120MHz driver for the DB6NT 2304/144MHz Transverter

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Having used the DB6NT transverter on 13cm EME for a while, even though it is equipped with the crystal heater the drift was still an issue. It was decided to investigate a method of generating an external GPS locked 120MHz signal to drive the transverter.

Design

My 1296 transverter uses a DFS96 (ref 1) with great results. For 120MHz usage it should be possible to use a similar method but without the need to use any digital circuitry. Initial experiments used what I considered to be the simplest solution; just a MAV11 driving the two diode multiplier and filter. I quickly found out that the modamp was generating more even harmonics than the diodes which, as per the design note only do well with odd harmonics

The final solution chosen was to multiply the input by eleven then add 10MHz in the mixer to reach 120MHz. The final circuit is shown in Figure 1. The unit is designed to accept a low nominal drive level of 0dBm. An external attenuator will be needed if your source produces more than this. The output is a nominal 0dBm, which is the input level specified by DB6NT for driving his unit. Note that the crystal filter only uses two crystals rather than three of the DFS96. They supply sufficient filtering due to the10MHz separation of all unwanted signals

Construction

The unit is housed in a 4.2x3 x1.3” tinplate box. It would have been possible to shrink the module but I had many of this size boxes. A double sided PCB was designed for the circuit, the ground plane being left mainly intact except for clearances around leaded thro components. The majority of components are surface mount of 0805 size, mounted on the track side of the board. The ground plane is mounted 17mm from the top edge of the box. This does require the heatsink of the 7808 regulator to be cut down to enable it to be soldered to the box sidewall inside the box and still fit the lid. The finished unit, mounted in my transverter case along with a 10MHz oscillator to support standalone operation is shown in Fig 2.

Results

The wideband output spectrum can be seen in Fig 3, which shows the largest unwanted signal is the harmonic at >-60dBc. Fig 4 shows the spectrum close in to the wanted signal which is equally good

Conclusions

Hopefully this article will help those having drift issues with their DB6NT 2304MHz transverters

Note there isn’t an equally simple solution to the 2320/144MHz transverter drive requirements which requires 120.8888MHz.

References

1. http://g4fre.com/dfs9096.pdf

Figure 1: Circuit diagram

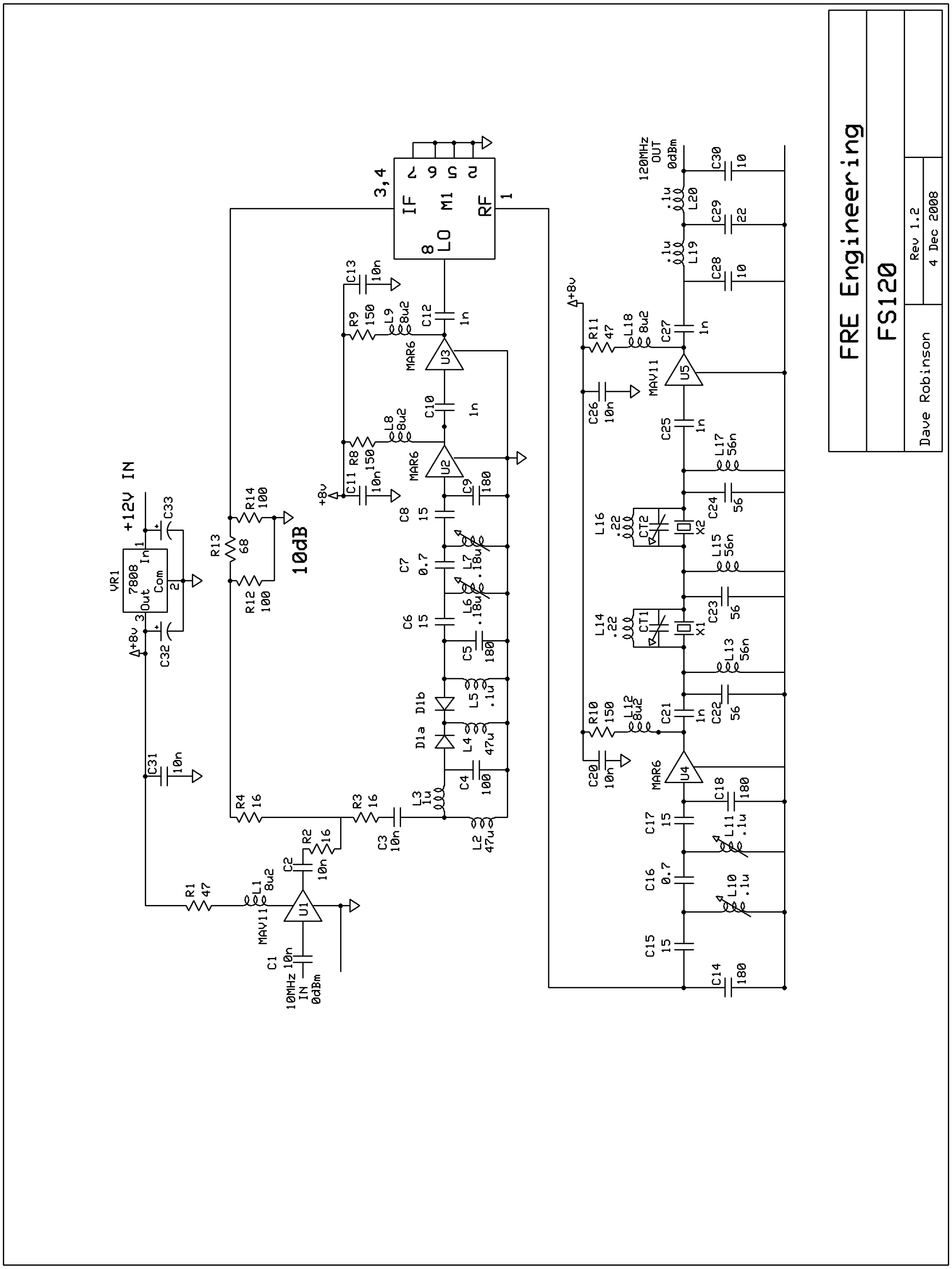

Table 1: Component Listing

C1,2,3,11,13,20,26,31	10n	
C4	100	
C5,9,14,18	180	
C6,8,15,17	15	
C7,16	0.7p	
C10,12,21,25,27	1n	
C22,23,24	56	
C28,30	10	
C29	22	
C32,33	1u 35V tantalum leaded	
CT1,2	5-20pF	DK 490-1981-1
D1a/b	BAT54C	
L1,8,9,12,18	8u2	DK PCD1142CT
L2,4	47u	DK 445-1067-1
L3	1u	DK 445-3156-1
L5,19,20	.1u	DK 490-1114-1
L6,7	.18u	DK TK3117
L10,11	.10u	DK TK3139
L13,15,17	56n	DK PCD1116CT
L14,16	.22	DK 490-1115-1-ND
M1	SBL1	
R1,11	47	
R2,3,4	16	
R8,9,10	150	
R12,14	100	
R13	68	
U1,5	MAV11	
U2,3,4	MAR6	
VR1	7808	
X1,2	120MHz Crystal	

Figure 2: Unit mounted in 13cm Transverter.

Figure 3 Wideband output Spectrum

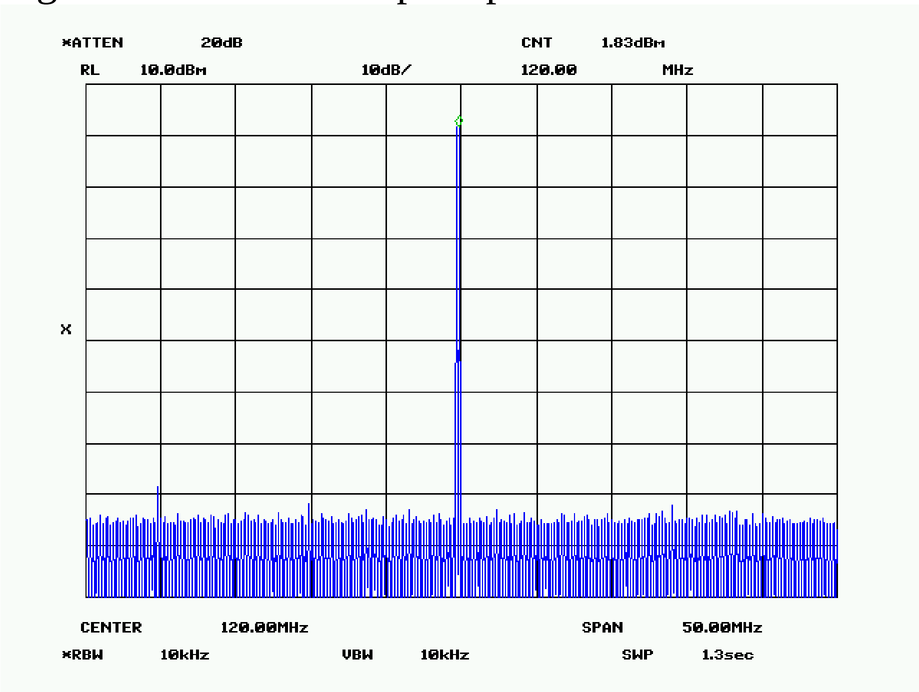

Figure 4: Narrowband output spectrum