ALTAI SWR-2T Modified for Amateur HF Bands

Not so long ago I decided to buy a Yaesu FT-817 QRP rig to explore going portable" and managed to buy a used one from a respectable dealer on eBay. This led me to looking for a compact antenna matching unit, and culminated in the conversion of a CB antenna matching unit for Amateur HF band use. This is now published by the RSARS in Mercury called CB BREMI BRL15 Antenna Match for Amateur Radio HF Band Operation. This new "tuner" worked far better than I had expected, but requires a SWR meter in order to use it. Although the FT-817 has SWR metering this is on an LCD display as a row of "lumpy" pixels. It was thus possible to "tune" the antenna, but my preference was for a traditional SWR meter with a moving coil meter to go with it as this is more provides better indication of the SWR reading.

Regular members of the UK RSARS 80m Net will know earlier this year I managed to convert another CB SWR/ Power meter. - Zetagi HP-201 to use with my Vector 500 linear amplifier. This uses a two toroid tandem coupler design originally patented by Sontheimer and Fredrick in 1969 see http://www.g3ynh.info/zdocs/refs/Sontheimer/us3426298.html

The ALTAI SWR-2T I obtain for this project uses the same circuit as the Zetagi but is mounted on tailored printed circuit board. A cut-out was necessary to provide clearance for the bottom of the meter. This can be seen in the photos as can the insulation tape technique I employed to mask of the areas of copper prior to etching.

The Altai meter case measures 80x55x55 mm, and the two rear mounted SO239 connectors are spaced with their centres 55mm apart. This presented a challenge since the two toriods I had were 22mm diameter and 9mm thick. Initially these were stacked one above the other, and a piece of 2.5mm copper wire was formed into a humpback shape linking the two connectors to carry the toroid. This solution proved to be a mistake later on.

The coupler requires 30 turns of wire on each toroid to provide the required sensitivity at low powers. Teflon coated silver plated wire was used because the toroids have sharp edges, and this is a better solution that trying to wind Teflon plumber's tape onto the toriods to provide protection for the wire.

The etched PCB has to be tinned to protect the surface. I used a special soldering bit that has a T-shaped oblong block of copper at the end. This is used like a scraper to spread the solder out over the pre-fluxed copper laminate. With a steady drawing action the PCB will become evenly tinned. The result is not quite as good as a roller tinning machine produces but it's very acceptable.

After pre-installing the upper torroid with the 2.5 humpbacked shaped wire, I could see that there was still space to fit the second toriod. This was supported by a short piece of coax mounted on two stand-off supports. The supports were made from two short pieces of 1mm wire that were bent into a hairpin, and then into an "L" shape in order to solder them to the PCB. At each end of the coax the centre core was threaded through the eye of the "hairpin" bend end and soldered. The coax with the supports attached was then soldered to the PCB. The coax braid at one end was removed completely, and at the other end it was stretched to form a tail and soldered to the earth connection point.

The Resistors and OA91 germanium diodes were tacked onto top of the supports. This elevated these components and saved a bit of valuable space. The two disc ceramic capacitors were then added, and the toroid's winding's ends were finally terminated.

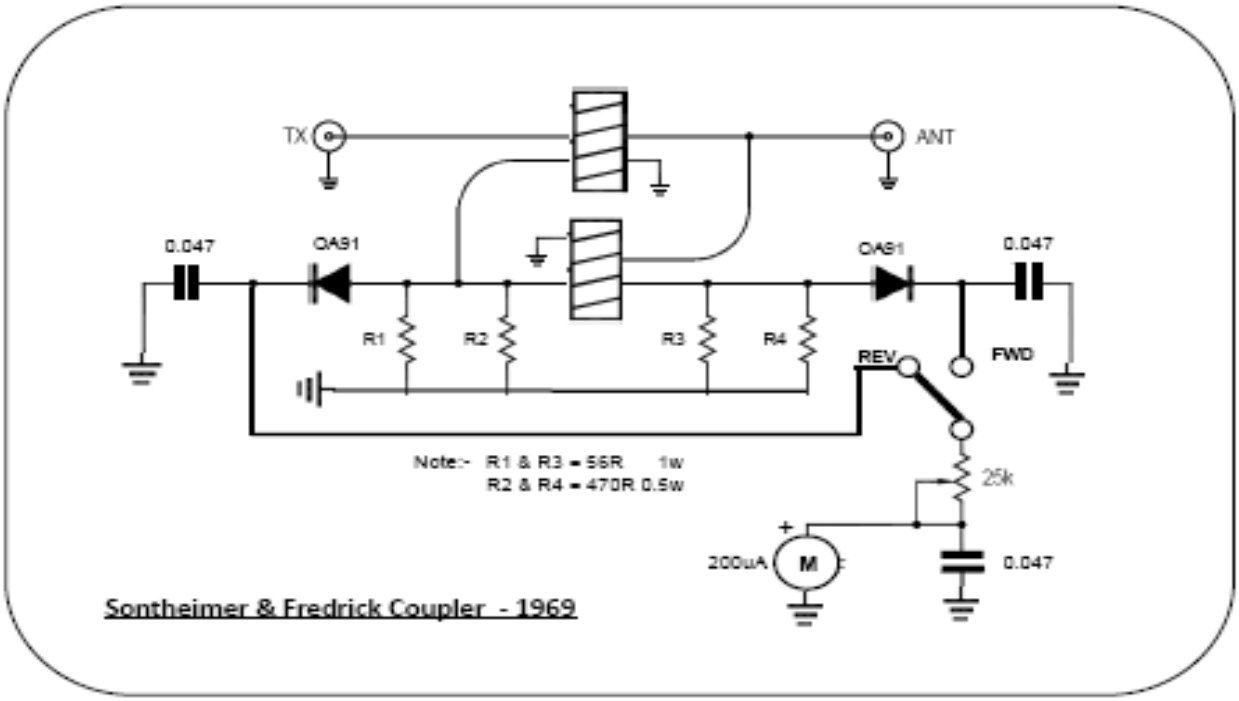
To test the meter I used my Kenwood TS 50 set to 10 watts and a PL259 ended 15watt dummy load. Initially the results were encouraging with the 80m, 40, 30m 20m checks all looking good with SWR readings close to 1.1:1. However on the higher bands the readings started to show an ever increasing error, when at 28.5 MHz the Meter showed the SWR to be 2.5:1.

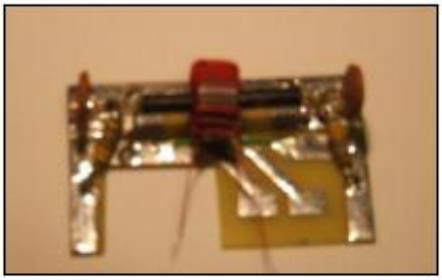
I soon realised that the source of my problem was that short humpbacked piece of wire I had used earlier. It should have been a short piece of coax. The only problem I could see in doing this was that it had to be self-supported, and secured by the centre core. There would also be extra strain because it would need to be arched to elevate the torroid above the lower one.

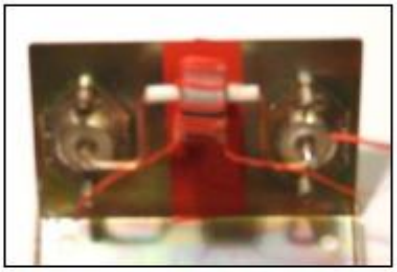
Mini-8 coax fitted this bill perfectly. It has a fairly thick stranded centre core. Once this short piece of Mini-8 coax was installed and soldered in. The tests were then repeated and this time the results were perfect. All the SWR readings were 1:1 right across the whole of the 3.5-29.9 MHz.

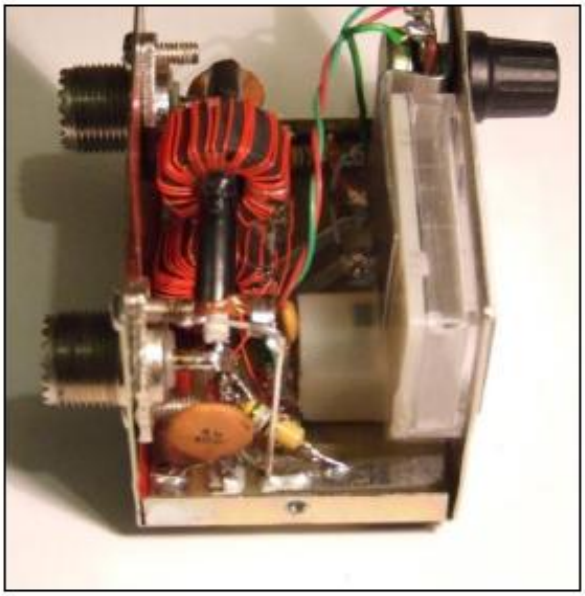
Later to make sure that the Altai SWR meter read correctly for other SWR readings, I connected a proprietary SWR meter in series with the modified Altai and tested it using my not so perfect full sized G5RV. This presents difference impedances on each HF band, and is still a little too long on 20m so a "tuner" is still required. By slowly adjusting my Welz Network Matcher - "tuner"- it was possible to see that the two SWR meters tracked each other fairly well on each band, and this proved that the mod was a success. This was a truly pleasing result, worth all my effort, and it only cost me a £1:00 at the last Kempton Park Rally and all the other bits were found in the junk box.

The Circuit Diagram for the Altai SWR Meter Conversion









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