Simple Circuit Modifications to the KW2000

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THE KW 2000 is a deservedly popular item of British s.s.b. equipment whose performance generally is first class by any standard and is an instrument which compares favourably with similar but much more expensive equipment which has to be imported from abroad. Of course, if one sets one's mind to it there will always be some point or other which can be found fault with dependent on what aspect of performance is considered to be important to the operator. I for one have no wish to criticize the general functioning of this little transceiver which is most satisfactory, but for those owners who may have thought that the quality of the speech both on transmit and receive was perhaps a little too harsh, then possibly the following observations and simple modifications might be of some interest.

The KW 2000 uses a Kokusai 2·1 kc/s nominal filter and, with a relatively limited band width such as this, it is most undesirable that any further limitation of the audio frequency response should take place elsewhere in the transmitter or receiver. If both the carrier crystals have frequencies which are correctly placed in respect to the mechanical filter passband, i.e. about 350 c/s at the maximum from the beginning of the flat part of the filter characteristic, then there should be an overall speech frequency response of approximately 300 c/s to 2·9 kc/s as the 2·1 kc/s nominal Kokusai filter has in practice a useful bandwidth of close on 2·6 kc/s. Whilst checking the KW 2000 at G3BA with an audio generator to determine its overall audio response it was noted that whilst the lower sideband has a passband of 700 c/s to 2·9 kc/s, the upper sideband response was 800 c/s to 3·5 kc/s. This difference in the audio frequency range showed quite clearly that the upper sideband carrier crystal frequency was too far away from the filter passband and a replacement crystal having a frequency 400 c/s nearer was obtained and effectively equalized the bandwidths of the two sidebands.

Although both upper and lower sideband were now substantially the same in response, the restriction of frequencies below 700 c/s was still most marked and pointed to a deficiency elsewhere in the set. An inspection of the circuit diagram showed that the intervalve coupling capacitor (C149) from the microphone amplifier was only 2,200 pF in value and would account for a loss in lower middle and bass. It was an easy matter to parallel this capacitor with a 0.01 μF ceramic and check the response once again by swept audio means. The overall passband now measured down to 400 c/s on lower sideband and 350 c/s on upper and was considered to be satisfactory. The same thing was done on the receiver by paralleling a 0·01 μF capacitor across the audio coupler (C127) which had a value of only 1,800 pF. Although the effective speech quality on receive is limited by the small open cabinet loudspeaker system, the increase in lower frequency response was quite noticeable and eliminated that " everyone sounding the same " effect which was particularly annoying and irritating when listened to for long periods. Incidentally, a large loudspeaker and cabinet really shows what the tranceiver will do and the reproduction after the capacitor modification was remarkably good indeed.

Perhaps it might be considered slightly odd that the reason I purchased a KW2000 was to use it on v.h.f. via a translator, but then my main interest is with v.h.f. and as I like making specialized equipment for these frequencies the KW2000 was the ideal prime mover (see RSGB BULLETIN, June, 1964). In the course of testing a separate a.m. rig on 2m it was observed that if the KW2000 was switched on with the microphone lead in but no microphone connected to it that full modulation could be effected due to rectified r.f. from the 2m rig getting into the microphone amplifier. The cure was to connect a 100 pF capacitor from the grid of the microphone amplifier valve V1a to its cathode direct and not to earth. This effectively stopped the rectification taking place and also the distortion which I had been getting on speech peaks when using 2m s.s.b.

These very simple modifications are straightforward to do and do not incur any butchering of the circuitry or the wiring, and I feel that they are worthwhile incorporating by those operators who are fussy about their speech quality. It should be borne in mind, however, that the modifications do effectively broaden the selectivity slightly.

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measured. The single-tone amplifier efficiency is therefore: p.e.p. output divided by p.e.p. input, multiplied by 100 x-e pressed as a percentage.

To summarize:

P.e.p. input = h.t. voltage × anode current.

P.e.p. output = 2 × mean power output. Or $I^2 \times 75$ (I being the new r.f. ammeter reading with single-tone input)

$$\text{Efficiency} = \frac{\text{p.e.p. output}}{\text{p.e.p. input}} \times 100\%$$

An alternative method of measuring p.e.p. output is to use a diode probe voltmeter across the dummy load. The voltmeter reading squared and divided by the value of the load equals the p.e.p. output in watts.

I.e.

$$\frac{V\text{ (voltmeter)}^2}{75} = \text{p.e.p. output.}$$

It will be noted that whenever a transmitter is driven with a two-tone input there is a definite relationship between the p.e.p. output power and the mean or average output power. The mean power output is always exactly half of the p.e.p. output; this assumes a true half sine-wave envelope and no flat topping or other distortion of the waveform.

Most of the r.f. ammeters in use by amateurs have been obtained from surplus sources and will have doubtful accuracy. Note, however, that these meters are heat operated devices and are calibrated in r.m.s. values. They can therefore be calibrated with d.c. obtained from the car battery or other suitable source. The meter to be tested is connected in series with a 100 ohm potentiometer and the workshop AVO or similar testmeter and connected to the 12 volt supply (with a 2 volt battery a 10 ohm potentiometer would be suitable).

Further information on the theory of two-tone and single-tone testing may be found in " Single Sideband " in the issues of the BULLETIN from September 1961 to May 1962.

Circuit Correction

In " Single Sideband," RSGB BULLETIN, July 1965, Fig. 1, the rectifier bridge associated with TI is incorrectly drawn; the two silicon rectifiers in the top right hand arm should be reversed in polarity. Heater rating for the 6HF5 valve is 6·3 volts, 1·25 amps each; the total heater rating is 6·3 volts, 9 amps.