88mH Coils, Explained!

By G8MNY  
(Update Dec 07)

(8 Bit ASCII graphics use code page 437 or 850, Terminal Font)

After seeing several buls on 88mH coils, I thought I would explain what they were used for by the millions in the UK telecomms industry.

LINE THEORY
The basic 600Ω 2 wire telephone line system is quite lossy. This is due to too high a capacity between the wires & the copper resistance, this causes high loss & also higher loss at higher frequency than ideal.

![Simple Line vs Loaded Line](image)

The capacitance & resistance value of the wires can't be changed. Reducing the load Z flattens the frequency response, but increases the loss (a useful trick for short music circuits!). But adding series inductance spaced evenly along the line to make the line look like a cut off filter has several effects...

1/ increases the line impedance (matching transformers need for 600Ω!)
2/ substantially reduces the line loss below the cut off frequency
3/ & flattens the comms band frequency response.

![Graph of Normal vs Loaded Line Loss](image)

The standard for cables between telephone exchanges (office) was to use a loaded cable with an 88mH balanced coil every 2000 yards, starting 1000 yards from the exchange & completing the last 1000 yard pi section with a capacitor or a 44mH terminated inductor half section.

![Diagram of Loaded Cable](image)

BACK TO THE COILS
The coils consist of 2 identical bifilar wound windings on a common ferrite core, they are quite high Q, & capable of keeping their inductance with up to 50mA of DC current flowing (which is a lot for a pot core!) which is why they are quite large for the max of 10mW of AF signals on telecomms lines.
Wire colours are normally Black & White Red/Black & Red/White, & it should be quite easy to identify the 2 line pairs.

Pot Core <-----==== 2 pairs
2cm tall ~~~ ~==== of wires
2.5cm dia ~~~

Some coils are ally can encapsulated, others plastic & some not at all.

**INDUCTANCE VALUE**

Watch out for the 44mH ones, as they look much the same other than labelling & have half the 88mH test inductance values below.

```
Centre          Centre
Tap                      Tap
|______ Tap            |______ Tap |
|                     |         |
| L Cancels           | L Cancels |
| L Cancels           | L Cancels |
|                     |         |
| 22mH OR             | 22mH OR |
| 22mH OR             | 22mH OR |
|                     |         |
| odd mH              | odd mH |
```

If just 1 winding is used then you have 22mH. By paralleling the 2nd coil you get half the DC resistance, but the phase must be right!

```
Centre          Centre
Tap                      Tap
|______ Tap            |______ Tap |
|                     |         |
| L Cancels           | L Cancels |
| L Cancels           | L Cancels |
|                     |         |
| 22mH OR             | 22mH OR |
| 22mH OR             | 22mH OR |
|                     |         |
| odd mH              | odd mH |
```

**USES**

So with suitable capacitors they make useful AF filters etc.

They can be used as isolation transformers, not too well isolated, & no good for LF response with low L value.

One can also be used as an efficient voltage step up or a -rail inverter with just 2 transistors in flip flop. Note the push pull gives nearly 100% output all the time so smoothing is not needed in some applications!

```
+12V     55mA     e\ 2k2 2k2 /e
100u === / 22k 22k \ 100mA
```

See my buls on "Passive CW Headphone Filter", "AF 2 Tone Test Osc Design" & also "DC Power Conversions".

Why Don't U send an interesting bul?
73 De John, G8MNY @ GB7CIP