DF Hunting basics

Or

How to find Paul and Nigel before they go to the pub

What is a DF hunt

- A DF (Direction finding) Hunt is the challenge of finding a hidden radio transmitter before the other competitors
- These competitions can be on any chosen band. Popular choices are 2m and 80m
- This is emulating as a game what the professional authorities do when tracing interfering or illegal transmissions

Basic outline

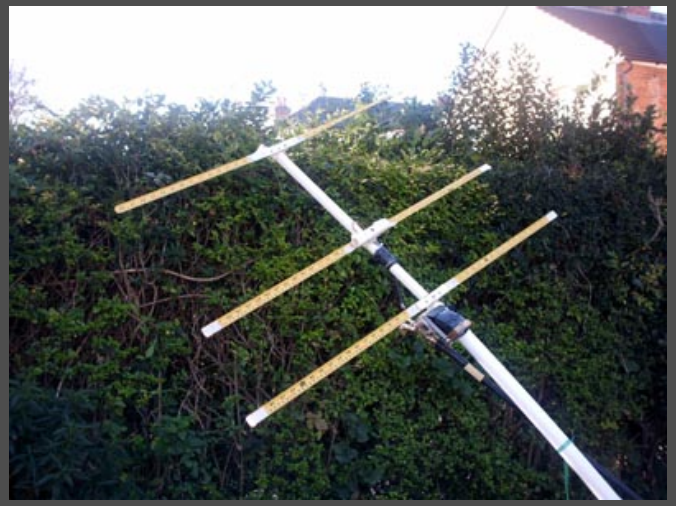
- A ‘Fox’ transmits on a pre-arranged frequency at stated intervals
- The transmitter can be automatic and very low powered or manned and cover a wider area
- The Cray Valley hunt is on 2m and covers the whole of ‘our patch’
- Sometimes cryptic clues are also used

Tools of the trade

- A radio with S-Meter covering the desired frequency which is light and battery powered for convenience

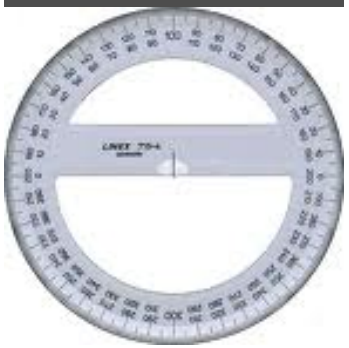
Tools of the trade

- A directional antenna with a good F/B but not necessarily huge gain – A basic 3 ele. Yagi does the job



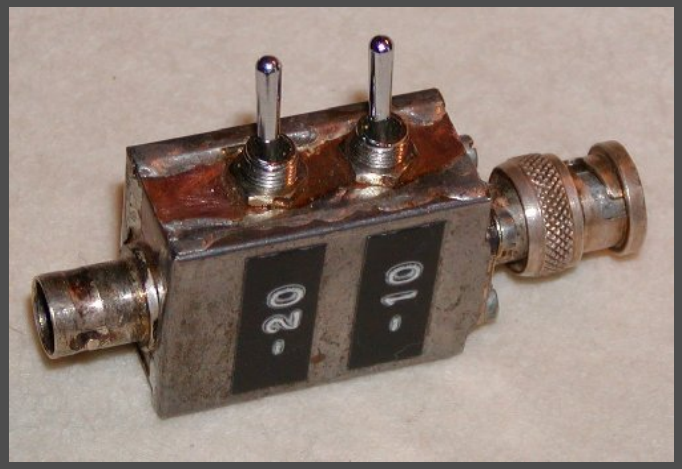
Tools of the trade

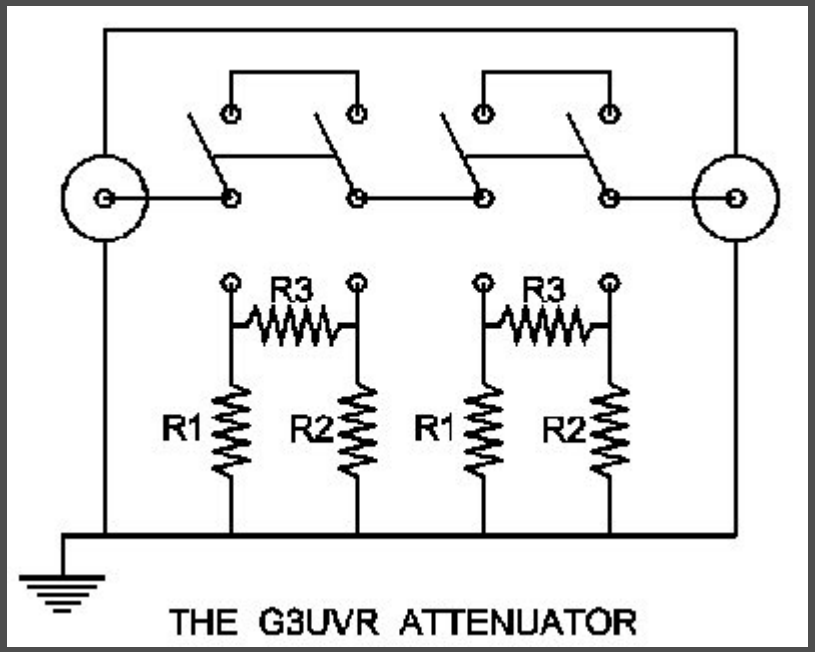
- A map of the area, Compass for bearings, a protractor, ruler and pencils for marking the bearings



Tools of the trade

- An attenuator for reducing the input to the radio
- The range of your S-meter may only be around 30dB





Tools of the trade

- So the total kit including the participant looks roughly like this

So you have decided to take part

- Over and above the basic kit you will need
  - A team of at least two, One driver, one lead operator
  - A car with enough fuel for the evening
  - To decide where you want to take your first few bearings from

Before you start

- Check the kit does what you want it to
- Make your first 3 bearing points clearly on your map
- Make your way to your first bearing point at least 10 mins before the start

Where shall I take my bearings from?

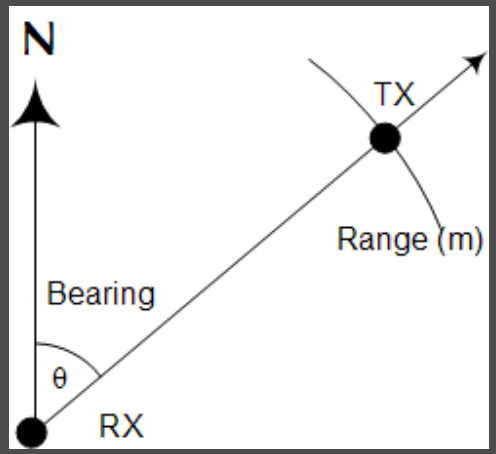
- The rules may state the start point
- Choose your positions so they are open and high to avoid reflections
- Have them marked on the map before you go
- Make sure you can travel between them easily between transmissions

Taking your first bearing

- Open your map and align it so it is orientated the same way as real life
- When the transmission starts move your beam round for the peak reading
- Get your partner to take a beam heading using the compass.

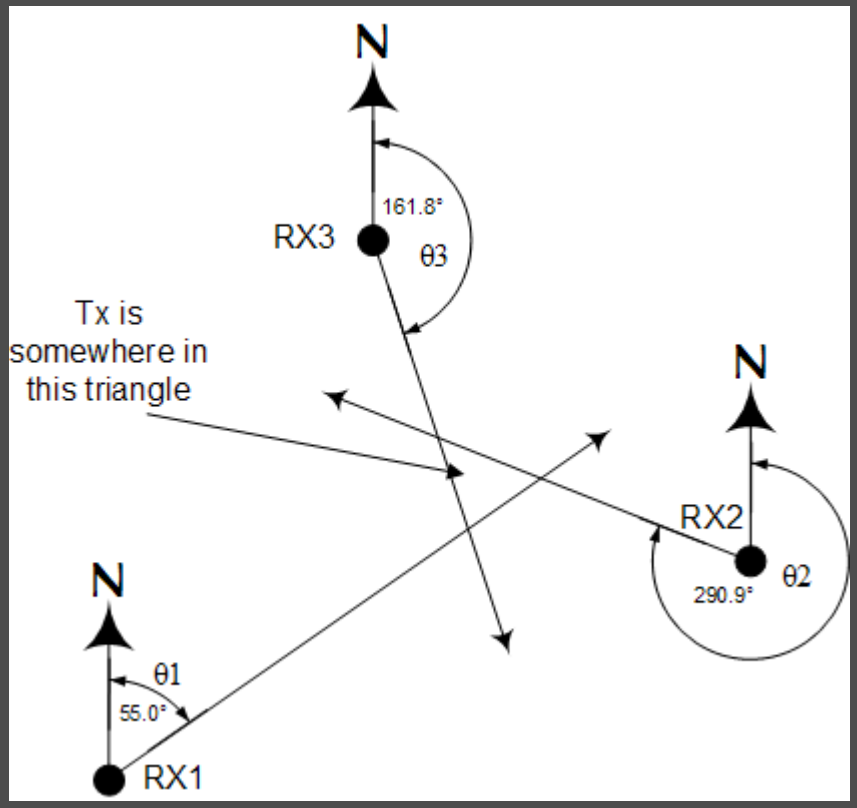
Taking your first bearing (cont.)

- Note the beam heading in degrees from north
- Place your Protractor on the map with it's centre where you are and mark a dot on the map at the appropriate heading
- Join the dots with a ruler and extend the line as far as you can go



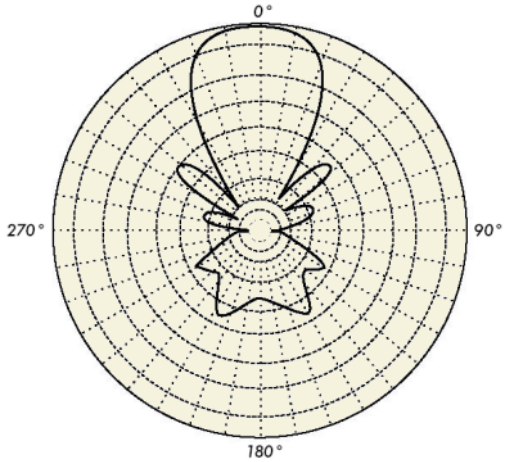
Next bearings

- The next two bearings (if you have chosen well) will give you a triangulation showing you the rough area of the fox
- Travel to that spot and put the attenuator in line ready for the next transmission
- Now you should be close to the fox and the bearings should be much more accurate
- More than likely your three readings will form a triangle within which you will find the TX
- They do not form a dot because of BEAM HEADING ERROR or TRANSLATION ERROR



Beam Heading Error – Beam Width

- A 3 ele yagi can have a 3db lobe as wide as 30 deg
- 3 dB is as little as half an S point
- Find the mid point between the where the S meter shows a drop - Check it two or three times

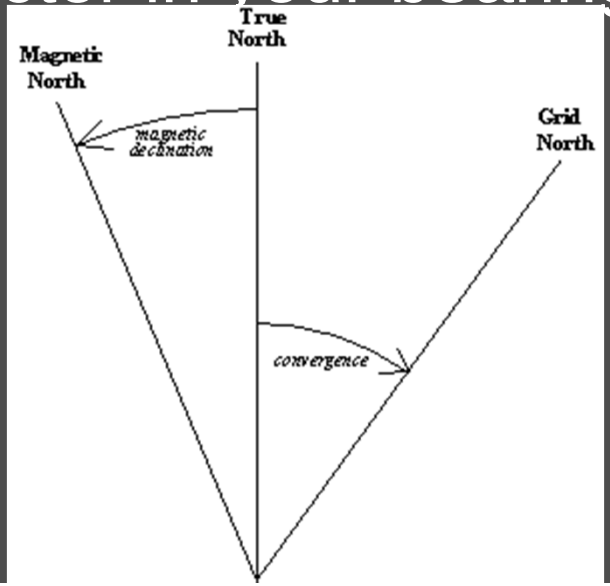


Beam Heading Error – Magnetic declination and Convergence

- It is generally believed that the lines on the map point north and a compass points north – Well yes and no
- There are 3 different definitions of north
  - True north - A line drawn from geographic pole to pole – fixed – bows away from the meridian
  - Grid north - Parallel lines relative to the meridian as drawn on a map – fixed – the difference between true and grid north is called the convergence
  - Magnetic north – Where a compass points – varies over the years
- On OS Landranger Maps, the difference between True North and Grid North is given on the map and also magnetic declination for the year it was made

Beam Heading Error – Magnetic declination and Convergence (cont)

- The formula this equates to is as follows
  - Magnetic/grid variation= magnetic declination - convergence
- So if the difference between Grid north and true north is 1 deg e (+) and between true north and magnetic north 3 deg w (-) you immediately have a 2 deg error factor in your bearings.



Translation Error – Getting the line right on the map

- Once you have the heading don’t mess it up by not plotting on a map correctly
- Use a protractor to translate onto the paper
- Mark the line as straight and thinly as possible

Refinements – taking bearings without a compass

- We have just said there is a discrepancy between grid north, true north and magnetic north
- Another method would be to take a bearing on a beacon or other fixed transmitter
- Then take a bearing on the fox and measure the difference

- The pros of this are you need to establish the exact bearing of the known source at each bearing point and mark up your map accordingly
- The cons are it can be confusing

- We do have a certain beacon very close however

Closing in for the kill….

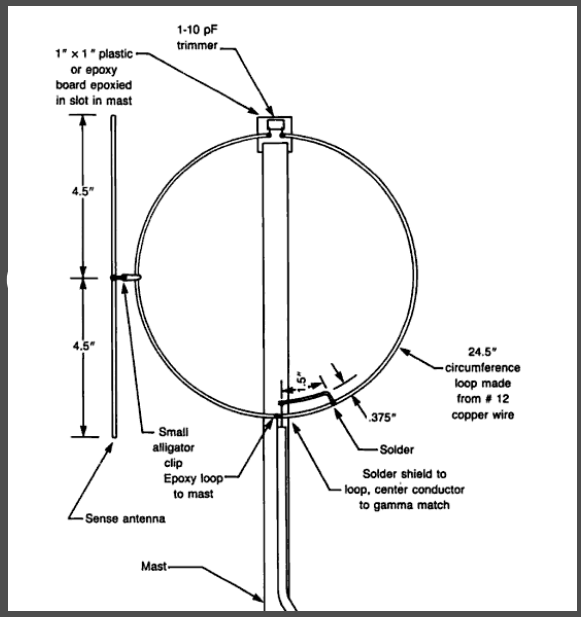
- So you are in the vicinity of the fox…
- Can you get any sort of bearing?
- Make sure your attenuator is in line
- Take your antenna off, or change to a rubber duck Can you still hear him?
- Look carefully at your map for any obvious places your prey may be.

Closing in for the kill….

- Once you can get a signal without an antenna or with max attenuation and a small antenna park up and move about on foot
- Find a high spot
- Listen to any clues
- Claim your prize

Refinements – Dedicated DF antennas

- Loops
  - Very sharp but no FB unless a sense
  - Very small at 2m
  - Only for use at very close range – no



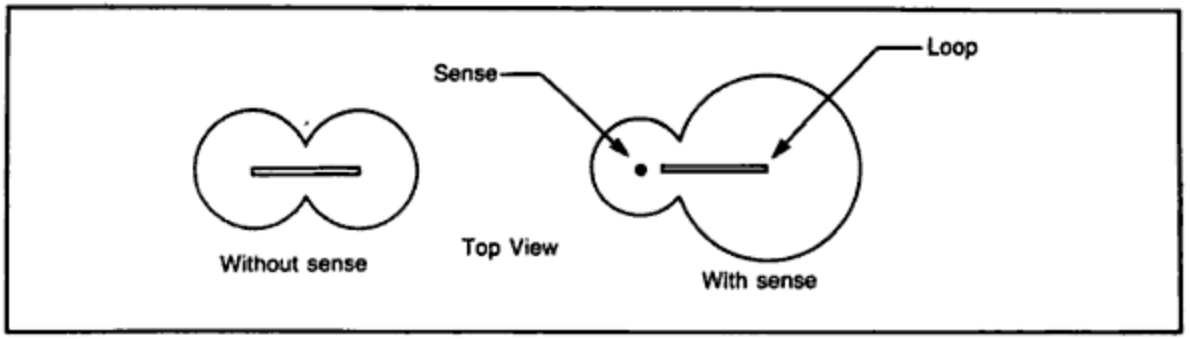


Fig. 4-2. Pattern of the simple 2 meter loop, both with and without the sense antenna, seen from above.

Refinements – Dedicated DF antennas- Phased arrays

- Very deep null whe
- Gain off the in phas
- Very sharp when tu

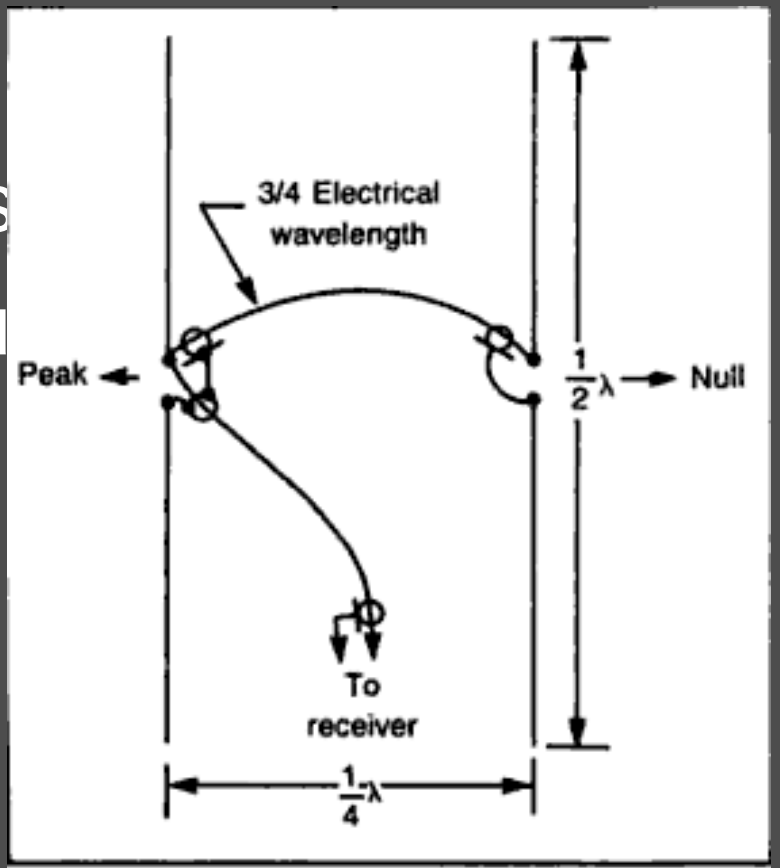


Fig. 4-13. A two element phased array. This antenna has a single null with a broad peak 180 degrees away.

Refinements – Dedicated DF receivers

- Normally dedicated to a small frequency range
- Calibrated internal meter and AGC output for a multimeter
- Potentially with built in antenna such as a phased array
- Audible and LED indication of direction
- Outlawed by most ARDF competitions

Refinements – Roof mounted phased antennas and Doppler systems

- multiple switched verticals
- Very accurate heading possible
- Used professionally
- Switching can be manually or automatic (using a timer circuit)
- Beyond the scope of the average amateur however a kit is available in the US

Questions?