4 Aerial Doppler RDF

By G8MNY (Updated Jan 15)
(8 Bit ASCII graphics use code page 437 or 850, Terminal Font)

THE DOPPLER RDF PRINCIPLE

By moving a Rx aerial towards the Tx (rotating it around a center), the Rx frequency increases, & when going away it decreases. So on a FM Rx a tone will be heard at the frequency who's phase compared to the aerial rotation position is the direction.

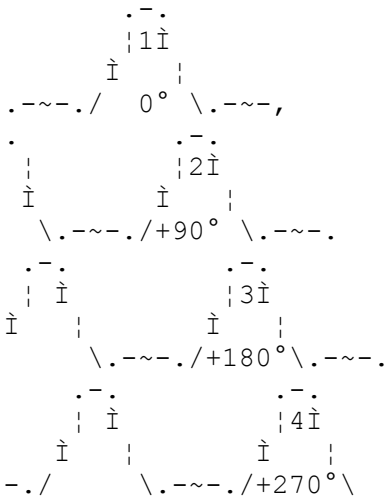
```
 + Freq          ->
                                          Tx
No change    v ROTATNG ^                  *

 - Freq          <-       plan view
```

To mimic a spinning aerial a least 4 identical aerials are needed. And each of these needs to be faded in & out in pseudo 1/2 sinewave manner. This assumes the 4 aerials don't interact!

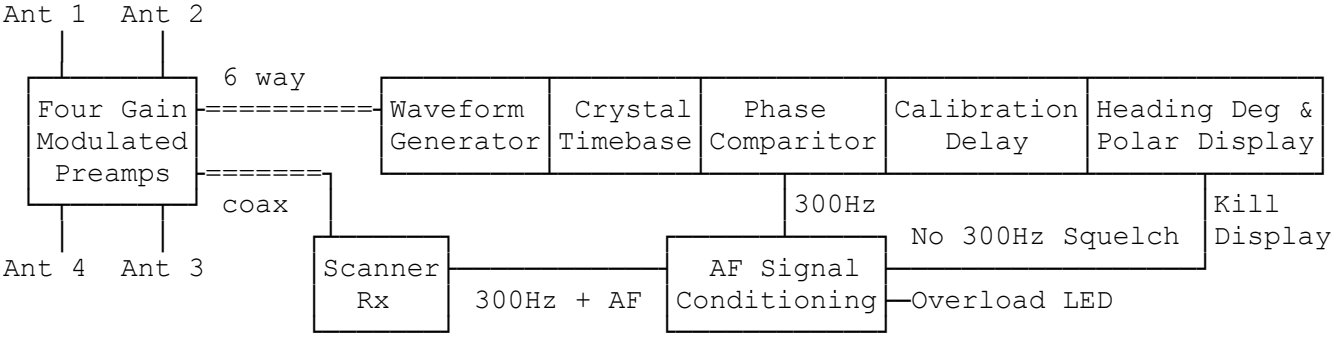
EARLY KIT RDF

I have a 1981 commercial USA kit by Doppler Systems Arizona, model 3003, it uses a crystal timebase to clock 4 phases of an identical waveform stored in Proms.



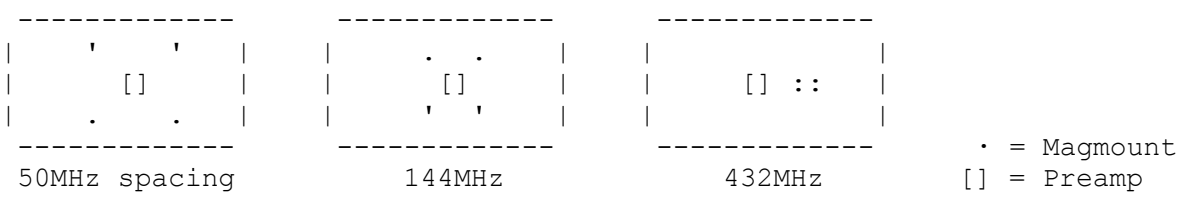
They give the 4 phases of smooth gain changing bias for gate 2 of the 4 dual gate mosfet preamps mimicing a spinning aerial rotating 300 times per second.

SCHEMATIC



AERIALS

These must be identical with same length feeder etc. I used 4 magmounts with short 1m leads to BNC plugs. Into these I can plug in aerials, telescopic ones give 100-432MHz, for lower frequencies "coat hanger" wire can be cut & put into PL259 plugs. It is important they are wired up in order correctly!



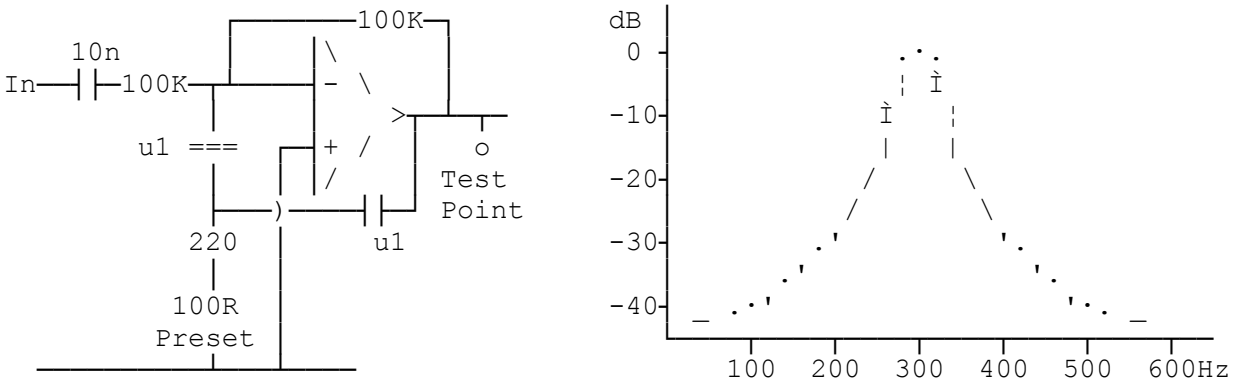
The aerial spacing needs to be about 1/4 wave for the doppler tone to develope, the distance & the shape of the vehicle roof all affect the bearing calibration!

RX SETUP

I use the simular sized AOR2002 Scanner for the Rx, modified with a Pre Vol AF output (see below). The aerial arrangement with external preamp is optional, but less cables. Mine preamp came unmounted outside the unit, so I put it in a diecast with magnetic underside & 4 BNCs, but I also modified it with 4 step up broad band RF transformers for more gain & terminated them on the PCB with 470R instead of the 47Rs & added 2 clipping diodes as protection in case I Tx! With the preamp output coil removed, it now gives useful gain 50-432MHz.

AF MODIFICATIONS

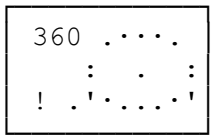
The original circuit had very little pre signal conditioning, only a few dBs down at 200Hz & 1kHz, so any modulation kills the system. So I desigend a very narrow wayne filter on a couple of the existing initial opamps in circuit...



The exact centre frequency is set on the multiturn preset by setting identical losses at 290 & 310Hz, on the 1st op amp's test point & then the 2nd. The overload detector pick of point is moved to an earlier stage & made it more sensitive, so it operated before clipping occured.

DISPLAY

Polar display uses 16 LEDs in a circle for ease of navigating & 1 in the middle to indicate power. As well as that there is a 0-360° bearing indication.



An oveload LED indicates if there is too much AF drive.

IN PRACTICE
Anoyingly my scanner gives different 300Hz delays (phases?) between wideband & narrow band FM modes, so the barring changes if the bandwidth is changed. But I found on narrow band FM mode, the heavily clipped wideband FM AF, RDF 300Hz signal is fine. So I added a dedicated unsquelched narrow band FM AF O/P for RFD feed, & I can still listen to the AM & WBFM modes.

The main problem is RF multipath, if any of the 4 aerials sees an upset RF field (nulling) the result is usless.

Why Don't U send an interesting bul?

73 de John, G8MNY @ GB7CIP