

Norfolk Amateur Radio Club

DF100 direction finder project for “Foxhunting”

Introduction

The DF100 is a simple direction finder designed for ‘Fox Hunt’ events on 2 metres, although could be adapted for other bands. Basically it works by using 2 identical Dipoles parallel with each other and alternately switched so that the signal picked up by each can be heard alternately by the receiver. As the Dipole is rotated there comes a point in which the signal reaching both dipoles is exactly the same and in this way the direction can be ascertained. Although simple in design the circuit is remarkably effective, the only real flaw being that the signal direction could be either in front or behind the dipole! By using a reflector (even your body!) and a careful ear the real direction can be discovered and there is plenty of scope for experimentation in this and other aspects of the design. For more information on Fox hunting/DF equipment check out the web - there's plenty there!

We hope this NARC kit will encourage members to venture both into some construction work and also take part in the fun event that is fox hunting - it does not have to be just a once a year event!

Making it easy.....

A NARC club kit of the all electronic parts, including PCB, is available as a service to club members - the other materials required to make the Dipole etc are readily available DIY materials you will probably already have at home. The kit of parts is entirely optional - you can just have all the information if you want to make it entirely yourself, including PCB artwork (although it should also work on veroboard).

What the NARC kit contains:

- 1 x NE555 Timer
- 1 x IC socket
- 1 x 1K resistor
- 1 x 100K resistor
- 4 x 470R resistor
- 2 x 10nF capacitors
- 3 x 1nF capacitors
- 2 x 1N916 equiv diodes
- 1 x 2 Pole 3 position centre off toggle switch
- 1 x PP3 Battery clip
- 1 x DF100 PCB (needs to be drilled)
- 1 x BNC plug prewired to long length of RG58 50Ω coax (connection to receiver)
- Coax cable to link Dipoles to PCB - these are made from the ample

Cost for kit of parts as above £5

What you need to provide:

- Handheld or other portable 2M radio receiver or transceiver
- 1 x Tobacco tin or similar (Mustard?) for case (must be metal for screening)
- 4 x Lengths of stiff wire for Dipoles (eg wire coat hanger)
- Wood for mounting Dipoles
- Wood screws
- Small pieces of scrap copper clad PCB for Dipole connections

General information

Whilst the club is able to loan basic hand and soldering tools we ask members to bring as much of their own equipment as possible so that those without tools can take part. We have permission to do basic electronic assembly at the club QTH but ‘hardware’ work like drilling and wood cutting must be done at home.

DF100 Direction finder concept and design by Doug G3HUL

Engineering and club project coordinator David Palmer G7URP
Home 01953 457322 / Office 01953 458844 / eMail dpalmer@dcpmicro.com

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NARC DF100 PCB construction

Notes for construction:

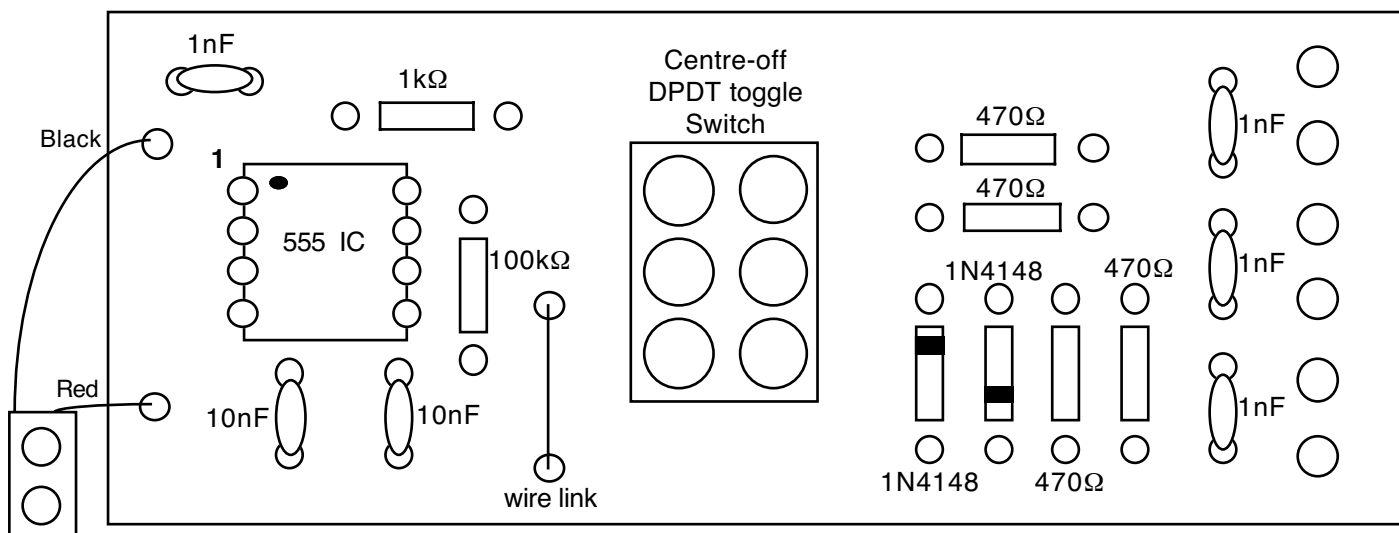
We suggest you start by forming the resistor and diode leads first and then mounting and soldering the 'lowest' components first.

Note that the tracks and pads on the PCB may have a protective clear lacquer which melts away when soldered, so on these you will not need to clean the copper first. When soldering the switch you will need to use quite a bit of heat to solder the legs properly but be careful not to apply heat for too long. It is better to use a hotter iron for less time than a cool iron for longer!

The 555 timer integrated circuit is not especially static sensitive but should still be inserted last. To protect the PCB pads you are strongly recommended NOT to fit and solder the coax cables until you have constructed the wooden T support, aerials and mounted the metal case/tin.

Qty	Component	Value
1	1K CR25 resistor (Brown Black Red Gold)	
1	wire link (use one of the cut off resistor legs)	
1	100K CR25 resistor (Brown Black Yellow Gold)	
4	470R CR25 resistor (Yellow Violet Brown, Gold)	
2	1N4148 / 1N916 equiv diodes (Note polarity line)	
2	10nF capacitors (marked 103)	
4	1nF capacitors (marked 102)	
1	8 pin IC socket	
1	2 Pole 3 position centre off toggle switch	
1	PP3 Battery clip	
1	NE555 Timer (fits into socket)	

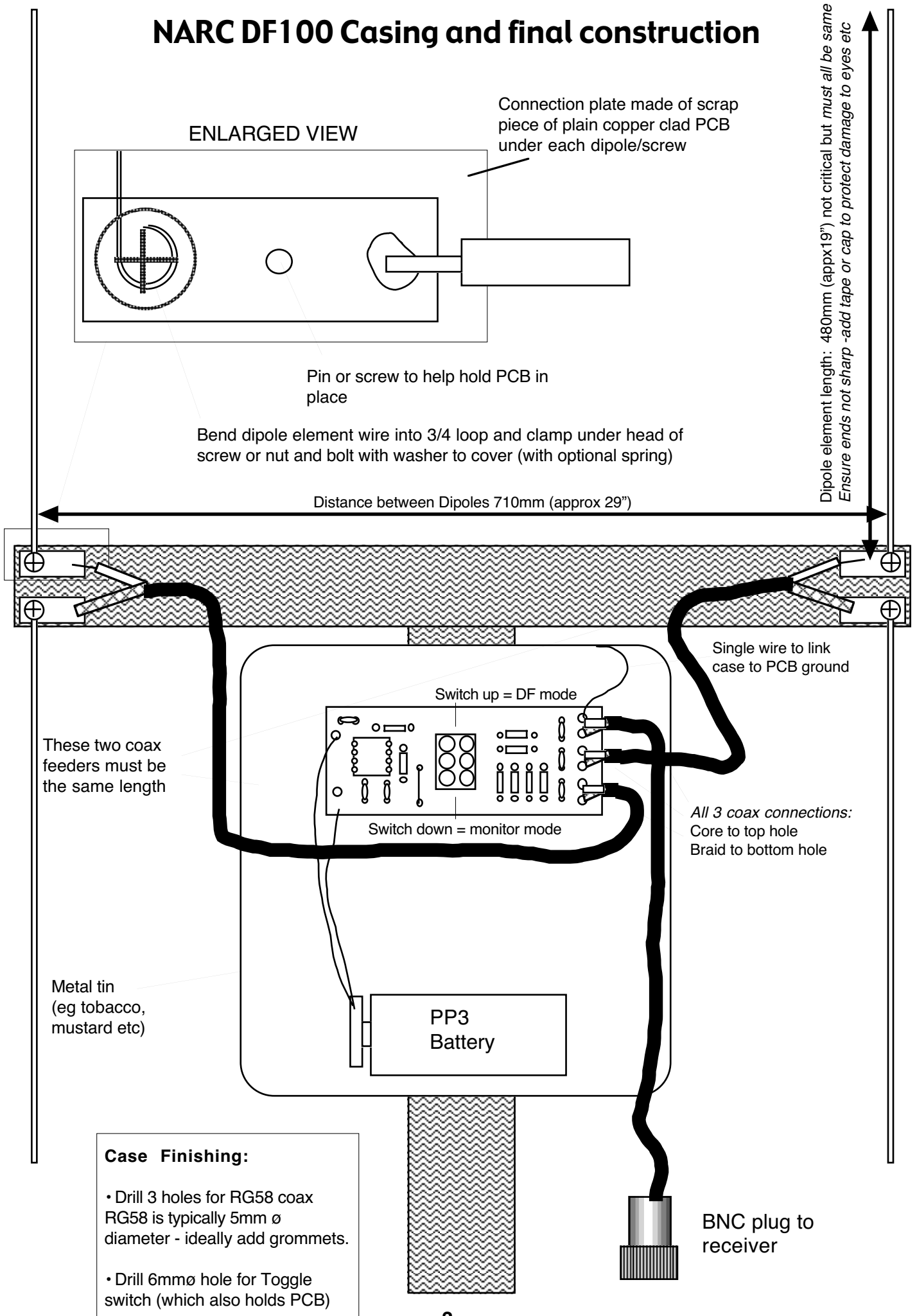
Top (Component) View



Simple test

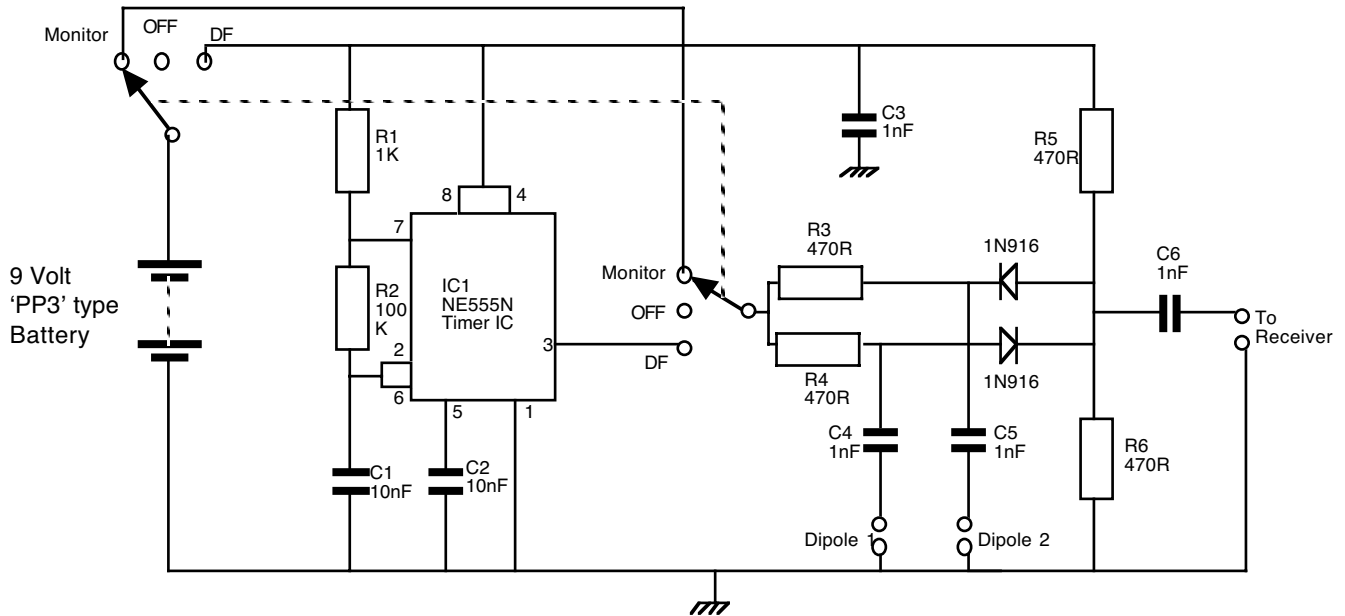
You may want to give your completed board a basic test before final assembly - if you have access to an oscilloscope you can do this easily. After thoroughly checking all parts are located and the battery clip is wired correctly connect a battery to the clips and an oscilloscope test probe to pin 3 of the 555 IC and the ground lead of the scope probe to the Black/negative battery wire. With the toggle switch in either the up or down position the scope should display a square wave oscillation. The rest of the circuit is hard to test but as long as it has been assembled correctly it should all work on completion

NARC DF100 Casing and final construction



- Case Finishing:**
- Drill 3 holes for RG58 coax
 RG58 is typically 5mm \varnothing diameter - ideally add grommets.
 - Drill 6mm \varnothing hole for Toggle switch (which also holds PCB)

NARC DF100 Aerial Switcher



Basic circuit description:

Power is provided by a PP3 9 volt battery switched via a 2 pole 3 position toggle switch wired so that in either top or bottom positions power is connected. IC1 is a 555 Timer IC wired in astable configuration as a square wave oscillator with frequency and mark space ratio defined by R1/R2/C1/C2. The output from pin 3 is fed, via the switch in 'DF position' to a network of 2 diode switches which are connected to the 2 Dipoles. The diode networks are alternately switched (reverse biased) by the square wave output of the 555 so that the signals from two matched dipoles are alternately passed to the output to receiver

The 'Mon' switch position simply connects a positive voltage from the battery to switch one of the dipoles only on all of the time in order that one of the dipoles can act as a normal aerial in order to monitor normal audio transmissions.

G3HUL Test Beacon

This is the circuit diagram for a simple Test beacon suitable for testing the DF100. Please note that Construction details and Technical support are not included!

For more information see Doug Mallett G3HUL.

