LETTERS

KW 2000 UPDATE

Sir, I was surprised to say the least, to see a 6577.5 kHz crystal recommended for conversion of the 30m band (10.1 MHz). My own 2000 has been in use on 10.1 since Jan 1, 1982, when the band first became available.

It is *certain* that the use of such a crystal, doubling, will give you disappointing results on that allocation. The fundamental frequency beats with the 9.5 to 9.9 MHz (31m) BC band and strong responses will appear in the 1st IF. Some of the broadcast stations put in 5 mV signals at least and whilst the majority, and perhaps stronger, will convert to fall between 3155 and 3055 kHz (10 to 10.1 MHz on the dial) they will none the less be a IM problem at the second mixer.

It should be noted that the BC signals are only 260 to 360 kHz LF of the 10.1 allocation. At 3% off resonance, the RF circuit response, even with a Q of 50, is only 8 dB down (16dB total for two circuits). The two KW2000 circuits cannot possibly cope with this situation.

After carrying out modifications using other 'off the air' signals for alignment, some modifiers might be quite shocked and assume, probably wrongly, that their wiring and procedures had been faulty.

With this particular IF, the area around 10 MHz is the very region of spectrum where the fundamental XTAL (13,155) should be used. The nearest unwanted beat is then around 16,200 kHz, which is 6MHz removed. A 3rd overtone is not possible with the design as it stands (3x4385).

Even on 14 MHz, the 2000 would benefit from the use of 17MHz fundamentals. In unfavourable conditions, the response from 11.7 MHz (approx) can be quite objectionable when using 8500x2 crystals, a 'general purpose' antenna and tuning unit. Using beam antennas of course this effect will be less noticeable.

The trouble with this oscillator circuit is that fundamental crystals in the higher range particularly, say above 15 MHz, tend to stop oscillating when the plate circuit is tuned to exact resonance, necessitating some slight detuning. However, this effect may not occur and, in any case, this detuned condition will be better than that described using the doubler. Also, I suggest that the fundamental arrangement will result in a purer spectrum for injection into the mixer.

Suppose you wanted a frequency of 9465 to be converted to 3155 kHz and chose the use crystal 6310 kHz x 2? In which case: 12620 - 9465 = 3155 & (unsupressed): 9465 — 6130 = 3150 also!

This result would sound very odd indeed, but, given stability etc, might well serve to produce DSB from SSB (Hic!).

But seriously, this is not far away in frequency from 10 MHz in the band, nor from 6577.5 ref the crystal.

My example could be described as the 'Mixing Syndrome' for this particular receiver IF. Other arrangements will have their own. It would remain a hazard irrespective of the type of mixer used and could only become acceptable given a *very intensive* degree of selective tuning and filtering between the oscillator and the mixer.

John S Charles, G3KVG

PS. My general purpose antenna, eg consisting of 40m dipole with tuned centre-feed from ATU.

Malcolm Healey, G3TNO, replies:

1. We recommend the 6.5775 MHz crystal for use on 10 MHz because that is what Mr. Ray Charles and myself have used with *NONE* of the problems mentioned by G3KVG.
2. The use of a higher frequency crystals in this circuit, where the crystal and the anode circuit are at the same frequency will most definitely have undesirable side effects, namely as the anode circuit is tuned either side of the correct frequency, the oscillator will tend to stop and generally behave in an erratic manner; also, a certain amount of 'pulling' of the oscillator frequency will occur. The amount of 'pulling' will depend on the frequency concerned and will always be greater at higher frequencies.
3. Although dismissed very lightly by G3KVG, the anode circuit of the stage being tuned to a frequency of 2 or 3 times the amount of rejection of the 6.5775 MHz signal at the mixers.
4. The effects of pulling, as in 2, above, will also be affected by the loading of the oscillator by the *transmit* mixer. This loading will change with the drive applied to the mixer, ie SSB or CW. This changing loading will cause the conversion oscillator to be pulled around to an amount that will depend upon the drive level being applied to the mixer. This will give pronounced chirp on CW and FM superimposed on SSB. I have, in fact, tried the higher frequency crystal recommended by G3KVG, and monitoring the outgoing CW signal using it, the note could only be described as T8C. The note normally with the modified KW2000 is T9X. De-tuning the anode circuit of the oscillator does improve the note, *but* at the expense of Tx drive and linearity, so is *NOT* to be recommended.

Now to the heart of the comments by G3KVG regarding spurious responses on receive by virtue of the fundamental frequency from the oscillator beating with broadcast station in the 9.7 MHZ band, also producing signals in the receiver. The truth is that they don't! I have used my version of the KW2000 with the 6.5775 MHz crystal on 10MHz and I can find *NO* evidence of this problem, using a variety of aerial systems ranging from a simple 10MHz ground plane to a 100 metres and end-fed aerial at 50 feet — always, of course, using an ATU.

Also, if comments from G3KVG were to hold *any* water, the Tx would, of course, produce an out-of-band signal. I have checked this using the station Racal RA17 Rx, transmitting on my normal 10MHz aerial, with the 100 metres end-fed connected to the Racal Rx. There is not a trace of *any* spurious in-band or out-of-band signals in the tuning range from 8MHz to 12MHz. I can't think of a more severe test as both Tx and Rx are next to each other.

I would ask G3KVG *how* changing the fundamental crystal in the oscillator stage can reduce the out-of-band IMD problems from the much-worried about (by G3KVG) broadcast signals he mentions. *Regardless* of LO frequency used, those signals will *still* be present at the input to the receiver and indeed probably up to the input of the first Rx mixer input, and will cause the same IMD problems. Changing LO crystal *WON'T* make them go away (or has someone re-written the theory books while we weren't looking?).

To G3KVG — I honestly think that you *must* have something wrong with your KW2000 if you get problems with it on 14 MHz and above, with, as you quote, problems from signals at 11.7 MHz when operating on 14 MHz! I have used my KW2000 on 14 MHz using a largish (500 feet per leg) vee-beam via a decent ATU with no such problems. There must be something very wrong with yours!

Malcolm Healey, G3TNO

Sir, my husband and I are enjoying the series 'Upgrading the KW2000 series of HF transceivers' and are keen to have to go at adding the new bands to our own '2000B — as described in Part 6 of the series.

Therefore, could you or the authors advise me of a supply of the coil formers,