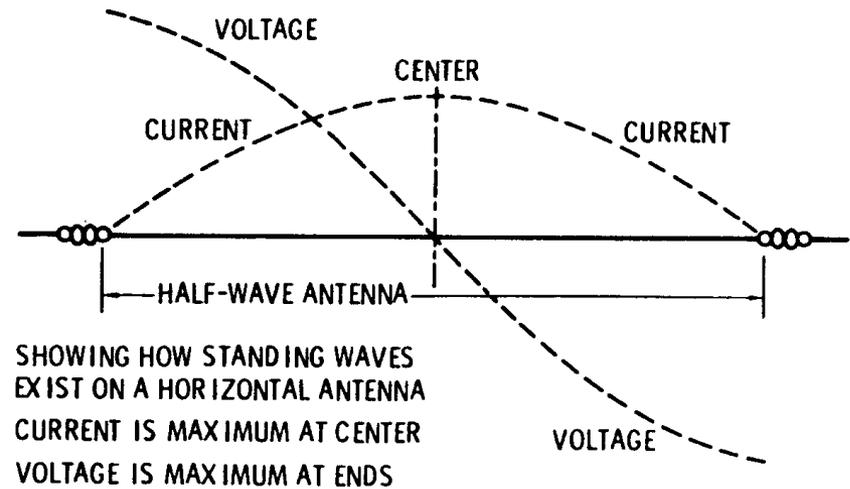
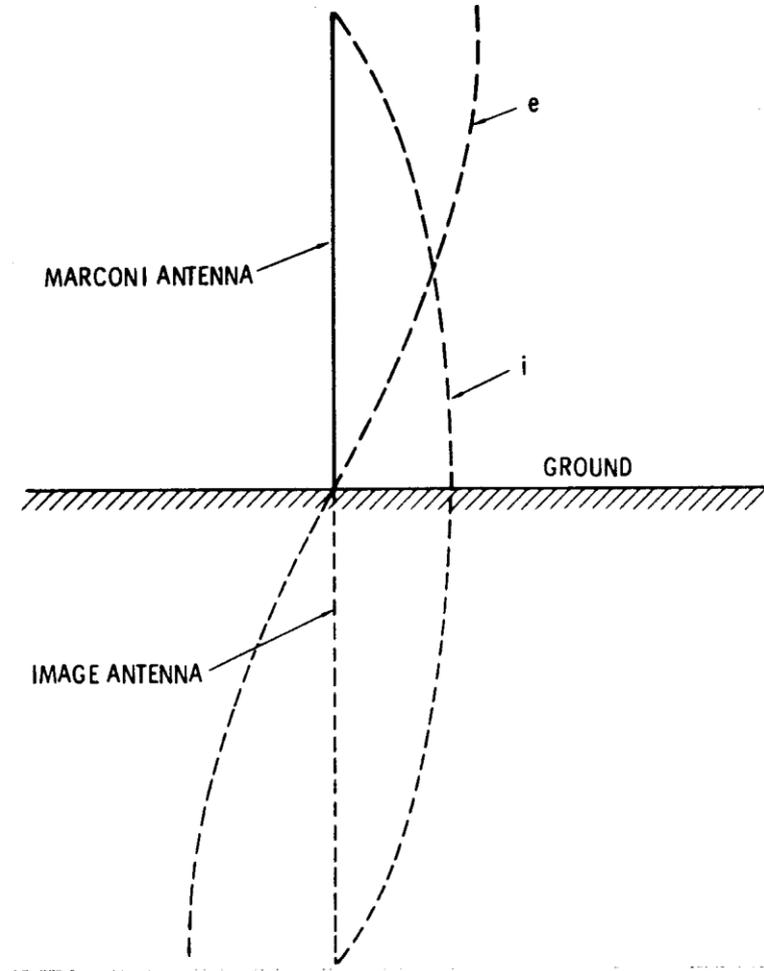
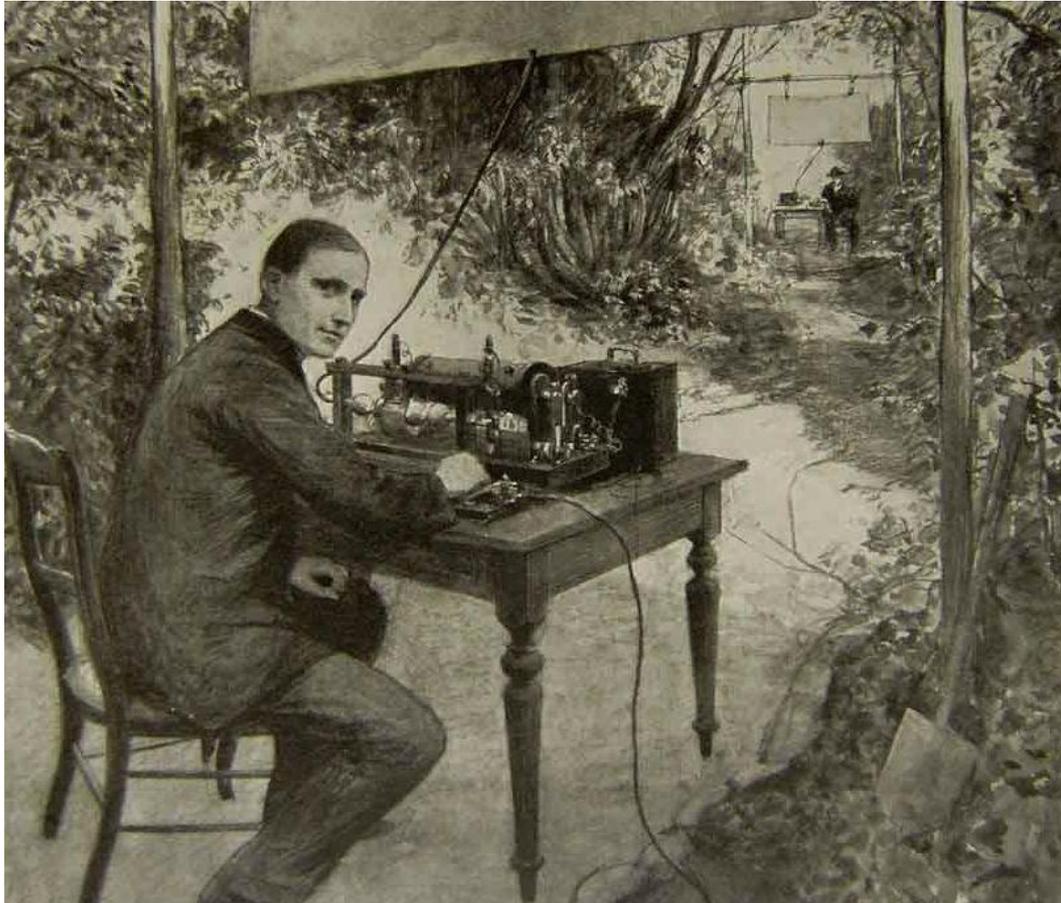


Figure 7. The Resonant Antenna

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

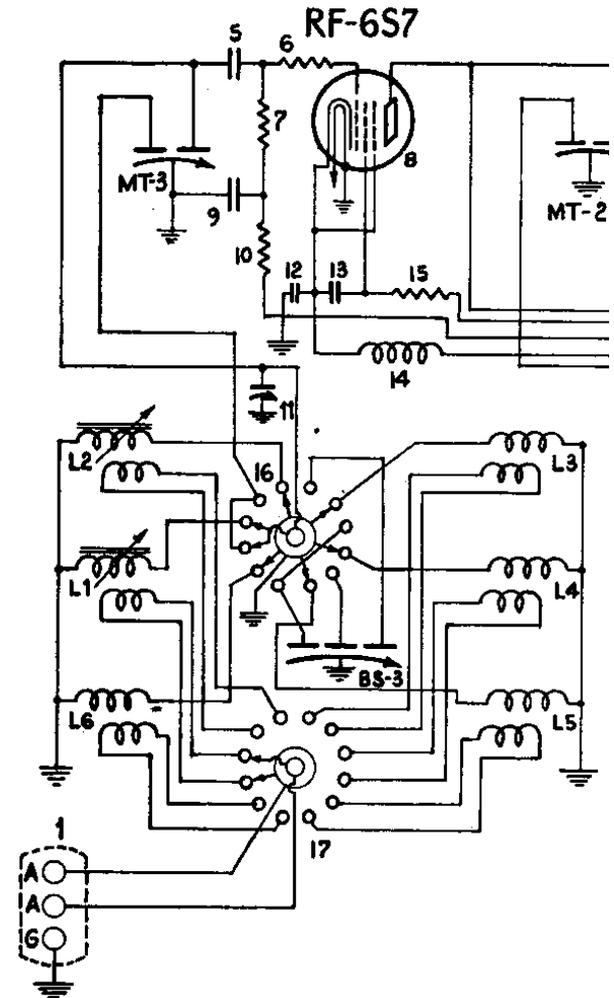


# Connection to the Receiver



- 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 wavelength 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.

# The Interference Zone

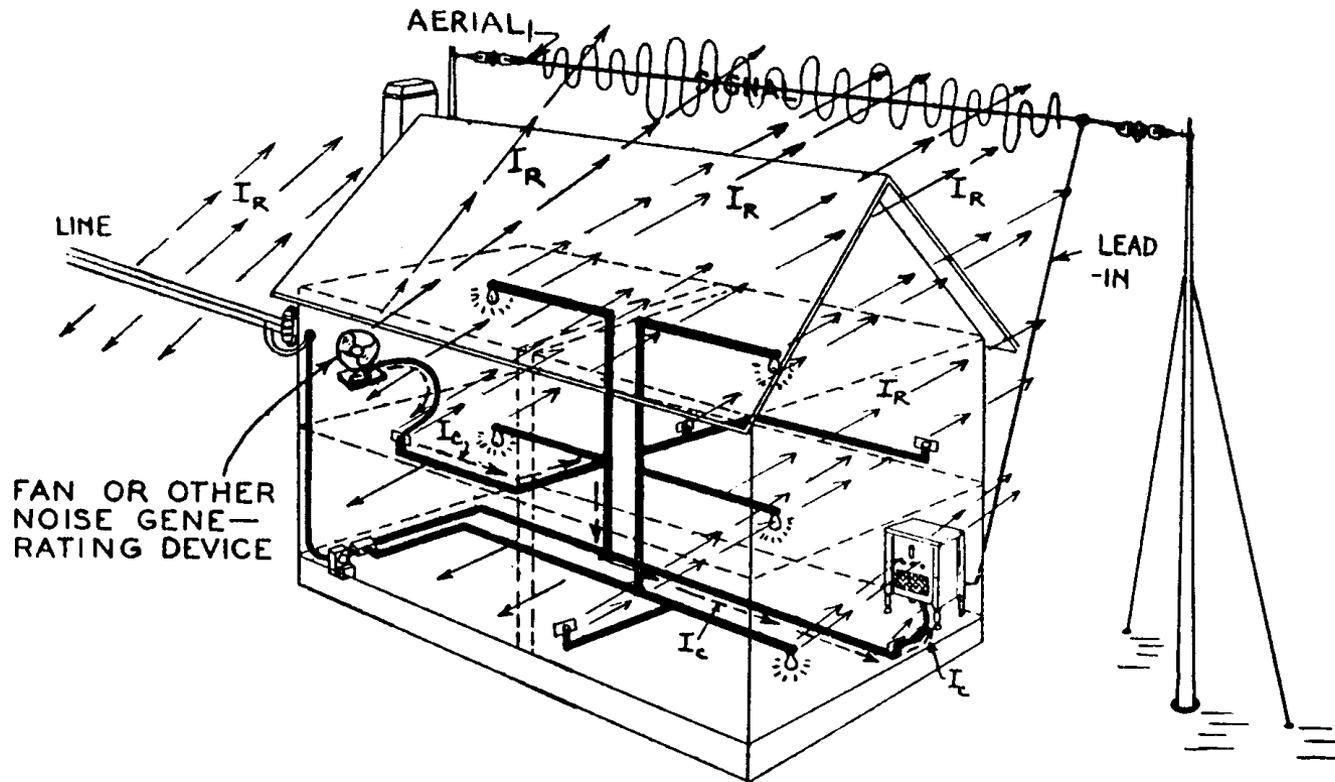


FIG. 30-4.—How an electrical device located in one part of a building can produce electrical interference part of which ( $I_c$ ) is conducted directly through the electric light wiring to radio receivers operating from the same lighting line; the other part ( $I_R$ ) may be radiated either directly 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).

# RANDOM WIRE

## With shielded lead in

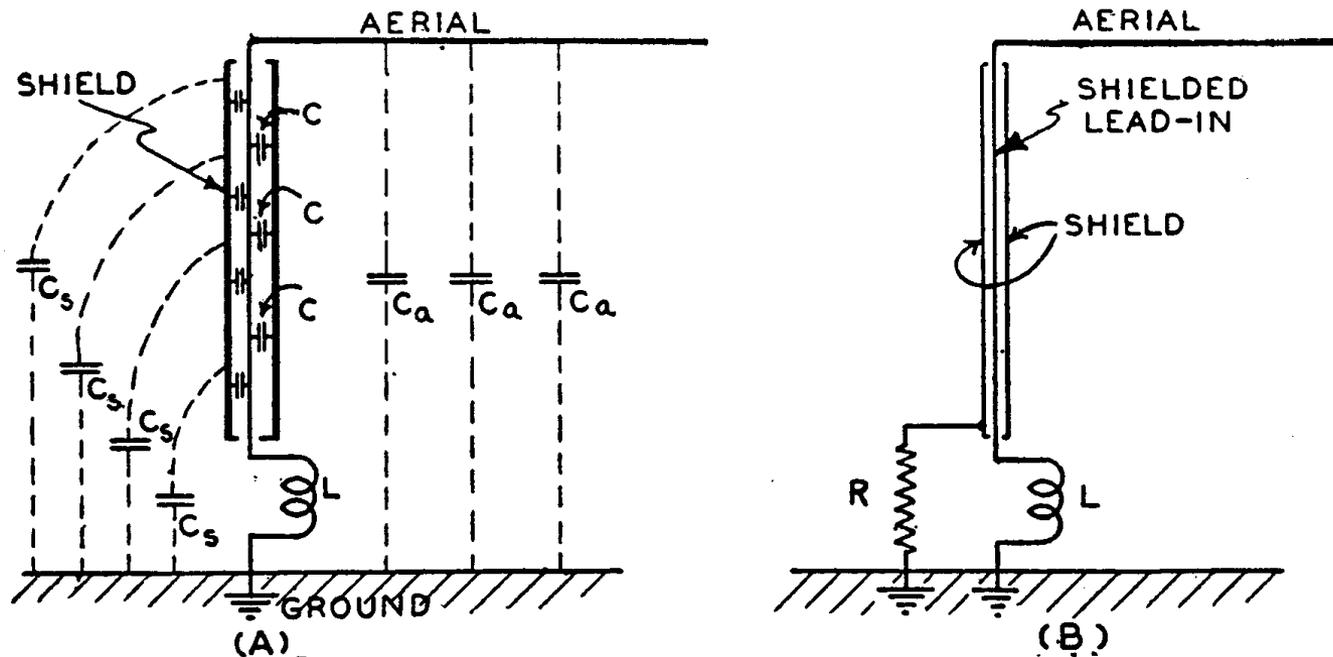


FIG. 30-28.—(A) The various capacities which exist between the aerial, ground, lead-in and shield in a shielded lead-in antenna system.

(B) How the lower end of the shield may be connected to ground through a resistance (or choke) to reduce local oscillations of noise current in the shield circuit.

# The Doublet Antenna

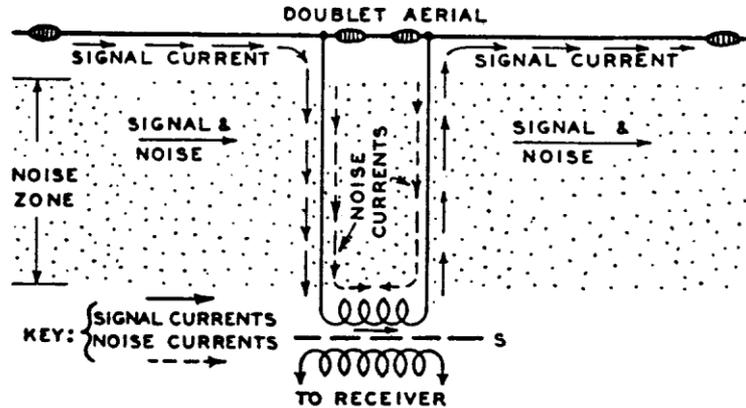


FIG. 30-46. — How the noise voltages induced in a parallel-feeder lead-in are cancelled out in the primary impedance-matching transformer. The signal voltages induced in the two halves of the doublet are additive.

- 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

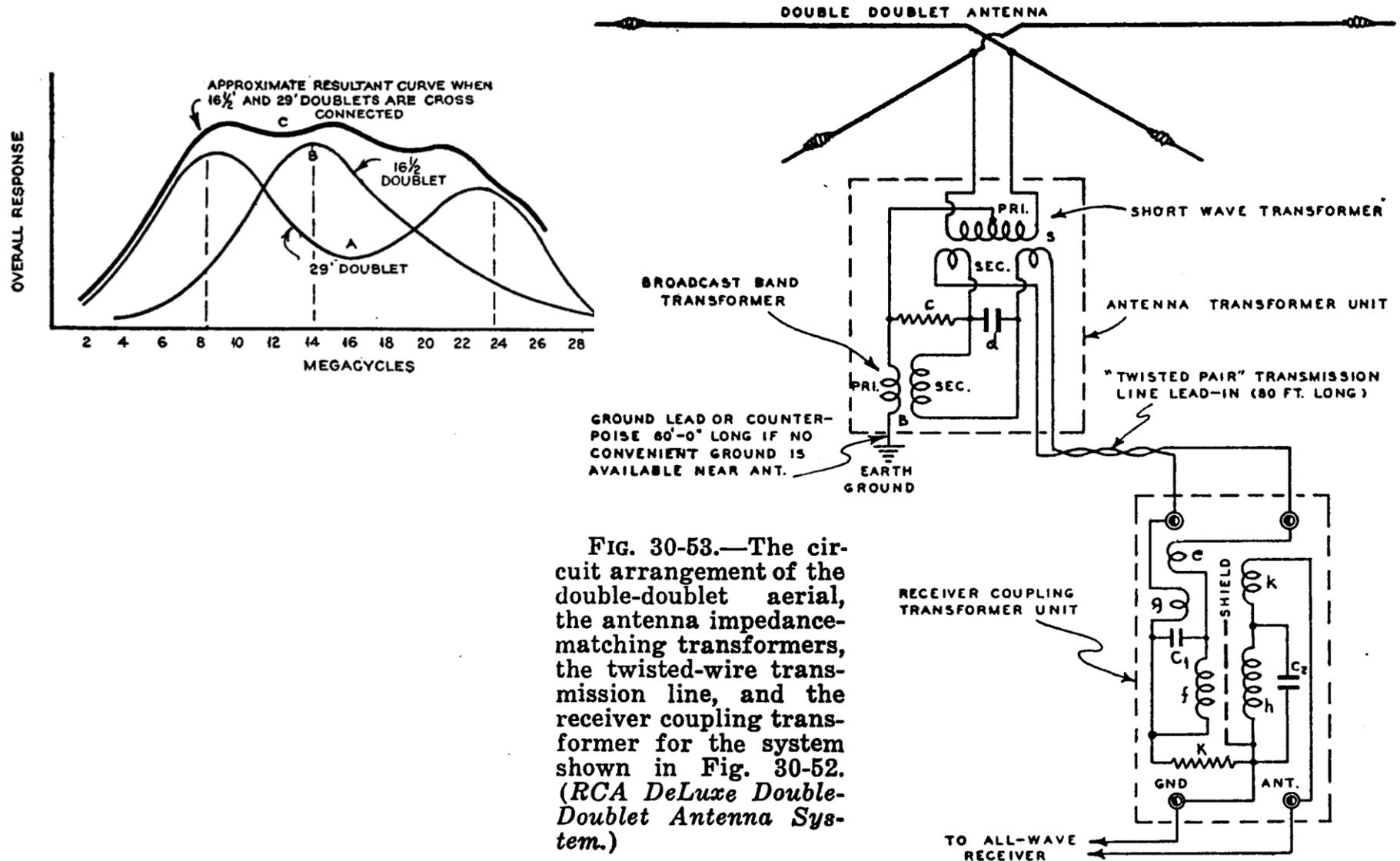


FIG. 30-53.—The circuit arrangement of the double-doublet aerial, the antenna impedance-matching transformers, the twisted-wire transmission line, and the receiver coupling transformer for the system shown in Fig. 30-52. (RCA DeLuxe Double-Doublet Antenna System.)

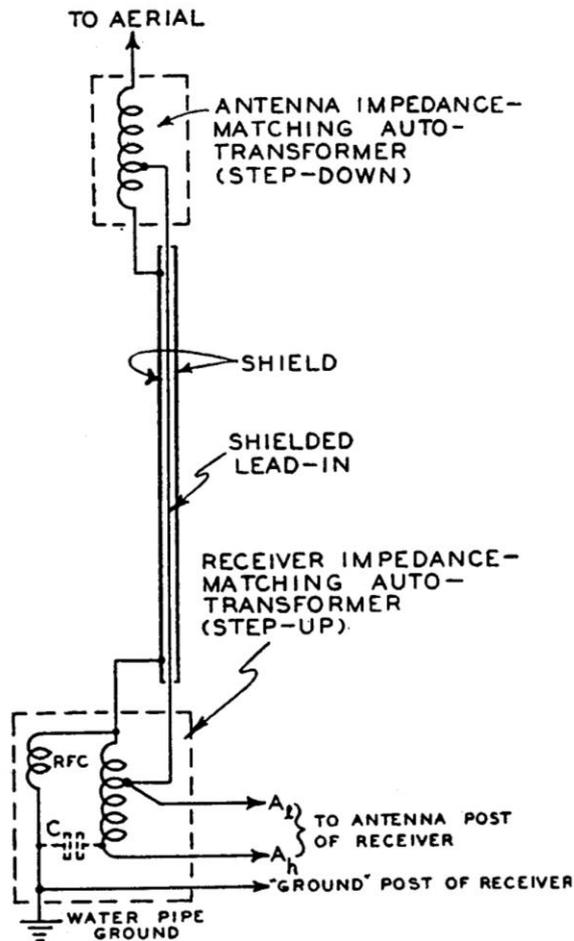
# Probe Antennas

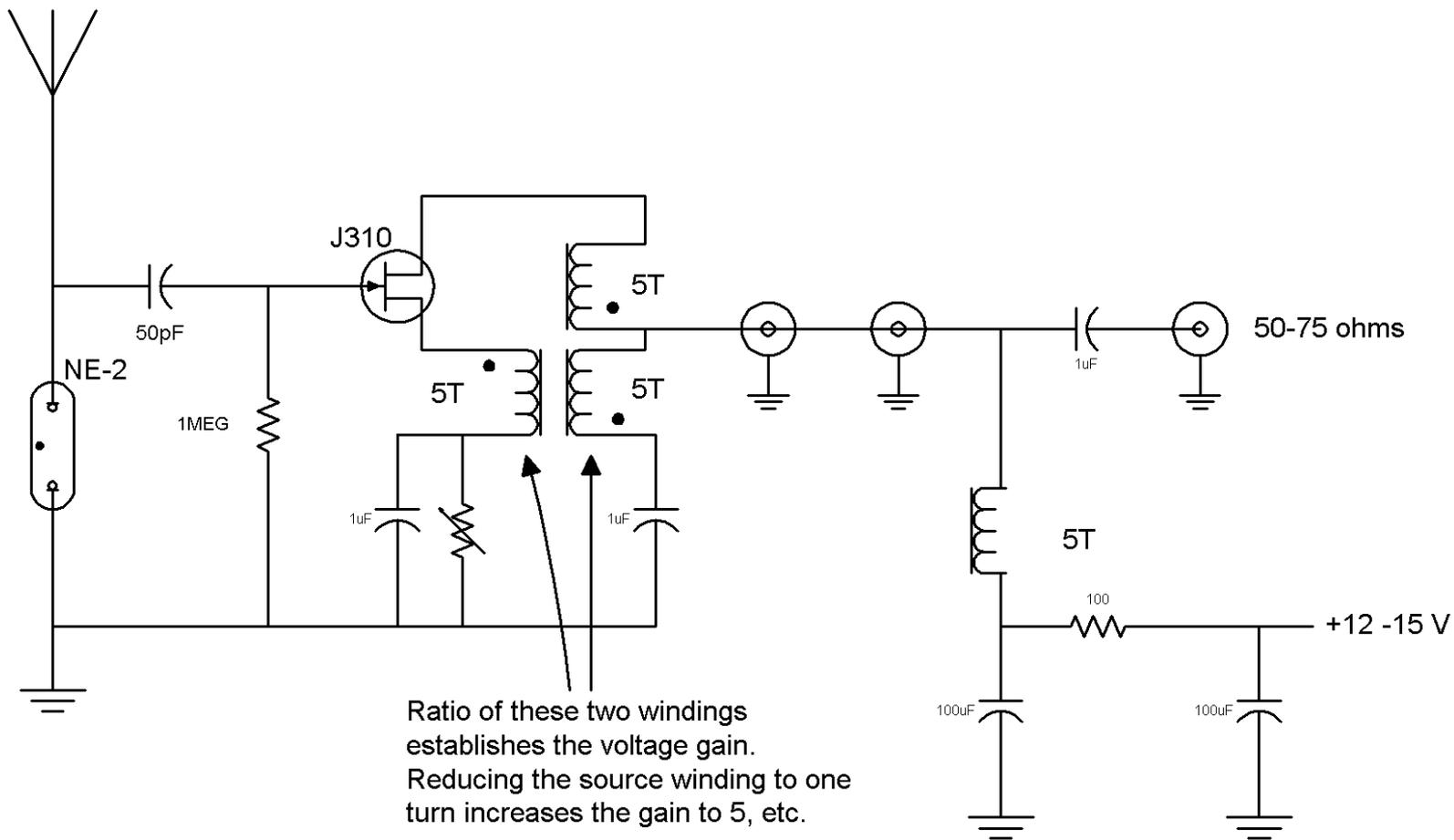
- Sample the Electromagnetic field with a small, inefficient antenna, and make up the difference with an amplifier.
- Loops: sample the electrical field of the available signal, and ignore the electrical field.
- Rods: E-field probe.

# Rods

## (E-field Probes)

- Much, much shorter than the wavelength.





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

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## Practical Antenna Systems for the Radio Collector - Beyond Wire Antennas

A lot of us have acquired some really nice radios from the 1930's, and then hang th

## Practical Antenna Systems for the Radio Collector - Beyond Wire Antennas

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 21<sup>st</sup> Century life style. Both commercial and homebrew setups will be considered.

# Commercial Active Loops

- W6LVP active loop
  - <http://www.w6lvp.com/>
- DX Engineering - RF-PRO-1B - \$500
- [https://www.dxengineering.com/parts/dxe-rf-pro-1b?seid=dxese1&cm\\_mmc=pla-google--shopping--dxese1--dx-engineering&gclid=CjwKCAjwsdfZBRAkEiwAh2z65gl-PEYr8yjOoYqGrChVHMwulBrthDxIKGwGrJCDr\\_QtRkkOxdfv5BoCXeoQAvD\\_BwE](https://www.dxengineering.com/parts/dxe-rf-pro-1b?seid=dxese1&cm_mmc=pla-google--shopping--dxese1--dx-engineering&gclid=CjwKCAjwsdfZBRAkEiwAh2z65gl-PEYr8yjOoYqGrChVHMwulBrthDxIKGwGrJCDr_QtRkkOxdfv5BoCXeoQAvD_BwE)
- <https://www.dxengineering.com/parts/dxe-rf-pro-1b> \$500
- Wellbrook L264

