Antenna Workshop

Richard Marris G2BZQ presents an antenna that can be erected in five minutes - indoors/outdoors - horizontal/vertical - or you can just hang it out of the window. As a plus-point it also tunes to the 7MHz band.

This project all started with a requirement for a quick assembly (about five minutes) utility antenna for 3.5MHz c.w. It seemed to be a great idea to be able to quickly erect a simple antenna, a little under five metres (16ft) in length, in under five minutes? But to achieve this an end-fed antenna would have to be loaded and needed a good earthing system.

However, when I took a look at an ancient coil of 300Ω flat-twin feed-line, which had hung on the garage wall for several years, suddenly the thought occurred that around five metres of this contained a total wire length of some 10m, if the end were soldered together. Such a length of wire, can be formed into a loop of a little under three metre diameter, which experience showed that it would produce a very effective tuned loop for transmission and reception.

So, I wondered, why not try an experiment, using the 300Ω twin as a long thin elongated loop antenna? Using this twin feeder as the loop would have some useful capacity between the twin wires (see later) and if it performed as a transmission loop antenna, it would be a design that wouldn't be so 'earth conscious'.

The schematic, if I may call it that, is shown in **Fig. 1** and the circuit couldn't come much simpler. Every item I used, came from the 'junk box', though once it was found that the idea worked quite well, a small investment was made in a new length of twin feed-line and a piece of copper clad board to serve as a base mounting plate ... about the price of couple of beers!

No TVI Or BCI

In the event, the prototype, described here, worked very well when coupled to a 3.5MHz 10W c.w. transmitter. There was no TVI or BCI noted. It also produced a low noise level on receive. This was no doubt due to it being a comparatively narrow bandwidth device. As a bonus, I found that it would also tune and load on the 7MHz band.

With a piece of nylon cord attached to the far end, the antenna could be erected in about five minutes. And, unlike many 'short' antennas, it was very docile in loading up with from the transmitter and in its operation.

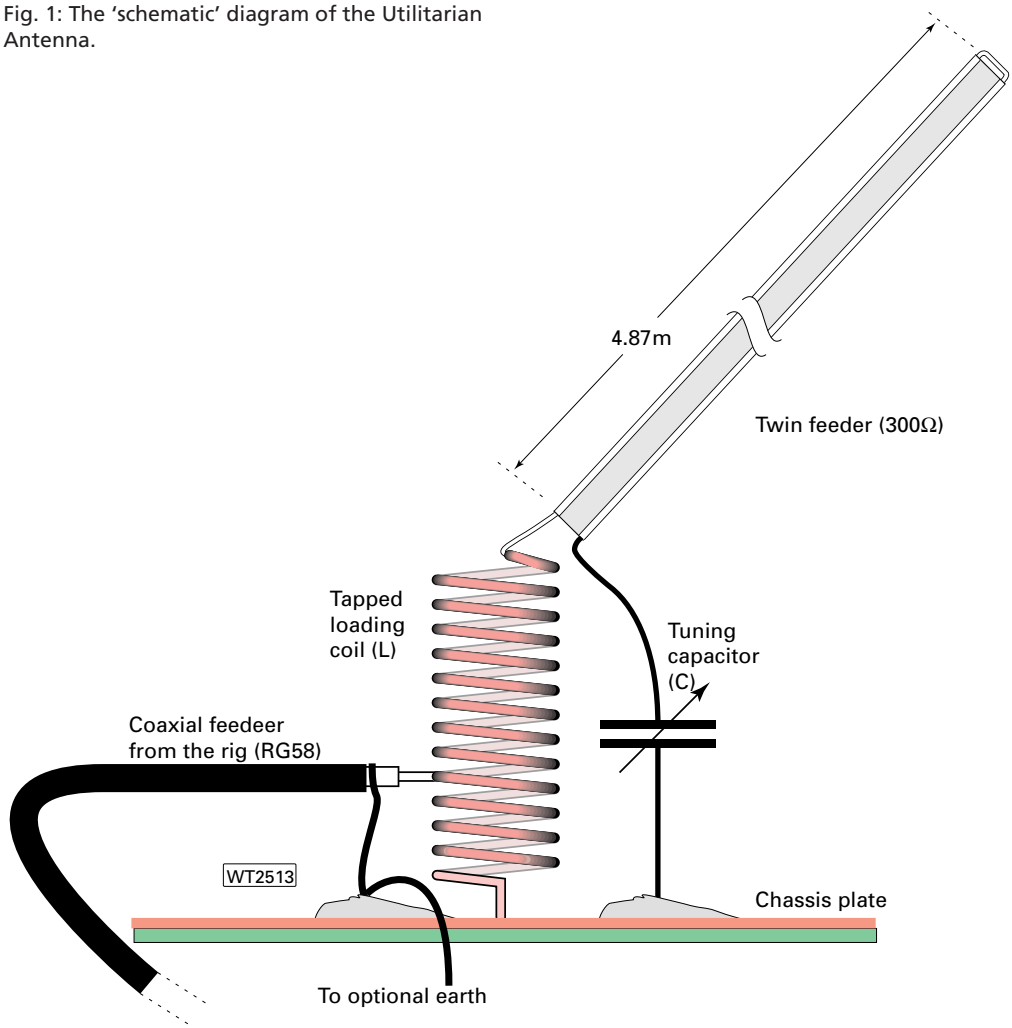
Let's just take a detailed look at the 'circuit' of Fig. 1. The antenna consists of a 4.87m length of 300Ω feed-line, shorted at the far end, by soldering the two feed wires together. If carried out carefully, this operation can provide a small eyelet, through which a length of thin nylon cord can be secured. This then acts as an end support to the antenna.

One side of the feed-line is connected to the variable capacitor 'C' to tune the antenna. The other feed-line end wire is connected to coil 'L' with a short length of RG58 coaxial cable tapped up from the bottom, to 50Ω, for connection to the transmitter. Both 'C' and 'L' are firmly secured to a copper clad board baseplate.

The 300Ω feed-line has a quoted capacity of 13.2pF per metre between the two wires. As a result we have approximately a total capacity of 63pF spread evenly over the full length.

Variable capacitor 'C' was a two-section, 410pF per

Fig. 1: The 'schematic' diagram of the Utilitarian Antenna.



section and conveniently fitted with an inbuilt slow motion drive. Only one section is used, though if the other section is connected in parallel, with the one used, it's possible to cover 'Top Band'. But, on this band, the performance is not good, however, it might be okay for local working.

One Section

Although I used one section of my junk-box capacitor, you could also use both sides of a dual 210pF per section unit. In fact almost any robust variable capacitor would suffice, providing it had good insulation, plus air spacing between the plates. A capacitor with a total value of between 350 and 500pF would be satisfactory.

Preferably the capacitor should have a slow motion drive, if not you can add an external one instead. As the unit isn't at an r.f. 'earth' potential, then to minimise hand capacity detuning effects, an insulated shaft to the tuning knob is necessary.

The illustrations of **Fig.**s **2** and **3**, show the simple layout of a piece of copper clad board (250 ×180mm). The tuning/loading coil 'L' is wound using 2mm (16s.w.g.) tinned copper wire close-wound on a piece of 22mm o/d tubing, using 20 close-wound turns, with a 50mm tail at each end. When this is removed from the mandrel, it will spring out to some 25mm diameter. The turns should be carefully pull-spaced, to an eventual one wire diameter spacing. This action makes the coils some 75-80mm long.

The ends of the coil should then be bent and mounted as shown in Fig.s 2 and 3, with one end soldered to a screw or solder post on the 25mm long insulated pillar. The other end of the coil should be mounted to keep the coil around 25mm from the baseboard. where the other tail should be securely soldered to the copper clad base plate.

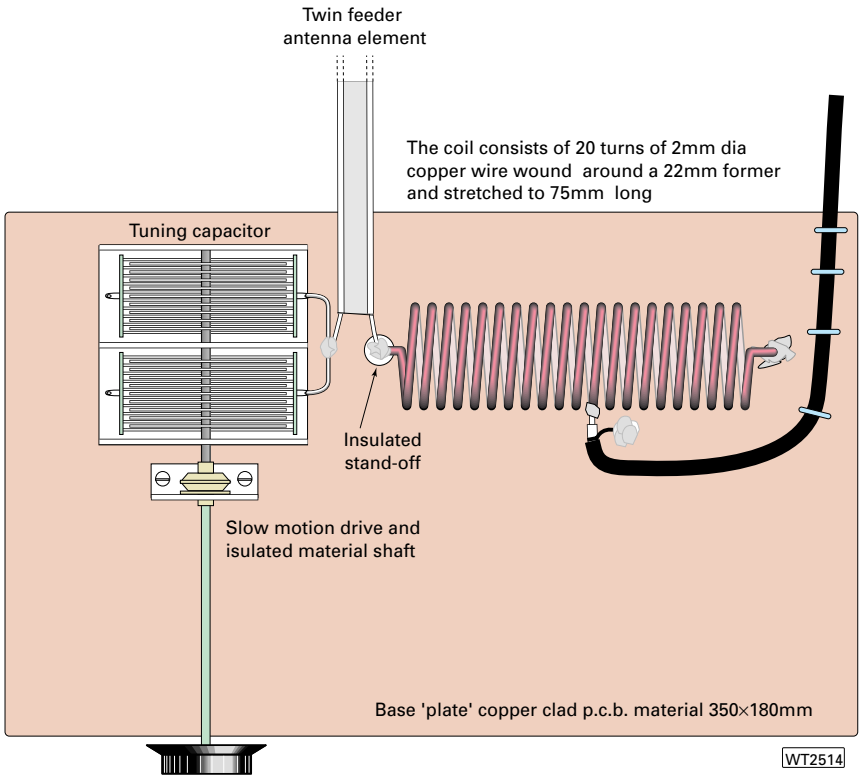
After soldering the outer shielding to the copper clad base plate, the coaxial cable should be secured with cable cleats, as shown. The coaxial cable also can also be folded when not in use and secured with a rubber band. But now you're ready to begin the testing phase!

To begin the next phase, the position of the coaxial cable tap will be found during testing but, at the assembly stage, should be lightly secured at 10 turns from the bottom. (In fact this was the final position on the prototype). Now all that's needed for testing is a transmitter, receiver and a field strength meter.

Hang the antenna with a length of nylon cord to a suitable in-room fixture, for initial testing. Tune the receiver side to about 3.55MHz and rotate the variable capacitor for maximum signal/noise. If using a separate transmitter, tune it to the same frequency as the receiver and match it into a 50Ω dummy load.

Substitute the antenna for the dummy load and feed a small signal into the antenna, which should produce a reading on the field strength meter (f.s.m.). It's just possible that it may be necessary to re-adjust the antenna variable capacitor minutely, by noting the radiated output on the f.s.m. Increase the transmitter power, as required and re-check.

Note: the simplest and best method of tuning up is by measuring the radiated signal on the f.s.m.



● Fig. 2: Looking down on the baseboard shows the location of all the parts.

Testing Phase

During the testing phase of my original prototype, using the initial 'lashed up model' with the antenna draped over the back of three chairs, in a rough semi-circle, a DL station was heard calling QRZ? on the same frequency. A quick call to him produced a short QSO which was, certainly, not in the script!

In practice, the antenna wire can be hung vertically, horizontally or down (such as out of an upper window) or at any angle in between. An optional earth connection can be made as in Fig. 1. However, it didn't appear to make any difference to performance. No doubt this is because the antenna works as an elongated tuned loop.

Although not earthed at the antenna, the equipment is earthed in the usual way to maximise safety. I've found that the antenna 'loop' can be slung up indoors or outdoors (or part in, part out). It's very versatile ... as intended.

Don't forget, the most satisfactory way to load up the transmitter is to record radiated output on a field strength meter. Enjoy using your 'Utilitarian'!

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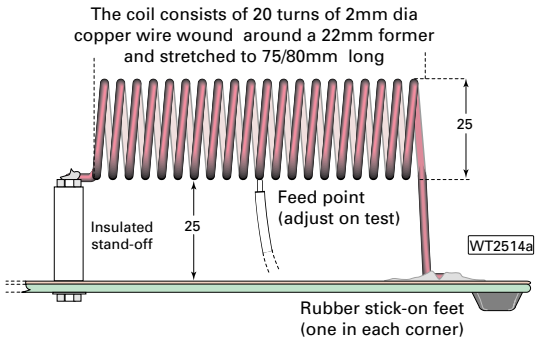

● Fig. 3: The tuning/loading coil should be mounted so as to be parallel to and about 25mm away from the baseboard.