SPECTRUM COMMUNICATIONS

Incorporating Garex Electronics & G2DYM Aerials

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5-500kHz VLF CONVERTER

The VLF converter selects input signals between 5 & 500kHz and up-converts them to provide an output in the range 4.005 to 4.500MHz for reception and demodulation in a general coverage receiver.

At a frequency of 5kHz a quarterwave aerial would be 15000 metres long, whilst at 500kHz a quarterwave aerial would be 150 metres long. It is clear that only a minority of radio enthusiasts would be able to even put up a long enough aerial for 500kHz, so the converter needs to function with electrically short aerials.

My solution is to provide an input amplifier that provides a very high input resistance that will allow the signal voltage at high aerial impedance to be sampled and converted down to a lower impedance to feed to a signal filter.

In this design the input stage is a common source FET that has a relatively high drain current and will cope well with signals of hundreds of millivolts. The output of this feeds a 5-branch elliptic low pass filter that achieves just fractionally short of 50dB attenuation at 900kHz.

Output from the filter is fed to a discrete diode ring mixer that is also driven from a 4MHz Colpitts local oscillator. The sum of the signals difference is chosen so that tuning of the general coverage receiver will correspond like for like with the input frequency range.

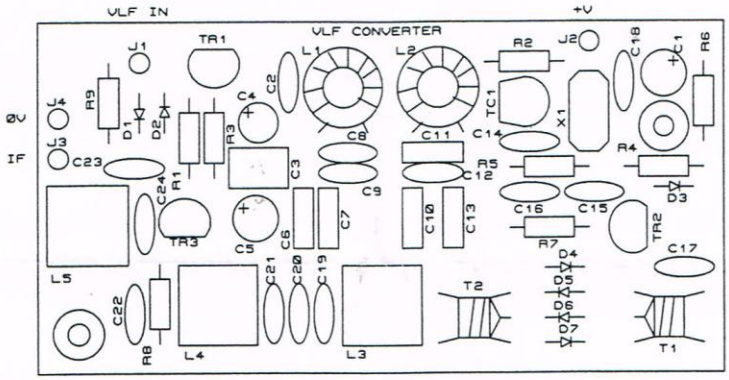
These signals are passed through a slightly over-coupled bandpass filter with a passband width of 500kHz at the –3dB points. The insertion loss is 2dB and the midband dip is 2dB below the two peaks. The –10dB bandwidth is 720kHz and the –20dB bandwidth is 860kHz.

Following the bandpass filter is another FET of the same high-powered type in common gate configuration producing about 15dB gain. This is about 2dB less than the losses of the filters and the mixer across the operational range.

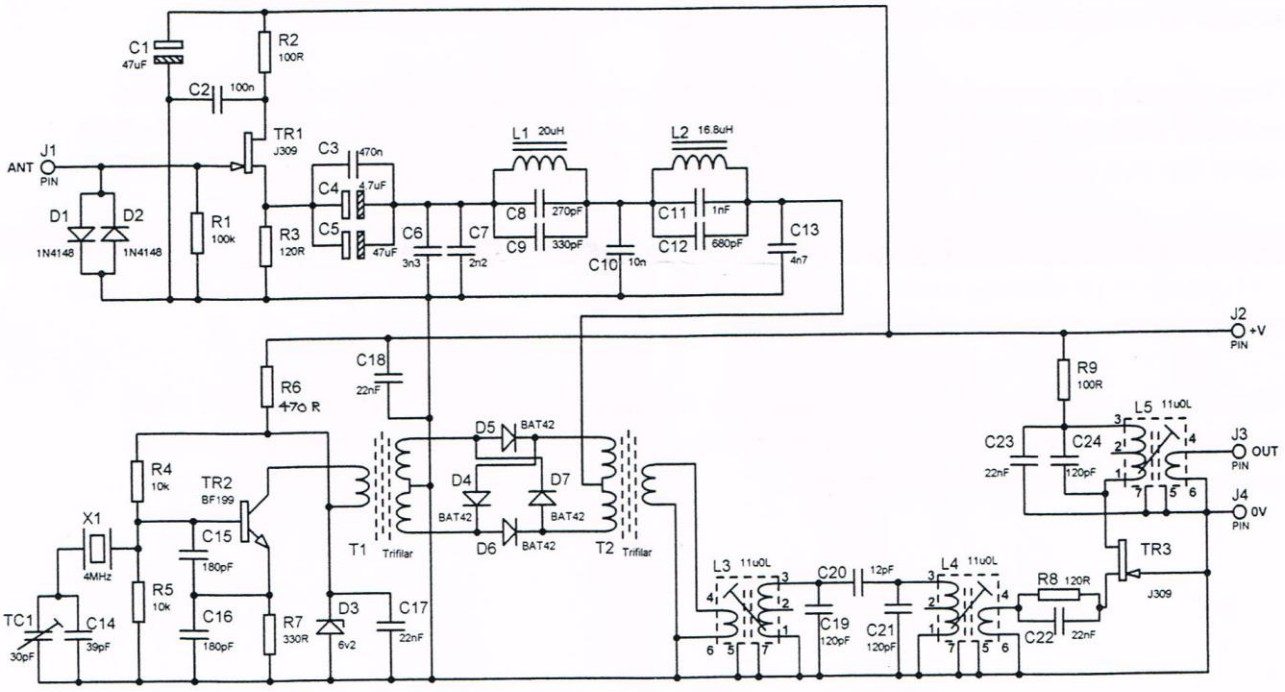
Alignment is achieved by simply setting the oscillator to 4MHz by adjusting TC1 while monitoring it on the receiver. Then by peaking L3 – L5 at 4.25MHz, being close to the centre of the converter output range.

VLF CONVERTER HARDWARE KIT

1	BOX Diecast 114x64x55 Drilled	Hammond 1550D plain (RX ATU)
1	4mm terminal post, red or black	
1	BNC chassis socket	
1	2.1mm DC chassis plug	
1	2.1mm DC line socket	
1	LED & holder	
1	2k7 resistor	
1	SPDT toggle switch	
2	M3x12mm pozi pan screws	
4	M3 nuts	
4	Small feet	
1m	14/0.2 red/black twin lead	



25-500kHz VLF CONVERTER



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5-500kHZ VLF CONVERTER
DOC No. 141013
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RESISTORS		
2	100R	R2, R9
2	120R	R3, R8
1	330R	R7
1	470R	R6
2	10k	R4, R5
1	100k	R1
CAPACITORS		
1	12pF	C20
1	39pF	C14
3	120pF	C19, C21, C24
2	180pF	C15, C16
1	270pF	C8
1	330pF	C9
1	680pF	C12
4	22nF	C17, C18, C22, C23
1	100nF	C2
1	1nF PB	C11
1	2n2 PB	C6
1	3n3 PB	C7
1	4n7 PB	C13
1	10nF PB	C10
1	470nF PB	C3
1	4.7uF	C4
2	47uF	C1, C5
DIODES		
2	1N4148	D1, D2
4	BAT42	D4, D5, D6, D7
1	6v2 zener	D3
TRANSISTORS		
2	J309	TR1, TR3
1	BF199	TR2
COILS		
1	20uH, 19t FT37-61, 11.5" 28swg	L1
1	16.8uH, 12t FT37-61, 8" 22swg	L2
3	Spectrum 11u0L	L3, L4, L5
2	6t trifilar FT37-43, 5" 32swg	T1, T2
MISC		
4	Pins	J1-J4
1	30pF trimcap, Murata	TC1
1	4MHz crystal	X1
1	PCB VLF Converter	