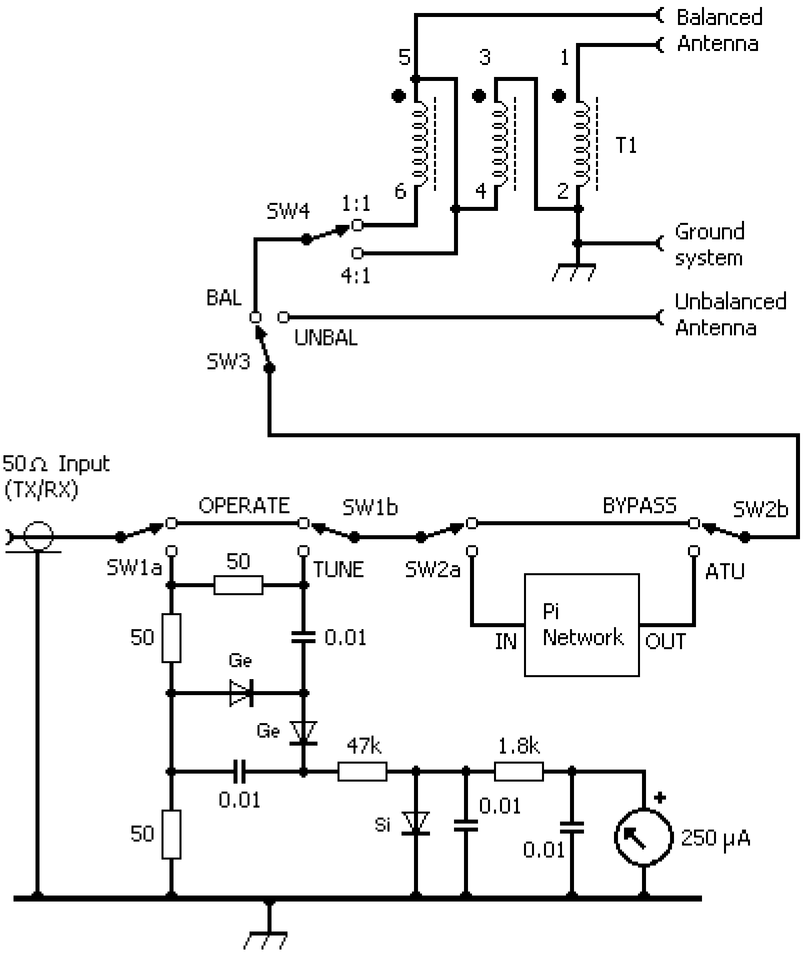
Speaker cable was used for feeder.. The ATU successfully matched this antenna on all amateur bands 1.8 to 28 MHz.

Front View

The ATU is built into a matt black box of ABS plastic having external measurements of 198 x 112 x 64 mm (Maplin part number BZ75S).

Main Circuit Diagram



Main Circuit Diagram

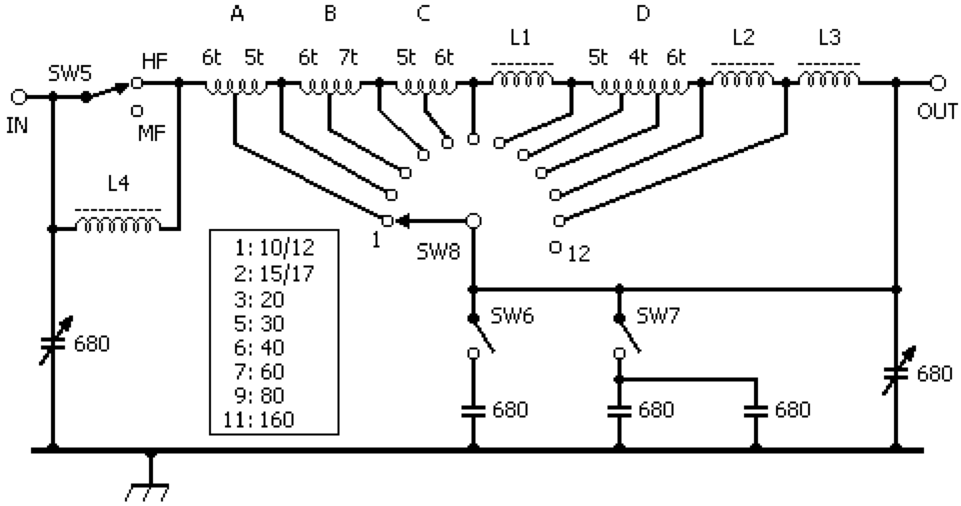
Details of the Pi Network are provided below. For the germanium (Ge) diodes, I used type OA95 - but OA81 or OA91 would probably work fine too. For the silicon (Si) diode, I used a type 1N4148 which, in this circuit, is used to limit the current through the meter. The 50 ohm resistors should be carbon types. For each 50 ohm resistor, I used two 100 ohm (2 watt) resistors in parallel, although 1 watt components should suffice when using QRP (5 watt) transmitters. The moving coil meter was obtained from Maplin, part number LB80B, (internal resistance of 675 ohms, graduated '0' to '5').

In the TUNE mode (and with the transmitter 'ON') the meter indicates relative reflected power. The 1.8 k resistor sets the maximum meter deflection, using the silicon diode as a voltage limiter (0.6 volts). The 47 k resistor is used to provide

FSD when the antenna is disconnected or severely mismatched. Under these conditions, the power amplifier stage in the transmitter is automatically protected by virtue of the resistive components in the bridge circuit which maintain a safe load for the transmitter under all load conditions.

Pi Network Circuit Diagram

The circuit of the pi network is shown below. A 12-position rotary switch was used to select the tapping points. L4 and SW5 provide additional inductance when using electrically short antennas on 1.8 MHz (for example, the 'MF' switch position is required when tuning my G5RV-sized doublet for 160m). The table included in the circuit diagram indicates the typical switch positions for each of the amateur bands, but the exact switch position required for a given band will depend upon the impedance presented by the antenna. SW6 and SW7 and the associated 680 pF capacitors are required to provide sufficient tuning range on 80/160 m, but these may be omitted if operation on these bands is not required.



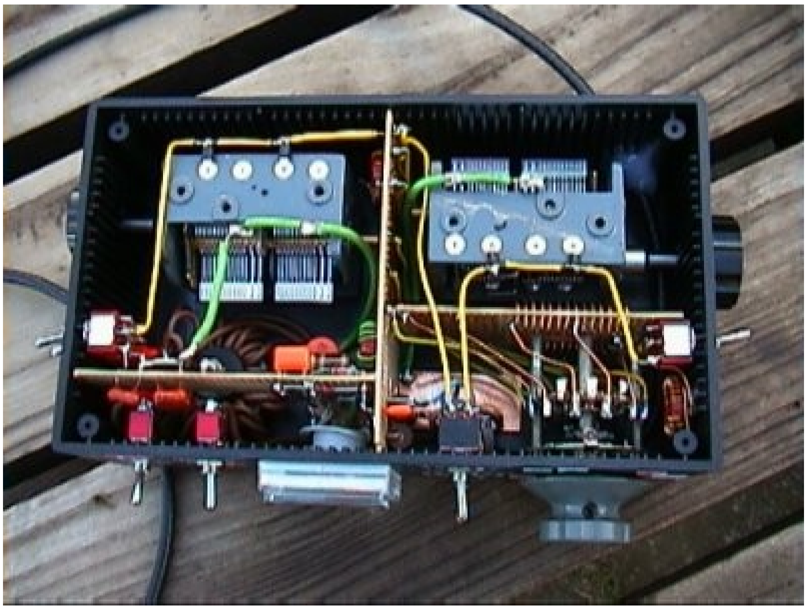
port_atu2.bmp (17790 bytes)

Lack of space in the box required the use of space-saving coils wound on plain 0.1 inch matrix board. Coils A and B were each wound on the matrix board in the form of a solenoid. Coils C and D were also wound on matrix board, but were wound 'flat'. Coils L1; L2; L3 and L4 were wound on T50-2 and T80-2 ring cores (see below).

The ATU may be used with unbalanced antennas (such as marconi antennas, or end-fed wires); or with balanced antennas (such as doublets and half-wave dipoles).

A novel feature of the balun transformer in the above circuit is the use of a changeover switch to select antenna-to-source impedance ratios of 1:1 or 4:1. having the choice of 1:1 and 4:1 baluns greatly improves the ability of the antenna matching unit to cope with the wide range of impedances often presented by doublets used for multiband operation.

Inside View



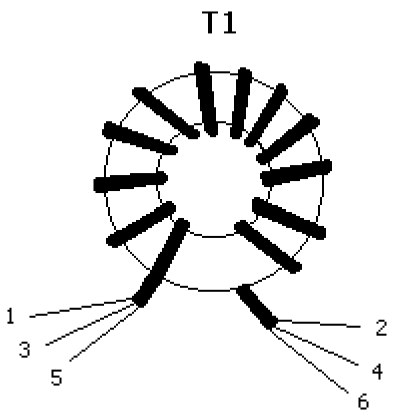
The above picture shows how I mounted the variable capacitors in an opposing configuration. Ideally, the panel knobs would be forward-facing, but the size of the box would not permit such luxury! Nevertheless, I have become used to adjusting the matching unit, and no longer find it tedious to adjust the side-mounted controls for the best match (i.e. minimum meter deflection while in the TUNE position).

Constructing the balun

The balun transformer, T1, is wound on a T130-2 ring core. The wire gauge is not critical: multi-strand wire salvaged from a length of mains flex would be fine. It helps if the conductors are colour-coded.

Start by twisting three wires together at about one twist every 15 mm. Wind twelve turns on the toroid, and label each of the three wires at the start of the winding with the identification numbers 1; 3; 5. Then label the other end of each wire with 2; 4; 6 respectively. Refer to the circuit diagram to ensure correct installation. Neither the number of turns, nor the direction of the turns, is critical in this design. During testing, I found no difference in performance between a transformer of 10 turns, and another wound with 14 turns.

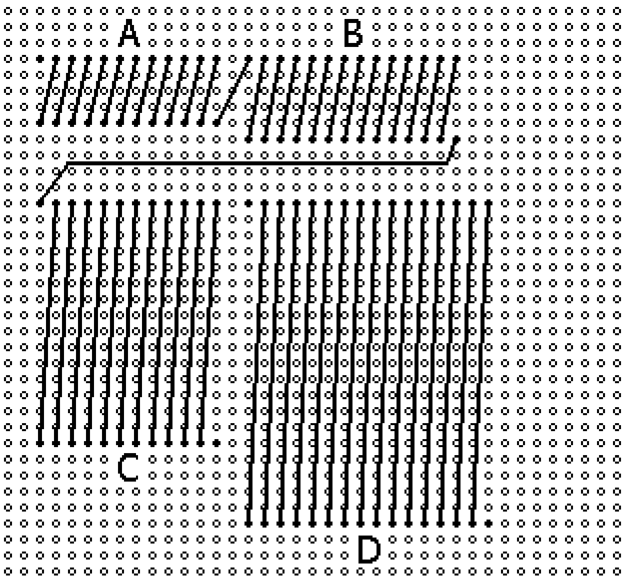
Balun Diagram



Balun Picture

Construction of coils A; B; C; and D

Each of the coils was wound as shown below. Note that the coils in my ATU occupied different relative positions to one another. Nevertheless, the diagram does serve to show the dimensions of each coil. For all coils A - D, I used plain, solid-conductor copper wire that just happened to be a clearance fit in the holes of the matrix board. Of course, there is nothing particularly special about the size of coils that I ended up with - they just happened to work!



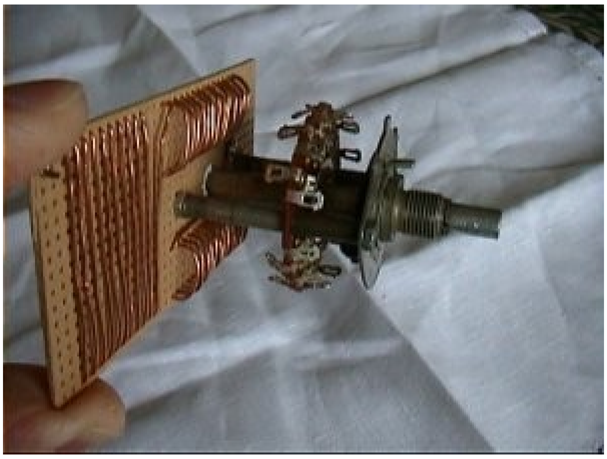
Coil A: 11 turns, 3 clear holes.

Coil B: 13 turns, 4 clear holes.

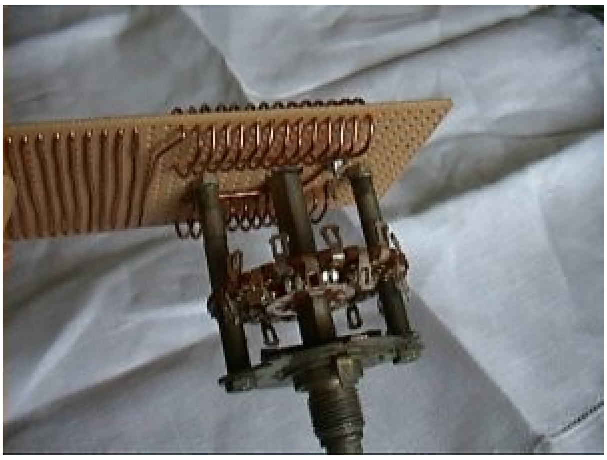
Coil C: 11 turns, 14 clear holes.

Coil D: 15 turns, 19 clear holes.

Switch and Coils



Switch and Coils



These pictures show the actual contruction of coils A; B; and C after having been mounted on the switch assembly, but prior to wiring.

Construction of Coils L1; L2; L3; and L4

L1 through L4 are single-layer coils, wound using 26 SWG enameled copper wire on ring cores of '-2' material.

L1: 17 turns, 26 SWG on T50-2 core.
L2: 23 turns, 26 SWG on T50-2 core.
L3: 23 turns, 26 SWG on T80-2 core.
L4: 38 turns, 26 SWG on T80-2 core.