CONVERTING THE CB BREMI BRL15 ANTENNA MATCHER FOR QRP OPERATION ON THE HF BANDS HF Bands

G8ODE RSARS 1691

The BREMI Antenna Matcher was a £1.00 bargain from the October Kempton Park Rally purchased after Mike Buckley and I had started to close the RSARS Stand. The size and shape reminded me of the twin meter Power & SWR units that were on offer some 20 years ago. I suspected that the two tuning knobs were connected to miniature variable capacitors often found in modern domestic transistor AM radios. This assumption proved to be correct when I later opened the box at home. Inside I discovered that the two SO239 connectors were soldered to a paxolin PCB with the two 250pF capacitors. A spiral inductor was also etched on this PCB, and a small fixed value capacitor formed the remainder of the circuit.

Some while ago after I had acquired an FT-817 QRP rig, I joined the FT-817 Yahoo Group. The group is very active and provides a good reference for all sorts of information about the rig but also about operating it in various ways. Here I discovered a kindred spirit in Rick McKee KC8AON from Ohio. On his Web site, his QRP Project MINI-T-Match Tuner had caught my eye. He design uses two of these miniature capacitors, albeit his were 300pF, and a home brew 35 turn coil on a 1 inch former. Rick's design is by no means original, but looked like a good starting point for my mod to the BREMI.

Having decided that the BREMI could be converted into an HF T-Match design, my challenge was to design an inductor that worked with the existing 250pf capacitors (value confirmed with my Autek VA1 Antenna Analyser). There was space inside the case but not enough for an 1 inch former. I had also seen other designs on the WEB using small red toroids. Although I had some that were possibly suitable, I decided against using these, because making a suitable small inductor with 12 taps looked too daunting. I liked the idea of an air core inductor and knew of a web site that would enable me to easily design a single layer close wound coil with the correct inductance.

Using http://my.athenet.net/~multiplx/cgi-bin/airind.main.cgi, I determined that Rick's 35 turns on a 1 inch (25.4mm) diameter former using 1mm wire produced an inductance of 19uH. Now with the space I had, all I could readily fit would be a former of about half that size. After rummaging in the garage I discovered a piece of flat conduit with rounded sides. Previously I had used some and discovered

that you could deform it into a round 15mm diameter tube. Armed with this fact I entered the dimensions into the above link and discovered I required 90 turns of 0.9mm wire for 20uH

The problem with using the 0.9mm diameter enamelled wire was forming the taps every 6-8 turns and still maintaining a close would coil. What was required was a thinner gauge of wire, and some means of creating neat taps along the coils length. Being from a telephony and communications background I had some spare 2 pair indoor telephony cable. This has thin single core plastic coated wire. The insulation is quite thin since the maximum working voltage it is normally only 50v DC, with at times a 25 Hz 75 volts AC ringing voltage superimposed on the DC. A test wind of 90 turns with no taps easily fitted the 118 mm piece of conduit I needed to use.

The next snag was how to strip the wire and form the turns. To create a neat tap I cut the wire about 10mm beyond where the taps needs to be. Then stripped off th 10mm of insulation, and did the same to the other wire. The two bare ends were then twisted together and soldered. Once the wires are soldered together you can continue winding, and you leave behind a neat pre-soldered tap. Using this method I continued winding and created the remaining 11 taps. Astonishingly enough the 90 turns of telephony wire yielded an inductance of 20uH.

The design required a single pole 12 way switch, and I had already checked that the this could be installed between the two tuning capacitors. This required some careful measuring to position the two new holes used for the screws to secure the switch in its final position. The switch shaft was cut slightly longer that those of the capacitors, and put the switch knob slightly forward, making it easier to operate the switch. This can be seen in the accompanying pictures.

With the various parts prepared the final job was to modify the PCB to create the T-match. This required a few cuts with a sharp scalpel and a couple of bridging links. Once this was done the next task was to install the new inductor coil. This was achieved by pre-wiring the 12-way switch, and then soldering the ends to the taps in ascending order i.e as the switch is rotated clockwise the inductance will decrease.

Having successfully assembled the BREMI it was time to test it. I decided that I would initially use my existing G5RV which has not been optimally tuned, and thus would present a variety of impedances that I would have to match. I also thought it prudent to use the Kenwood TS50 with its robust PA stage, and operate it at 10 watts, which would be double that of the FT-817 QRP rig, and thus have a good safety margin when it was time to try it out with then FT-817.

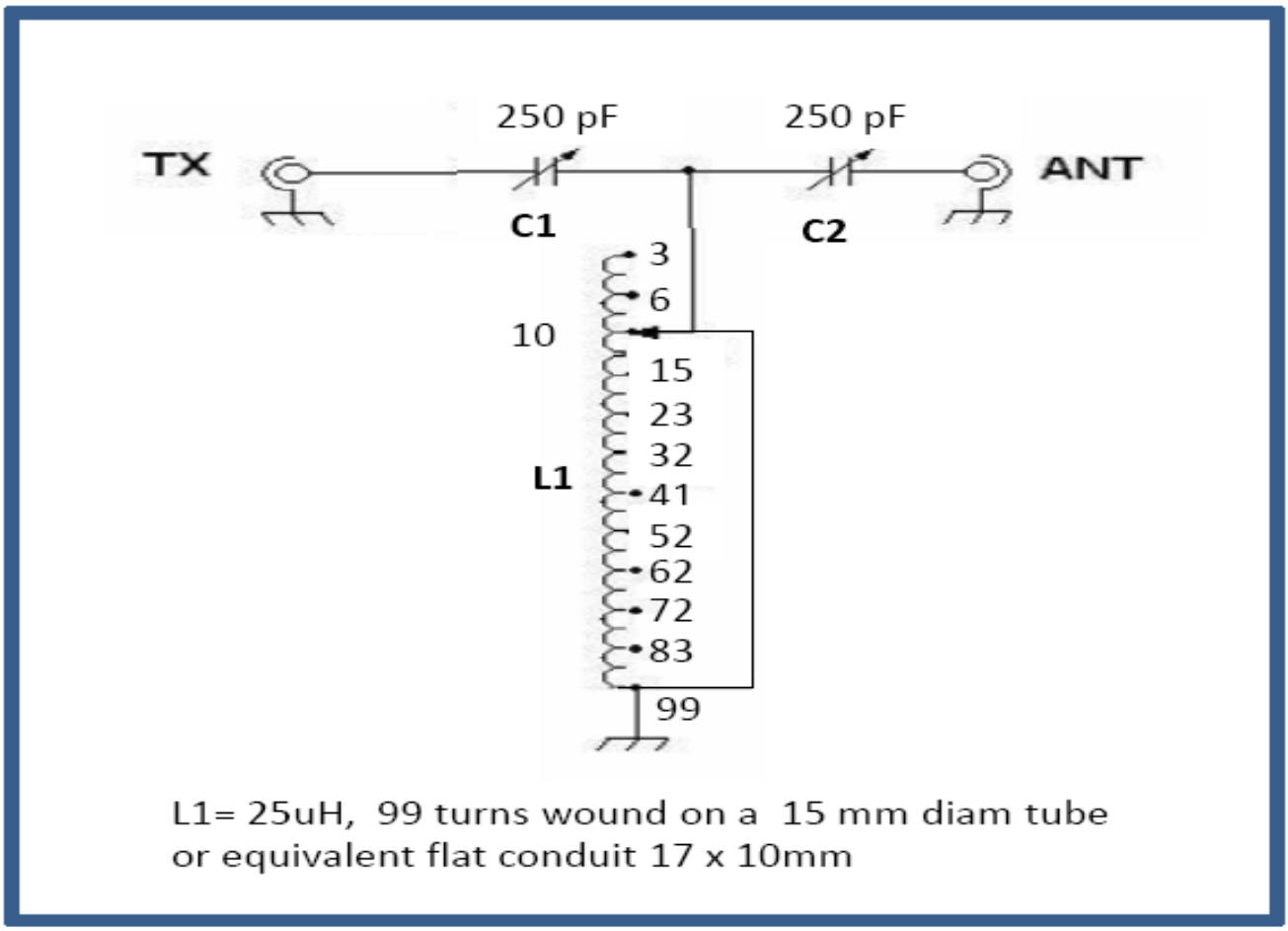
To may surprise I could tune almost all the bands apart from 20m and some of the WARC bands. The fact that 20m did reduce the SWR below 2:1 was rather a disappointment.

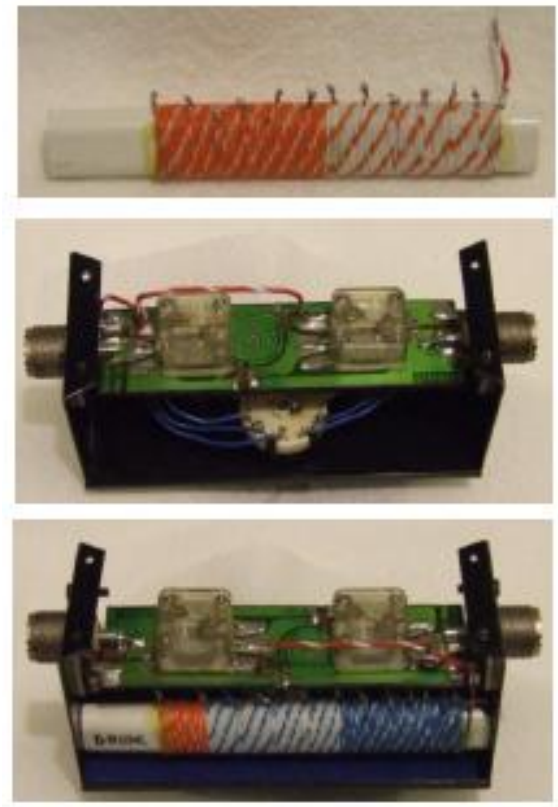
The root cause seemed to be that the lowest tap was at 6 turns. This was obviously too big. So a Mark II coil was made, and the inductance increased to 25 uH with 99 turns. The taps now started at 3 then 6. This has proved to be the winner.

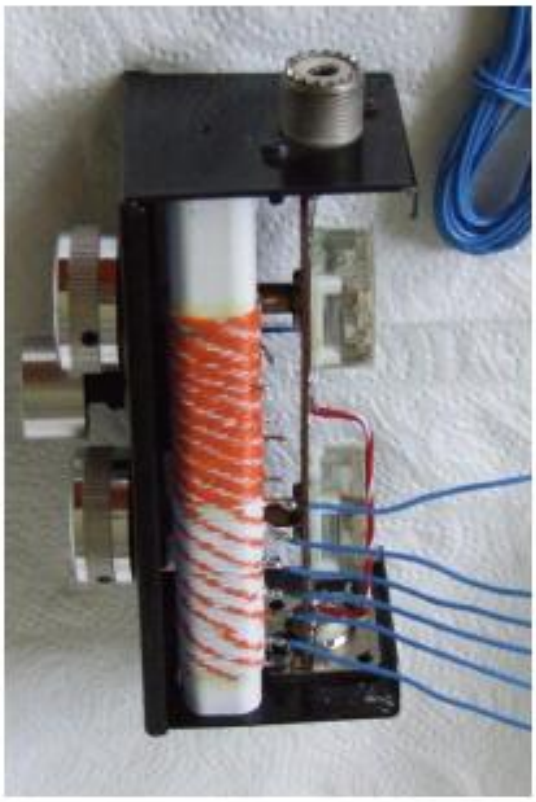
I can now tune the G5RV on all the HF Bands between 80-10m, and as a bonus tune the G5RV on Top band as well. After this success I next tested the BREMI on a 42 inch telescopic whip – shown in the accompanying picture. I found that with a bit of practice this would also tune on 80-10m bands. OK this is not the best antenna, but it did “tune” it. Yes, will be a little deaf compared to the full size antennas, but it did receive reasonably well. I had similar successes with a 3 m and a 6 m long wire strung up to a nearby bush at about 2 metres above the lawn, a\nd of course the obligatory counterpoise of a similar size.

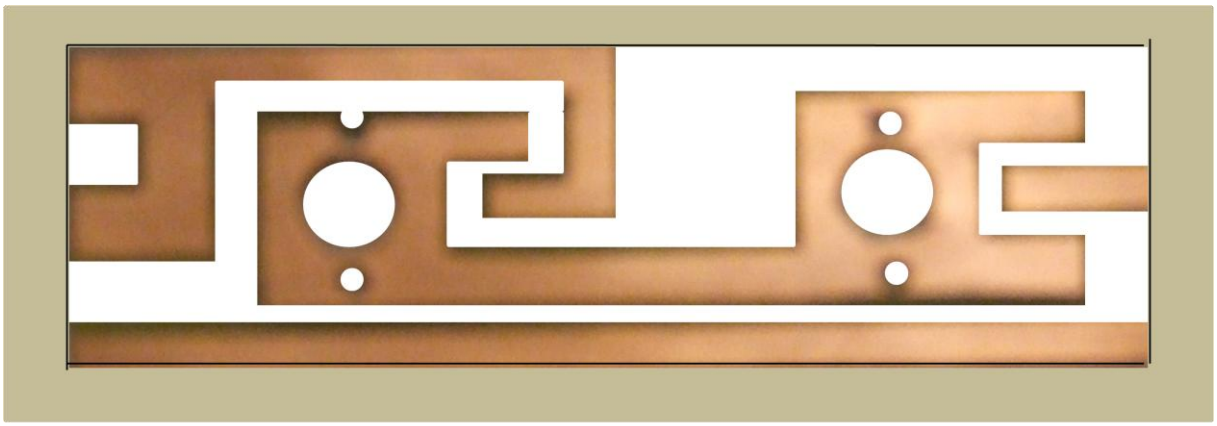
However my joy did not last long. I like all my PCB soldering to be free of any flux and odd solder splashes, so I decided to clean the PCB with isopropyl alcohol. This turned out to be my undoing, as the next time I operated the BREMI two tracks arced over and the PCB became charred, making it unserviceable. So in the final photographs you see the new glass fibre PCB I designed and etched. The BREMI had to undergo a total rebuild but it now works just as before, but the tracks are spaced further apart, so the tracking problem should not occur again.

The coil is tapped at 3, 6, 10, 15, 23, 32, 41, 52, 62, 72, 83, 99 turns.









Mark II BREMI HF Mini-T G8ODE

In conclusion the project was a joy to build, cost very little and works really well. Not that I want to compete with the likes of the Miracle Whip (Copyright), but this little BREMI box appears to out perform it, since it can not only tune a 42 inch whip but also a range of other antennas as well for a costs that are significantly less.

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