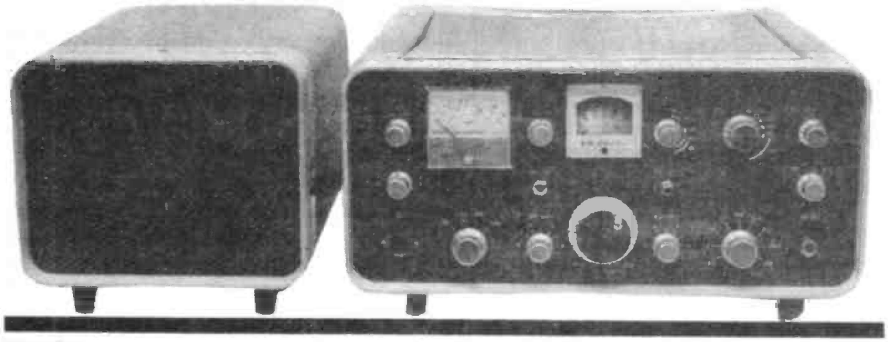
# Upgrading the KW2000 series of HF transceivers



# Part 5 More Mods

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## Improving the CW note

The note on most *KW2000s* leaves a little to be desired to the CW purists and the example at G3TNO was no exception. A number of critical reports on the note were obtained from local and more distant stations, including a most useful tape of the transmission from an SWL (needless to say, he received a QSL by return). It became obvious from the tape, various reports and local monitoring that the signal suffered from clicks on 'make', and thumps on 'break', and that the tone had a rather odd 'flutey' sound. Various experiments were tried with the usual key click/thump filter circuits, but none really cured the problem, so thoughts turned to an alternative method of generating the CW signal.

The *KW2000* was tuned up into a dummy load, and another receiver was used to monitor the signal produced. The balanced modulator was then temporarily unbalanced by shorting one side of the balance control RV14 to chassis, and the resultant carrier monitored on the outboard receiver; the note was perfect. So an external power supply was lashed up via a key to the junction of C6 and C7, a CR network being connected across the key contacts. The monitored note was now perfect with no trace of click or thump. This set up performed well on the lower bands, but on 21&28MHz a severe lack of drive was apparent, caused by the fact that the carrier in most SSB rigs is set to a frequency which is about 20dB down one side of the filter passband, as shown in **Fig. 105**. So a crystal in the centre of the passband was plugged into the socket normally occupied by the LSB carrier crystal, and again the note was monitored and the drive level checked; the note was still OK and there was now plenty of drive available on all bands. A few local contacts were made using this lash up, and everyone reported a great improvement in the transmission.

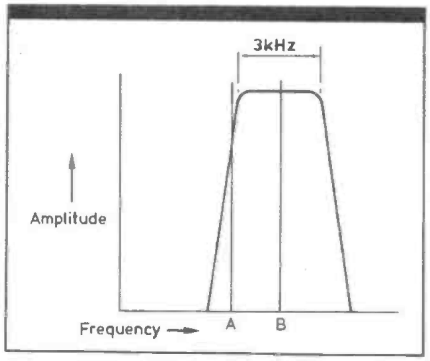


**Fig. 105 The position of the carrier with respect to the filter passband. For SSB operation the carrier frequency is normally set to position A, some way down the skirts of the filter response, so that the filter passes the upper sideband and filters out the lower. For CW operation more drive will be obtained if the carrier is moved to position B, in the centre of the passband.**

A list was now drawn up of the requirements for a permanent modification:

1) The ability to unbalance the balanced modulator with the key, without using an external power supply.

2) The automatic switching in, in the transmit mode only, of a carrier crystal in the centre of the SSB filter passband, reverting to the normal carrier crystal on receive.

After many trials and errors the circuit of **Fig. 106** was evolved. The advantage of this circuit, apart from an improved CW note, is that, at the flick of a switch (S1*), it is possible to revert to the unmodified state; thus the SSB performance is unchanged, and comparison between the modified and unmodified states is very easy.

The operation of the circuit is as follows. With S1 set to ON, and under key-up conditions, TR4 and TR5 are biased off, so no voltage will appear across R1003 or across the coil of relay C. The sidetone oscillator will be cut off, and with the rig set to VOX the contacts of the VOX relay RL4 will be open; thus the rig will be in receive with the CW filter switched into circuit. At the instant of closing the key contracts, TR5 is biased on, relay C is energised and a carrier crystal in the centre of the SSB filter passband is switched into circuit. The sidetone oscillator in the *KW2000* will at the same time activate the VOX circuit, putting the rig into transmit. This will close contacts RL4/2 and will keep TR5 biased on via D112. This latter feature is very important, as without it relay C will follow the keying, and the

* Note that the switch 'S1' referred to in this article is not the same switch as on the original KW circuit.

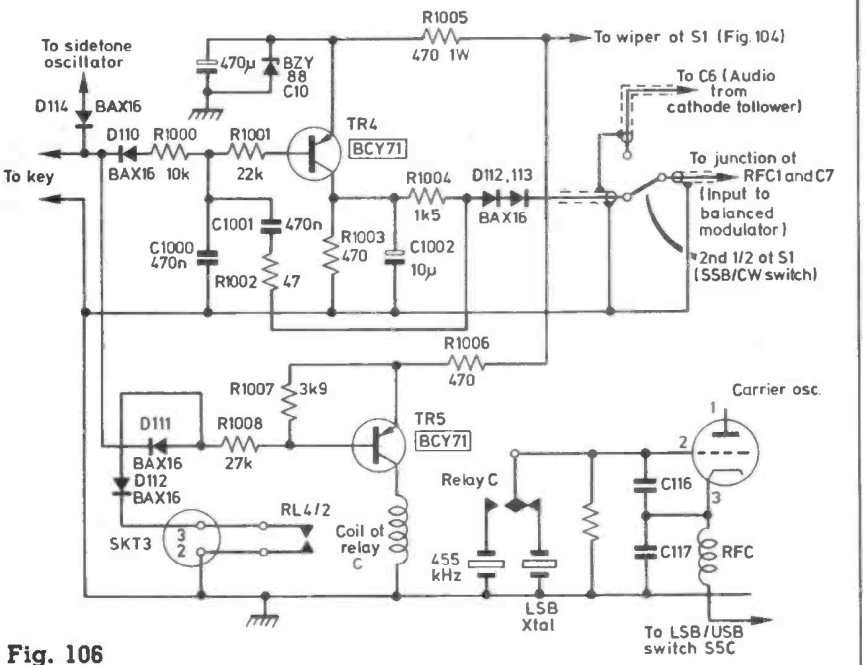


**Fig. 106**

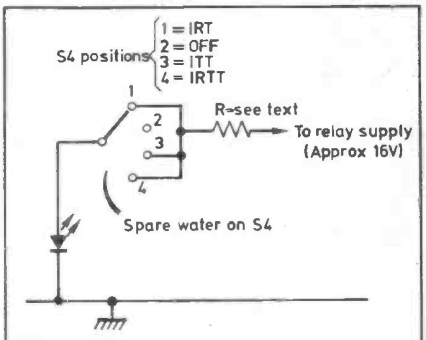


**Fig. 121**

outgoing transmission will sound like a cross between FSK and normal on/off CW! TR5 will stay biased on during the hold-in time of the VOX cirucit, or for as long as the rig is held in transmit by the INT MOX setting or by an external send/receive switch, provided that S1 is set to the CW position. Also under key down conditions TR4 is biased on via D110, R1000 and R1001, the turn-on and turn-off times being controlled by R1000, R1001, R1002, C1000, C1001 and C1002. These components are required to completely remove any thumps or clicks on the signal; there is therefore no need for further key click filters across the key or keyer contacts, and in fact they are positively harmful to the operation of this circuit.

When TR4 is biased on (key down), a voltage is developed across R1003 and C1002. This voltage is fed via R1004, D112, D113 and the second pole of S1 to the LF input of the balanced modulator, thus unbalancing it and producinga carrier at its output. This carrier will, of course, be fed on to the later stages of the transmitter. The two diodes D112 and D113 are used to prevent any slight leakage in TR4 unbalancing the modulator, which would, or course, produce a carrier under key-up conditions. D114 prevents this circuit being activated in the TUNE mode.

## Variable transmitter output power

It has been found useful to be able to vary the output power of the *KW2000* when, for example, driving a transverter or linear amplifier. As the rig stands there is no way of doing this except by adjusting the MIC GAIN control, which is a very undesirable way of varying power output, particularly at low output levels. Although the ratio of *peak* output power to the suppressed carrier at normal mic gain settings may well exceed 40dB, as the mic gain is reduced the carrier level due to leakage round the balanced modulator will remain the same while the peak output power will be reduced. Thus the effective carrier suppression will be reduced. The writers feel that it is best to vary the output power *after* the balanced modulator, and this can most easily be done by varying the gain of the transmit IF amplifier V3, which is in any case a variable-mu valve controlled by the ALC.

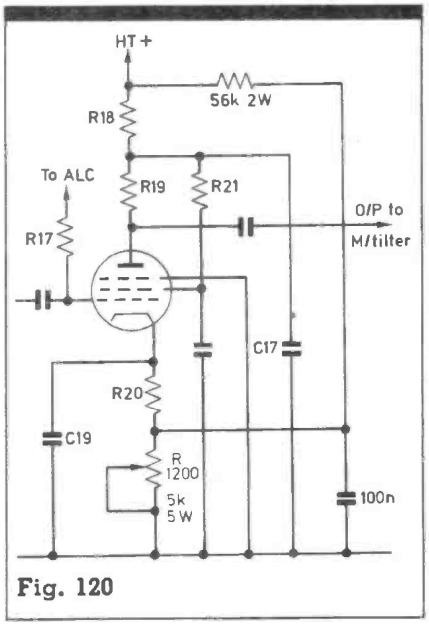


**Fig. 120**

The simplest way of controlling V3 without upsetting the ALC action is to insert a variable resistor in the cathode circuit to vary the bias. A circuit for doing this, employing only three extra components, is shown in **Fig. 120**. At full gain the output level is the same as with an unmodified *KW2000*, while at minimum gain it is possible for the output to be reduced to below one watt! This method leaves the mic gain control set as for normal operation, giving the advantage that at low power output levels the carrier suppression is not degraded.

## IRT IN USE indicator

A small but useful extra feature has been the addition of a warning LED to indicate that the IRT/ITT selector switch is on. The extra switching for this is already fitted, although left unused. There is a spare pole on S4, which can be wired as shown in **Fig. 121.** The LED is conveniently mounted approximately 1¼" to the left of the switch. The value of the series resistor depends on the particular LED used and the brightness required.

The next article, in our September issue, will deal with the important question of modifying the *KW2000* to cover the 10, 18 and 24MHz bands, as well as the missing sections of the exisiting bands. ●