Adding Top Band to the inverted-L Antenna

Len Paget GM0ONX extends the coverage of his inverted-L antenna, which he first described in the February 2004 issue of *PW*.

As sunspot activity slowly declines to its 11-year minimum, more and more h.f. activity drifts towards the l.f. bands. Although fairly active on 3.5 and 7MHz, until very recently I had never the opportunity to work 'Top Band' (1.8MHz or 160m). Having a small garden, traditional full size antennas such as dipoles, long wires and Beverages for this band are out of the question leaving me to believe that working Top Band was alas only for the fortunate few with big gardens and not possible from my QTH.

In the *ARRL Handbook* **A.C. Buxton W8NX** describes one possible solution to the problem in the form of a compact trapped dipole for 1.8, 3.5 and 7MHz, but at nearly 38m long, it was still far to big for my QTH. However, the concept of adding an additional trap to what was basically a W3DZZ antenna planted the question: could a similar solution work with my inverted-L?

Considerably Shortened

The W8NX antenna used a special high *Q* 3.5MHz coaxial trap, which although it considerably shortened the overall length of the antenna it also reduced the bandwidth on 3.5MHz to a mere 75kHz. I considered this compromise undesirable as my original inverted L antenna had an excellent performance on 3.5MHz and I didn't wish to compromise this too much. Instead I elected to leave the original design of my inverted-L antenna featured in February 2004 *Practical Wireless* virtually unchanged and add a conventional 3.5MHz coaxial trap and pay the penalty in extra antenna length.

The coaxial trap for 3.5MHz follows the same format as the 7MHz trap previously described in *PW*. It's constructed from 20 turns of RG58 cable on a 40mm pvc water pipe former. If you've not got that issue to hand, I've shown both traps, in **Fig. 1**, which shows the construction of them. These traps are capable of power limits well in excess of the UK limits.

In making up the traps, the 3.5MHz trap, like the 7MHz trap, I described in the first article, is sealed with silicon bathroom caulking, and wrapped with insulating tape (**Fig. 2**). It's added to the end of the original inverted-L antenna, along with an additional 8.54m length of 2mm diameter (14s.w.g.) wire - see **Fig. 3**. The final length will vary a bit from location to location because not only is there a shorting effect caused by the inductance in the 3.5MHz trap, there will also be a significant capacitance effect on 1.8MHz as the antenna is close to ground.

At my location, it was also necessary to install it with a slight 'dogleg' in the antenna, run as you may well be able to see in the heading photograph. So, I have most of the additional section running over the roof of the house - further adding to the capacitance effect.

Tuning The Antenna

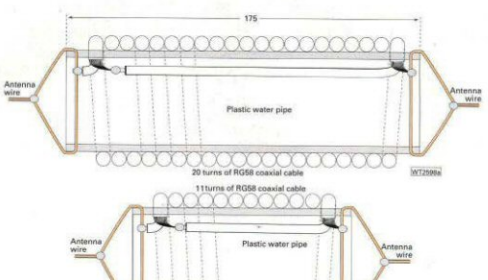
Tuning the antenna is quite simple and is basically a repeat of the process described in the February 2004 article, except it shouldn't be necessary normally to revisit the 7MHz section. The 3.5MHz section of the antenna should be checked for resonance and you will probably find that the resonant frequency has moved slightly due to the presence of the 3.5MHz trap. My principal area of interest is the s.s.b. and DX window end of 3.5MHz so I retrimmed that section of the antenna to bring it back into resonance at this end of the band.

The extended 1.8MHz section was cut to resonate at 1.9MHz and gives a standing wave ratio

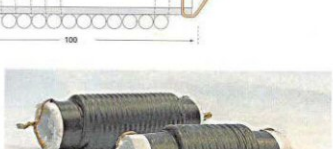
(s.w.r.) no greater than 1.5:1 over most of the band. But enough of the rag-chewing, does the additional section work? Well yes it does - surprisingly well considering its size and the low mounting height. Like all inverted-L antennas, it really needs a good r.f. ground however, dependent on your soil type, it's not always essential to install a earth mat or ground planes.

The original prototype of this antenna was dependent on a single earth rod into clay soil as its r.f. ground, but even with these limitations I managed to work in my first week ON4 (Belgium), LX1 (Luxembourg), OZ8 (Denmark) PA0 (Netherlands), LY2 (Lithuania) and 15 (Italy) plus most parts of the UK. However, after speaking to a number of stations on 1.8MHz it became clear that the received wisdom dictated that I should install 'ground plane' wires below the ground to further improve performance.

Ideally, groundplane wires, or radials, should be at least λ/4 long and run out radially in a circular pattern, but it's not possible to do this at my QTH. So, I went for what I could get, which was about half a dozen ground plane wires no longer than 10-15m in a 90° arc. It's difficult to say if it made any difference as I had a good natural r.f. earth and it was not practical to switch them in and out for a comparison. If however, you have dry sandy soil you will certainly require some kind of additional r.f. earthing to get an acceptable performance on Top Band.

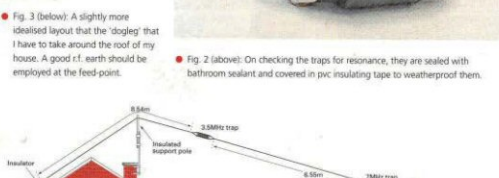


- Fig. 1 (above): The 'new' 3.5MHz trap is constructed along the same lines as the 7MHz trap (bottom) that I've described previously. For the new trap (top), some 20 turns of RG58 are made on a piece of 40mm diameter water pipe. The ends are sealed as shown in Fig. 2.



- Fig. 2 (above): On checking the traps for resonance, they are sealed with bathroom sealant and covered in pvc insulating tape to weatherproof them.

- Fig. 3 (below): A slightly more idealised layout that the 'dogleg' that I have to take around the roof of my house. A good r.f. earth should be employed at the feed-point.



Not Familiar?

For those not familiar with Top Band, most of the inter-G sideband voice 'rag chewing' activity takes place above 1.90MHz (typically 1.930-1.950MHz) with s.s.b. DX activity being below this, particularly the window between 1.840 and 1.850MHz. The usual bottom 30kHz as usual is reserved for Morse. Readers are reminded that in the UK we are only Primary User in the 1.810MHz to 1.850MHz section with a power level of 26dBW (400W) peak envelope power (p.e.p.) and that we are Secondary Users with a reduced power output of 15 dBW (32W) on the rest of the band. Foundation and Intermediate Licensees are of course restricted to their usual power limits of 10 and 17dBW (10 and 50W respectively). Even with the low power limits on most of the band, it's amazing how far you can get when your not competing against high powered stations.

If you haven't got the room for a big 'un, this pint size antenna will get you on to Top Band and is well worth the time and minimal cost to erect it. Even with the high noise levels Top Band is a pleasant alternative to the 'bear pit' that 7MHz has become and is an ideal band for those all important 'rag chews' particularly in those winter evenings. See you on the bands! **PW**