

A Novice ATU

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DESCRIBED HERE IS A piece of equipment which could still turn in good performance many years after one obtains a full licence. Some purists would argue that an aerial tuning unit (ATU) is unnecessary, and they are right. However we do not live in a perfect world! In the UK, the G5RV is a very popular aerial, and rightly so.

It is a multiband dipole with no traps, capable of use on all the amateur bands from 10 to 160m. In order to use this and other multiband aerials, an ATU is essential. The one described here is very heavily based on that described by Doug DeMaw, W1FB [1], reproduced in *QRP Classics* and featured in *RadCom* [2].

The components used are readily available from various mail order companies, and the unit will handle powers up to about 5W. It matches 10 to 160m with no difficulty, and can be built in a small box for around £10 including hardware.

CIRCUIT

THE BASIC CIRCUIT is shown in Fig 1. On transmit, the signal presented at L1 is coupled into L2, which makes a resonant circuit with C1. The wanted signal appears at the top of L2/C1, and is passed to C2 which couples it to the aerial. Unwanted signals, by virtue of C1 and L2 not being resonant, are rejected.

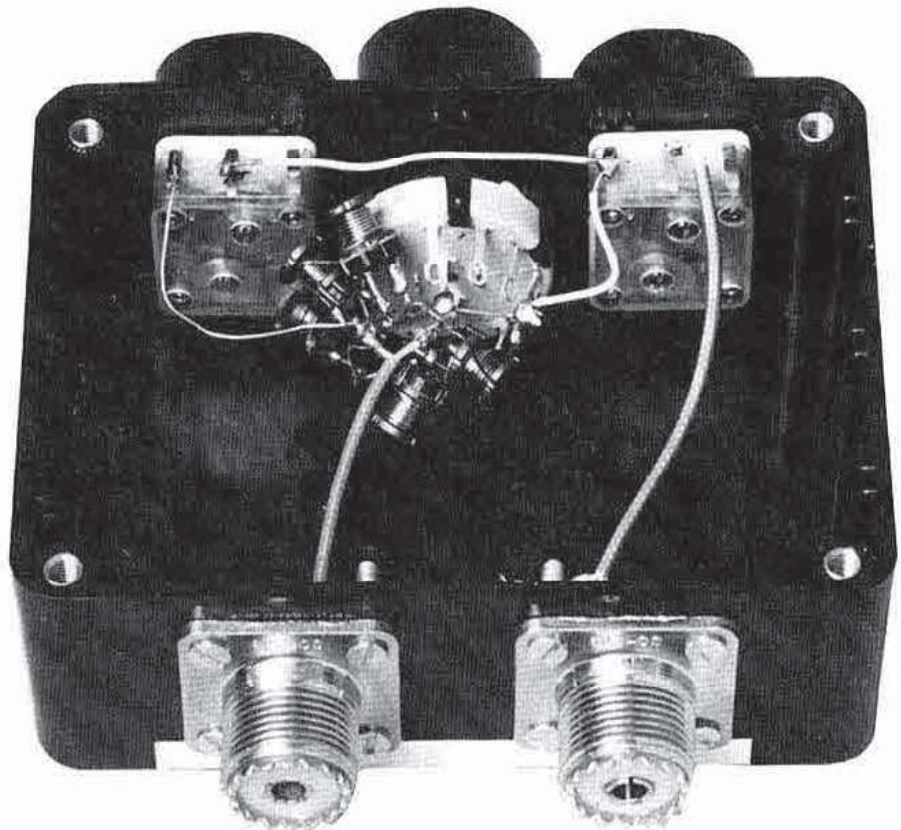
This is, therefore, a resonant ATU, unlike some other designs. On transmit it offers some attenuation of harmonics, which is always a very desirable feature. On receive it provides rejection of out-of-band signals.

C1 and L2 are initially chosen to be resonant in the 80m band. In order to make the ATU operate on other bands as well we need to change the value of either L2 or C1.

It is easy to change the value of L2, as shown in Fig 2. S1 in position 1 leaves the circuit as in Fig 1. In positions 2, 3 and 4 it brings L3, 4 or 5 into circuit in turn. The new coils are, in effect, placed in parallel with L2 changing the inductance of the tuned circuit so that C1 now tunes other frequencies. By choosing appropriate values continuous coverage from 10 to 80m is obtained. Inductances in parallel behave as resistors in parallel:

$$[1/L_{tot} = 1/L_a + 1/L_b].$$

In order to tune 160m we need an extra coil as in Fig 3. When S2 is in position 1 the circuit is exactly as in Fig 2. With S2 in position 2, L6 is placed in series with L2, and the total inductance is the sum of L2 and L6. C1 can



Internal view of the Aerial Tuning Unit. A small plastic or metal box makes a suitable housing.

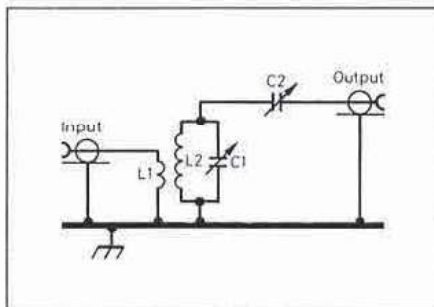


Fig 1: Basic circuit of the ATU.

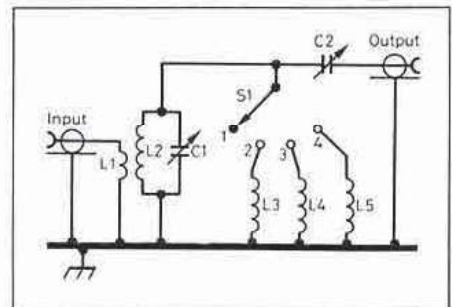


Fig 2: Coils added for other bands.

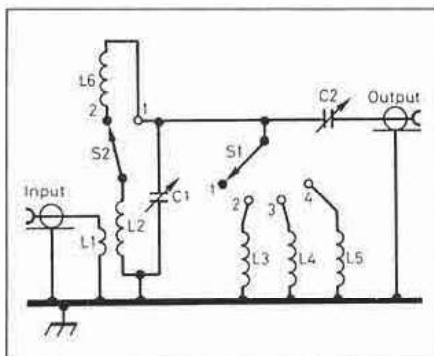


Fig 3: L6 added for 160m.

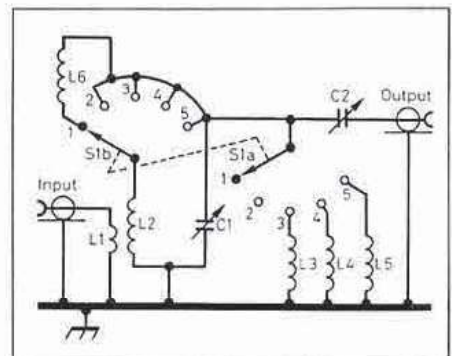


Fig 4: Two-pole switch for all bands.

now tune 160m. The functions of S1 and S2 can be combined in a single switch, as in Fig 4.

CONSTRUCTION

ALL COMPONENTS EXCEPT the capacitors are assembled on the switch! See Fig 6.

Note from the circuit diagram that the rotor of C1 is earthed, whereas no part of C2 is at earth potential. In order to avoid severely detuning the ATU when making adjustments to C2, its knob should be plastic. If a metal box is used, ensure that no part of the shaft comes into contact with the box.

The capacitors are mounted using M2.5 screws. Take care that these do not foul the vanes of the capacitors, which is easily done. Washers between the box and the capacitors will avoid this happening.

Ensure that the trimmer capacitors built into the case of the variable capacitors are set to minimum value.

IN-USE

THE ATU SHOULD BE used to minimise the reflected power from the aerial to the transmitter in conjunction with a SWR bridge. Adjust C1 and C2 repeatedly to achieve this, with preferably as large a capacitance as possible on C2.

S1 in position 1 permits tuning of 160m, in 2 of 80m, in 3 of 30 and 40m, in 4 of 17 and 20m and in 5 of 10-17m.

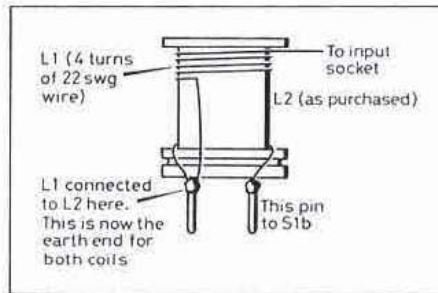


Fig 5: L1 is wound over L2 as shown.

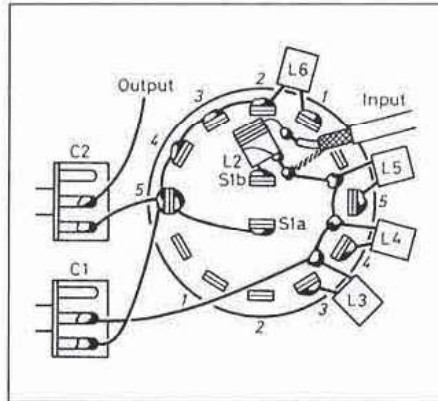


Fig 6: Coils are mounted on the switch assembly.

As described this is a low power piece of equipment. While not tested to destruction, it has handled a power level of 10W RF adequately.

COMPONENTS LIST

No. reqd.	Description	Source	Cat. No.
2	Variable capacitors C1+2	Maplin	FT78K
1	27µH coil L2	Cirkit	34.62085
1	10µH coil L3	Cirkit	34.62080
1	2.2µH coil L4	Cirkit	34.62076
1	1µH coil L5	Cirkit	34.62074
1	100µH coil L6	Cirkit	34.62090
2	S0239 sockets (in and out)	Maplin	BW 85G
1	2P6W switch S1	Cirkit	53.21025
1	Box - Any small plastic or metal box can be used.		
2	Plastic knobs for capacitors		
4	Stick on feet		

L1 is formed by winding four turns of 22SWG enamelled copper wire over L2, as in Fig 5. One end of L1 is connected to the end of L2, and where these are joined is a common earth connection. The transceiver input is connected to the other end of L1.

Mounting screws for the capacitors specified are M2.5.

Screws, nuts and washers are also required to mount the input and output sockets.

REFERENCES

- [1] QST, Sept 88, p26-28
- [2] TT, RadCom, Feb 89 p34

PCB AND KIT SERVICES FOR RADCOM PROJECTS

PCBs

G3BIK BATTERY OPERATED AF OSCILLATOR AND WAVEFORM GENERATOR (September 1990)

PCB Layout	93990	£4.70
Full Kit (including box)		£25.85

G4WIM 50/70MHz TRANSCEIVER (May/June/July 1990)

Complete set of boards	567WIM90	£67.56
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G4PMK SIMPLE SPECTRUM ANALYSER (November 1989)

RF Board	118946	} Prices on request
Video/sweep board	118947a	
Marker generator/PSU	118947b	
Complete set of 3 boards	1189SSA	£17.62

G3TXQ TRANSCEIVER (February/March 1989)

Main IF/Audio	028945	£11.75
VFO	028946	£5.55
Driver/Preamp	028947	£6.75
Low pass filter	028948a	£7.65
Band-pass filter	028948b	£4.70
Control board	038942a	£5.30
Regulator board	038942b	£2.35
Complete set of 7 boards	0289TXQ	£27.61

BRS54049 DUAL CONVERSION MULTIMODE RECEIVE IF/AF STRIP (May/June 1985)

PCB LAYOUT	643585	£12.75
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All prices include VAT, postage and packing

These PCBs are not available from RSGB HQ, but direct from Badger Boards, 87 Blackberry Lane, Four Oaks, Sutton Coldfield, B74 4JF. Tel: 021 353-9326.

KITS

THE FOLLOWING KITS ARE AVAILABLE AS ELECTRONIC PARTS ONLY.

PCBs ARE AVAILABLE FROM BADGER BOARDS.

G3TSO	Multiband Transceiver	POA
G3TXQ	3 Band (Excl PA)	£165.55
G3TSO	Frequency Display	£27.50
G3TSO	80m SSB Transceiver	£87.00
G4WIM	Dual Band Project	£457.35
G4PMK	Spectrum Analyser	£53.00
G3RVM	Ultimate Keyer	£18.00
G3TDZ	White Rose Rx (Main Board)	£29.95
G3TDZ	White Rose Converters	POA
Technical Topics	144MHz Doppler	£4.00
First Steps.	John Case PSU	£32.80

Prices shown are inclusive of P&P.

The above prices are for full component kits. The bigger kits are produced in module form if the constructor wishes to spread the cost. Please telephone for a full list.

Available from:-

J.A.B. Electronic Components
 The Industrial Estate
 1180 Aldridge Road, Great Barr
 Birmingham B44 8PE
 021-366-6928