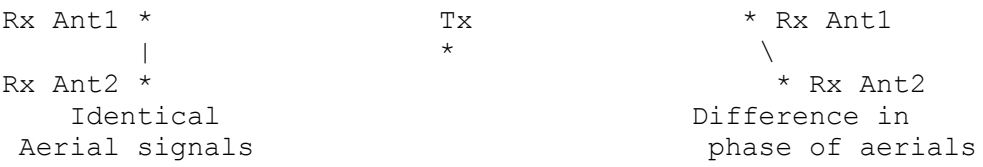
Doppler DF Aerial Design

By G8MNY (Updated Sep 11)
(8 Bit ASCII graphics use code page 437 or 850, Terminal Font)

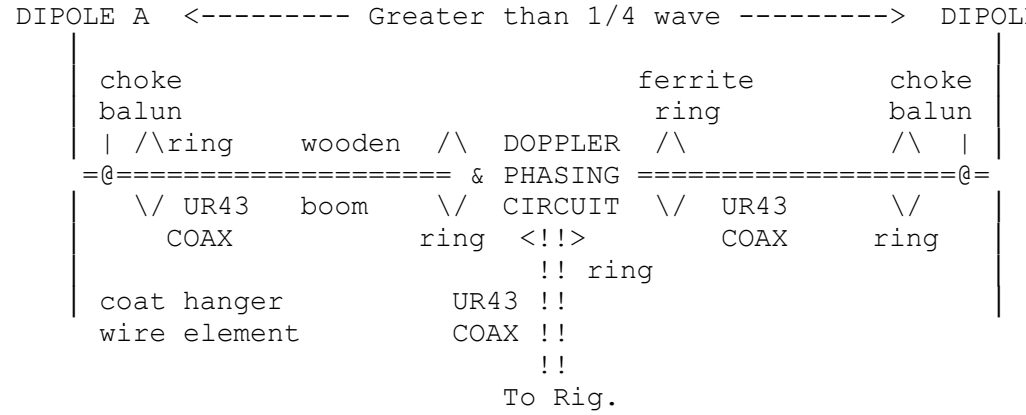
THE DOPPLER DF PRINCIPLE

By switching between 2 identical aerials at a fast audio rate, any amplitude or phase difference seen between the 2 aerial signals will show up in the Rx as a Tone in AM/SSB/FM mode.



The only time no tone will be detected is when both aerials have identical signals, which in an even RF field only occurs when the aerials are equal distance from the source. This happens however strong or overloading the signal in the Rx is! (using a Rx on the 3rd hamonic can be a solution to overload)

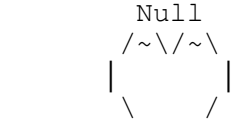
AERIAL LAYOUT



For 2m, the 2 dipoles (A & B) consist of 101cm long coat hanger wire (2x 52cm per 1/4 wave) rods mounted into 2 holes drilled close, but not touching, in each end of the wooden boom 84cm apart. The rods are connected (soldered) to coax, with a coiled coax choke balun. The balun is a coil of coax just shorter than a 1/4 wave, tightly coiled & as close as possible to the aerial feed point & taped/cable tied to the boom @ 90° to the dipole rods & so it does not couple to it! I also fitted small ferrite rings to reduce the effect of the unbalanced coax on the measured RF field.

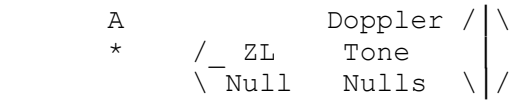
ADDING A ZL AERIAL SYSTEM

The drawback to a simple 2 aerial Doppler system is that it cannot give the direction "SENSE" of the source just the line it is on, as there are 2 identical positions of tone nulls in 360°. So conversion of the 2 aerials into a simple ZL type phased beam is needed as well, as this will give a cardioid polar response, with a sharp null of the back of the beam. But this will become unusable for DFing with a very strong signal! Details of how to, later.

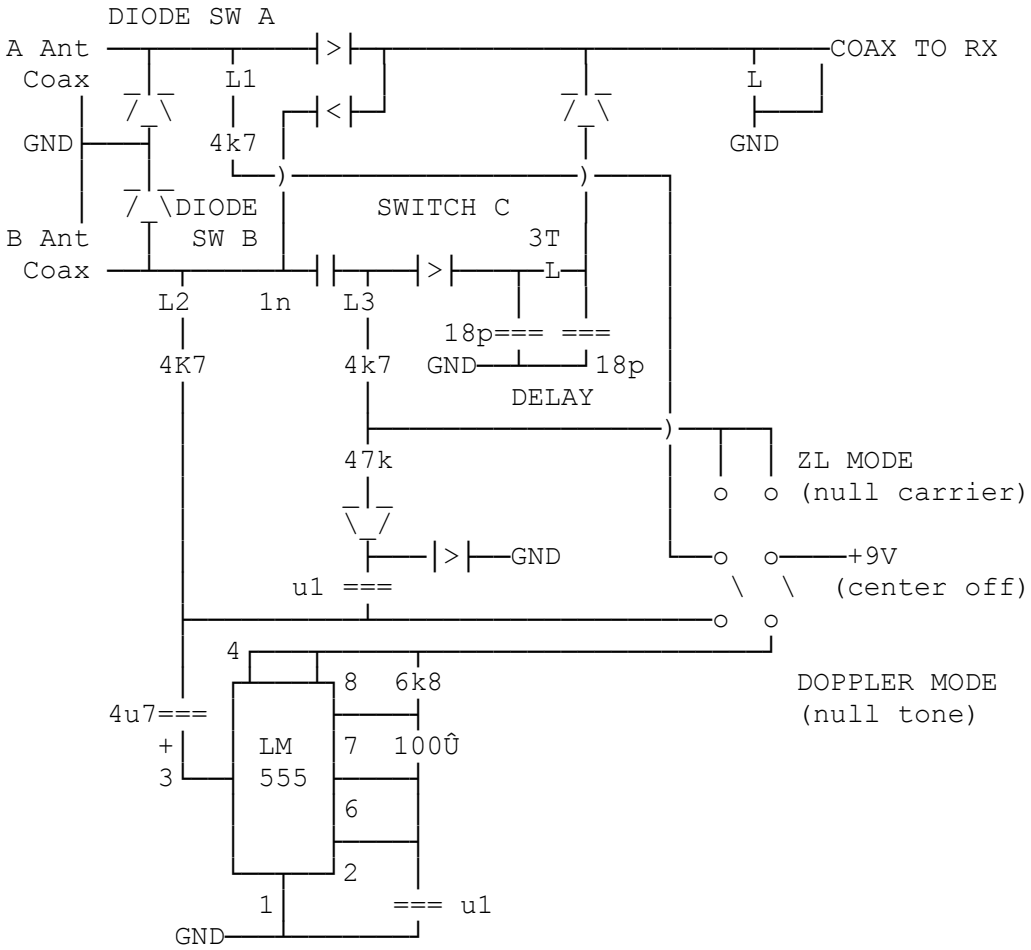


ADDED ADVANTAGE OF USING BOTH SYSTEMS
Using both systems together, if you get a poor correlation of the headings between them, then the RF field being sampled is poor (has reflections). So that is a bad RF location, because the aerial is turned through 90° & you are seeing an uneven RF field, so the 2 results cannot be trusted.
Repeating the tests just a few metres or so away normally solve this. (away from overhead lines & metal poles)

A label like this may be helpfull..



THE CIRCUIT



HOW THE CIRCUIT WORKS
The 2 aerial inputs each see a diode switch (A & B) using 1N4148 type diodes. The Ls are several turns on ferrite cores or beads, but if in series with 4K7 (L1-3) then they can be left out. Construction is on a PCB ground plain either by knife etching circuitry or ugly.

Aerial switch C is used to join the 2 aerials together, but with aerial B via a lumped delay line (or use a length of coax approx the same as the A-B gap) this L is about 3 turns 6mm dia & Cs used for this are set up to cause a signal null in one direction.

In ZL mode, diode switch B is off & switch C is on, passing the combined signal.

When the mode switch is in Doppler mode, the control of the A & B diode switches is from a 555 square wave astable running at about 1kHz. With a diode pump circuit to completely bias off the C switch path.

In the off position there is no through path!

It is possible to Tx up to 2W into the unit without damage, but only a small amount of power passes through to the aerial!

IN USE
This aerial, FT290, & Map, have won quite few of DF fox hunts, but it has occasionally failed to find fox too! The strangest was when the Fox man was well hidden behind a metal bus shelter, the signal seen by several DFers as a source 10m or so away! I have also been beaten by a barking dog & owner that found the fox due to barks on the fox AF.

Why Don't U send an interesting bul?

73 de John, G8MNY @ GB7CIP