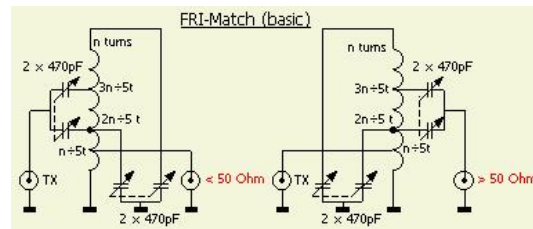
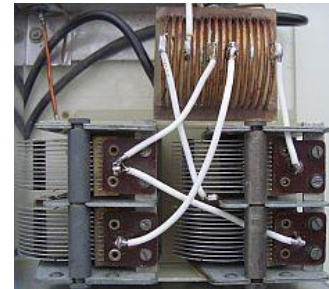
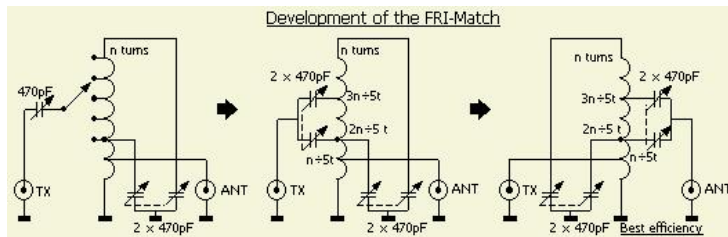


FRI-Match ATU, a single-coil Z-Match type:

(Freematch line matching unit etc. published in RSGB's RadCom 1989 July)



DESIGN



This ATU, I call my design FRI-Match, has been devised in 1972 as an unbalanced tuner for improving the SWR at the transmitter end of coaxial feeders to resonant antennas (vertical dipole, trapped dipole, G5RV, Yagi loop quad etc.).

Surprisingly, this single-coil-matching unit seems to have attracted relatively attention when it appeared in the RadCom 1989 July TT. In view of the current interest in this approach it seems worth repeating this pioneering 1989 item.

It is a modified version of the well-known Z-match and is designed as the result of many experiments in reducing the SWR between 3.5 and 28 MHz (incl. the WARC bands) without the necessity for switching coils and with a minimum of knobs.

Tom Seed, ZL3QQ, has published a basically similar approach with a detailed explanation of the theory of operation in BREAK-IN March 1992. Bill Orr, W6SAI, has featured this ATU in the August and September 1993 issues of CQ.

COIL INFORMATION

Long	4.5 cm	5.5 cm
ID	5 cm	4 cm
Turns	15	15
Taps on	3, 6, 9	3, 6, 9

The coil is made with: 15 turns of 2.5 mm diameter enamelled copper wire or 6 mm tinned copper wire, 4.5 cm long with 5 cm ID or 5.5 cm long with 4 cm ID. Taps on 3, 6, and 9 turns from earthy end.

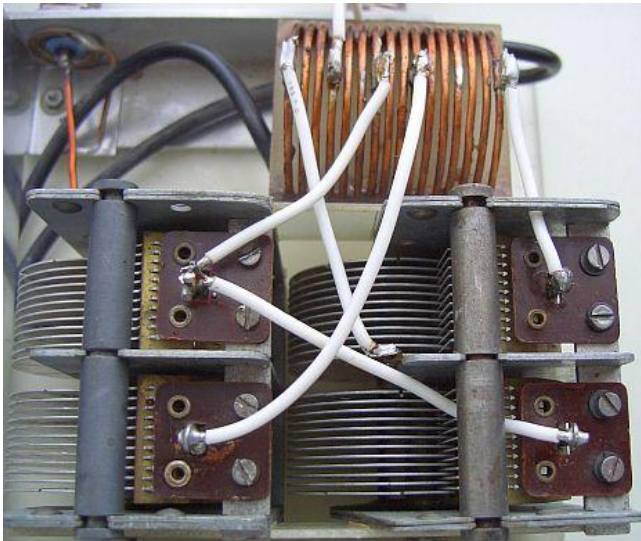
CALCULATION OF THE TAPS

If random sized 5 – 8 μH coils with n turns (see PE1ADY's ATU) are used the taps for equal efficiency on all bands should be at:

Coil	Random size but: $\pm 5 - 8 \mu\text{H}$
Turns	n
Tap 1	$n - 5$ turns from earthy end

Tap 2	2n	5 turns from earthy end
Tap 3	3n	5 turns from earthy end

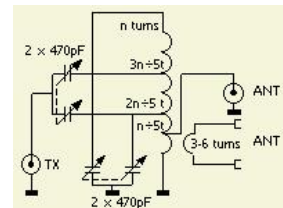
PRACTICE



It is essentially a "kiss" approach cheaper and almost faster than an automatic ATU provided that the calibrated settings on each band for minimum SWR are known so that the capacitors can be quickly reset.

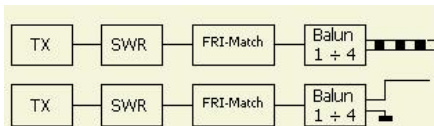
In practice the ATU has proved more flexible than expected and in many cases permits matching to non-resonant antennas.

With an extra 3 – 6-turn bifilar winding over the earthy end of the coil (fig») a "balanced" output for 50/75 twin wire or 300 ribbon feeder is feasible.

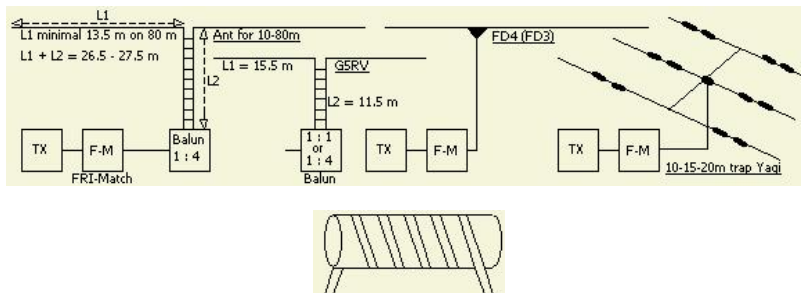


However, it should be noted that this design couldn't satisfy all possible conditions such as random length wires and antennas. This can sometimes be overcome by increasing or decreasing the length of the coaxial feeder or ladder line and/or reversing the input/output terminals of the ATU. To meet all possible matching conditions a more complex arrangement should be necessary.

MATCHING ANTENNAS



With this FRI-Match I do not recommend the use of a coupling coil but have the preference for a suitable balun at the output of the ATU.



The coiled ribbon performs similar as a choke balun.

If limited space in the back garden occurs eventually rolled up the ribbon.



Bij plaatsgebrek oprollen

TOROID

A toroid, self-shielding because of its low external field, facilitates compact construction. For ± 400 W power, a T200-2 toroid can be used with 25 turns on 75% of the circumference. Taps 5, 10 and 15 turns from earthy end. A 5 to 8 μ H coil seems to be the best as the result of experiments.

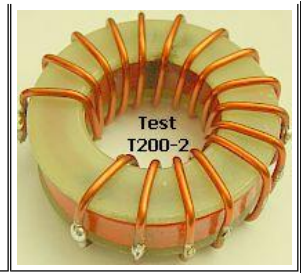
Before winding, several layers of Teflon plumbing tape must be applied to the core, to insulate it from the coil-windings. Another method of insulation is to cement two flat isolating washers (e.g. made from bare glass fibre board, see figure) on each side of the bare core. Apply a small quantity of super glue, possibly only a few drops, around the sides of the core. Work swiftly; the glue hardens quickly. The glue prevents the washers from moving out of alignment while the core is being prepared for winding. For a

Toroid	T200-2
Turns	25

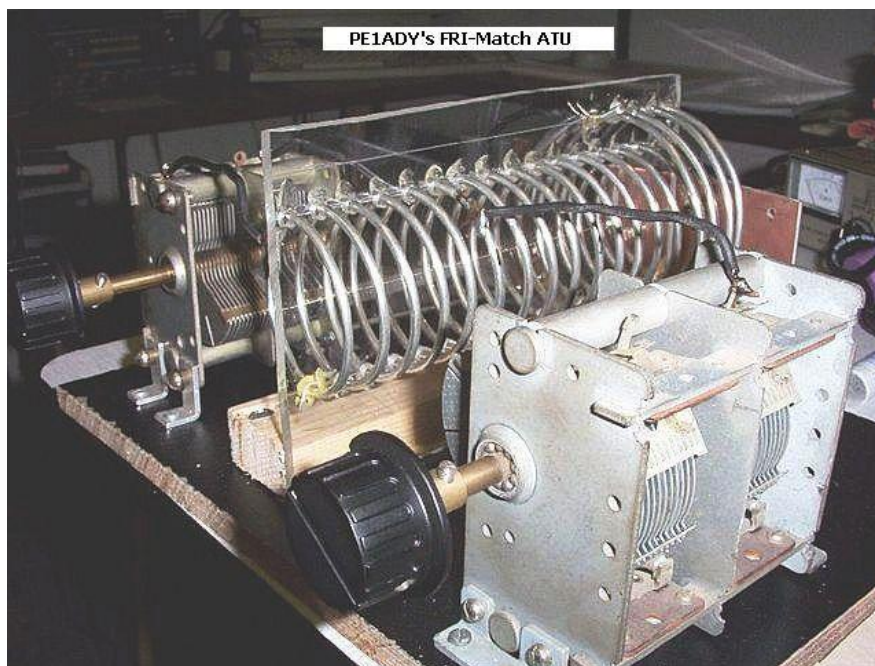
T200-2 core, the inner diameter should be 28 mm and the outer diameter 55 mm. With this last construction it might be even possible to use bare copper wire for the windings.

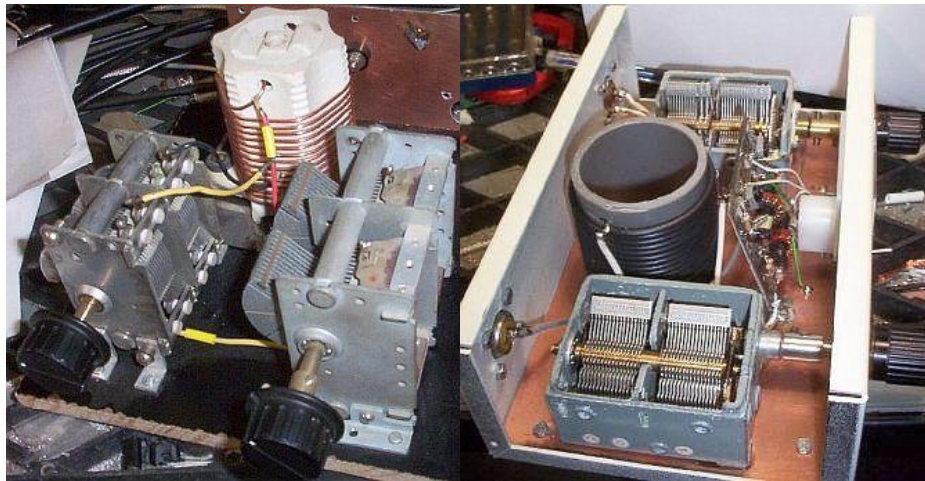


, 10, 15



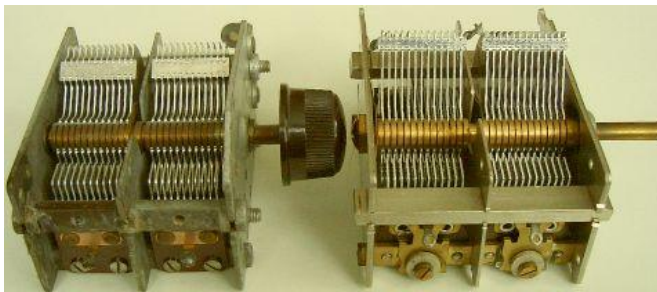
Home-made ATU (width), 17.5 6 12 cm with a T200-2 toroid:



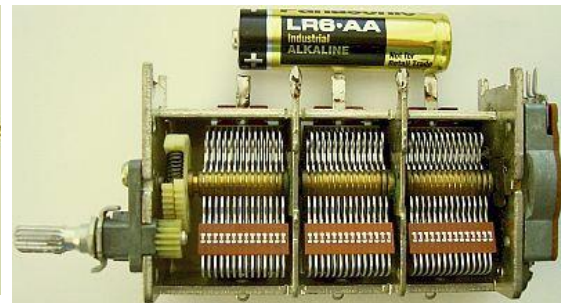


PE1ADY's home-made FRI-Match ATU's.

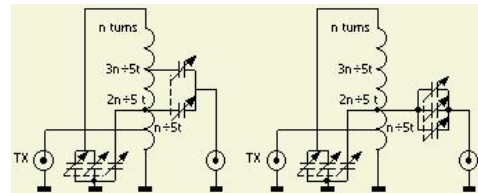
CAPACITOR INFORMATION



Twin-gang from vintage AM radios



Variable capacitors can be receiver-type twin-gang 10 – 490 pF per section, for power up to 400 W. For QRP to 100W operation a T200-2 toroid and two air-dielectric variable capacitors salvaged from vintage AM radios can be used. If 2 350 pF capacitors are used the coil should be increased to about 8 μ H. If 3 350 or 3 490 pF are used in some cases the FRI-match permits [limited](#) matching on the 160 m band. It will then still work on 10 m.



MATCHING WIRE ANTENNAS

