The mouse that roared (in SSB)!

Upgrading the Tucker Tin SSB transmitter

Originally described in the February, March and April 1972 issues of "Electronics Australia," the Tucker Tin Mk 2 SSB transmitter has proved a popular project with radio amateurs. Here the author, himself a radio amateur, relates his experiences in constructing the Tucker Tin, and details several design improvements.

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After constructing the "Tucker Tin" SSB transmitter some 12 months ago, the author experienced a considerable lack of success in getting it on air.

In retrospect this difficulty was probably due more to operator inexperience than to deficiencies in the Tucker Tin. Nevertheless it was quite obvious that considering the number of stations running well over 100 watts, a rig running 4 watts was not going to make much headway despite the few 'S' points difference. It was accordingly decided that what was required was greater power output and the achievement of this was tackled in two stages.

The first stage involved some alterations and additions to the original Tucker Tin chassis, particularly to the power amplifier. As indicated in the accompanying schematic an 807 was included as a new output tube (and a future driver for a linear amplifier) together with its own power supply. Fortuitously the original chassis design for the Tucker Tin had not been followed (as photos indicate) and there was sufficient space to include the new tube, a mains transformer, bias transformer, relays etc on the existing chassis.

A vital part of this revision to the basic design was to incorporate receiver muting and aerial changeover so that full advantage could be taken of the station antenna in the receiver.

A standard PMG relay was used, powered from the unused 5V filament winding and appropriate rectifiers and capacitors. Its first function was to switch the leads from the original transmitter key jack. Additional functions were to key the cathode ground connection to the 807; to change over the antenna from receiver to transmitter and to earth the receiver input on transmit; and finally to provide receiver muting.

In passing it should be noted that the 5MHz trap included in the tank circuit of the original Tucker Tin was dispensed with—with the new stage it proved to be unnecessary.

Another essential part of the first stage of the modification program was then undertaken. The author discovered that in order to fully modulate the signal, using the Japanese manufactured dynamic microphone available, an addi-

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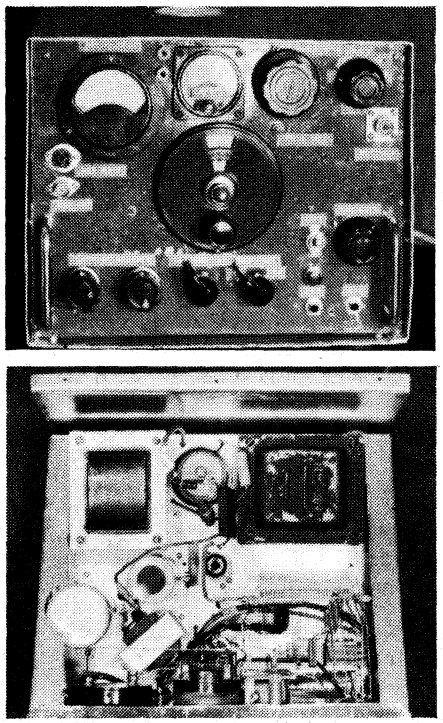
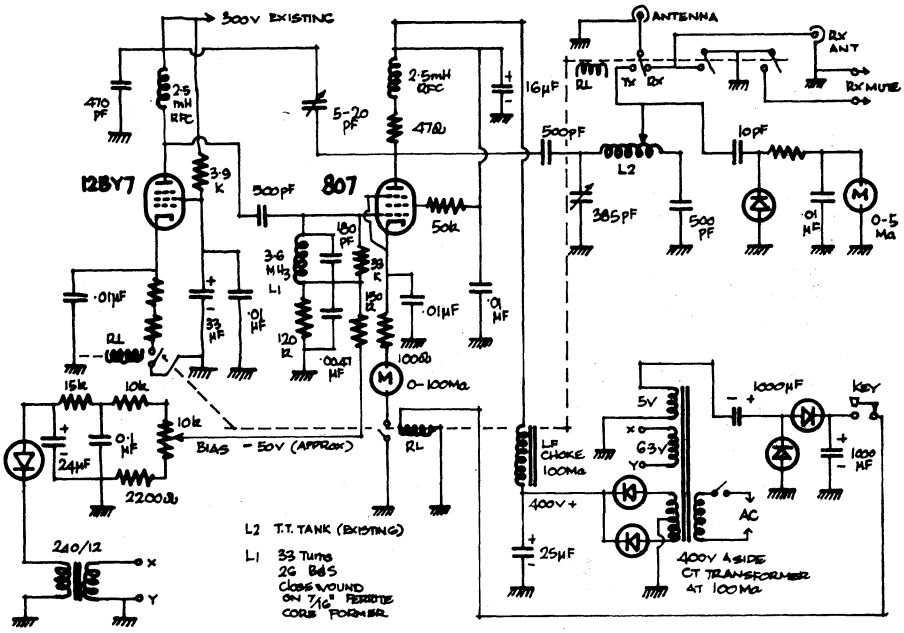




The revised power amplifier incorporates an additional stage (807) and has provision for aerial changeover and receiver muting. At left are two views of the modified Tucker Tin SSB transmitter as constructed by the author.

tional microphone preamplifier stage was essential. A preamplifier was made up in accordance with the circuit shown, and this stage precedes the original microphone preamplifier described in February, 1972. This arrangement appears to provide quite sufficient output to the modulator without it being necessary to shout.

Having got all the previously described changes to work, "on air" tests revealed one further serious deficiency—frequency instability.

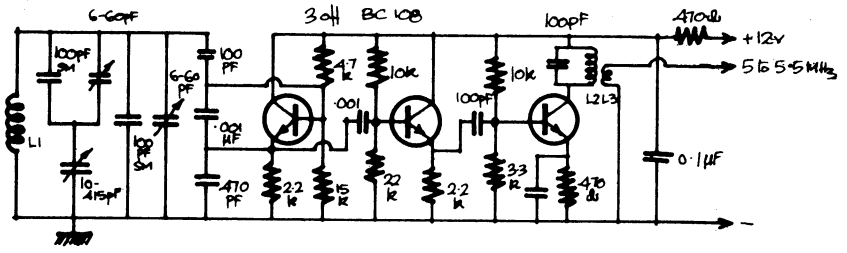
After considerable pondering and probing around with a multimeter the reason for the wandering signal became abundantly clear. Despite the fact that both the VFO and the crystal oscillators run continuously, switching from receive to transmit (ie switching on the mixer) caused the supply voltage to the VFO to drop by nearly 2 volts.

At first, the solution to this problem seemed quite simple—stabilise the power supply and, hopefully, the VFO frequency as well.

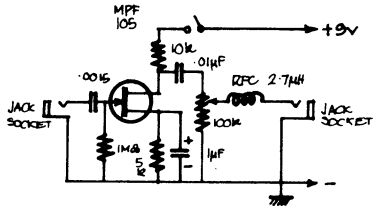
Initial experiments included the use of zener diodes, an IC voltage regulator and, finally, a separate voltage doubler power supply fed from a spare set of 6.3 volt leads on the power transformer. In addition, the supply to the drain of the VFO FET was detached from the supply to the adjoining buffer so that the new power supply would feed the VFO alone. This latter step involved some fairly brutal surgery to the VFO circuit board.

While these efforts certainly improved the situation, the author was still left with a 1kHz VFO drift which made net operation impossible and rendered even a normal contact difficult. At this stage, it was decided to abandon further efforts with the existing VFO and, instead, concentrate on building a new design externally. This approach was to prove entirely successful.

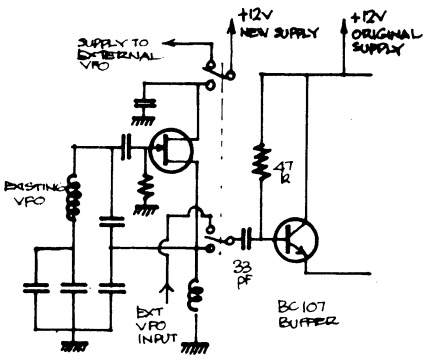
The circuit chosen for the new "external" VFO was originally described in "Electronics Australia" in October 1966, and is based on the so-called "Synthetic Rock" circuit designed by Commander P. H. Lee. Construction followed the general description given in EA, the only unusual item being the use of a grooved ceramic coil former. The relevant coil details are shown in the accompanying circuit diagram.



Circuit diagram of the "Synthetic Rock" VFO. Coil winding details are as follows: L1 20 mm diameter ceramic former, 30 turns 28B&S spaced over 50 mm; L2 30 turns 28B&S close wound; L3 5 turns 28B&S wound over earthy end.



Above, circuit diagram of the new microphone preamplifier stage.



At right, switching arrangement for selecting either the internal VFO or the external VFO.

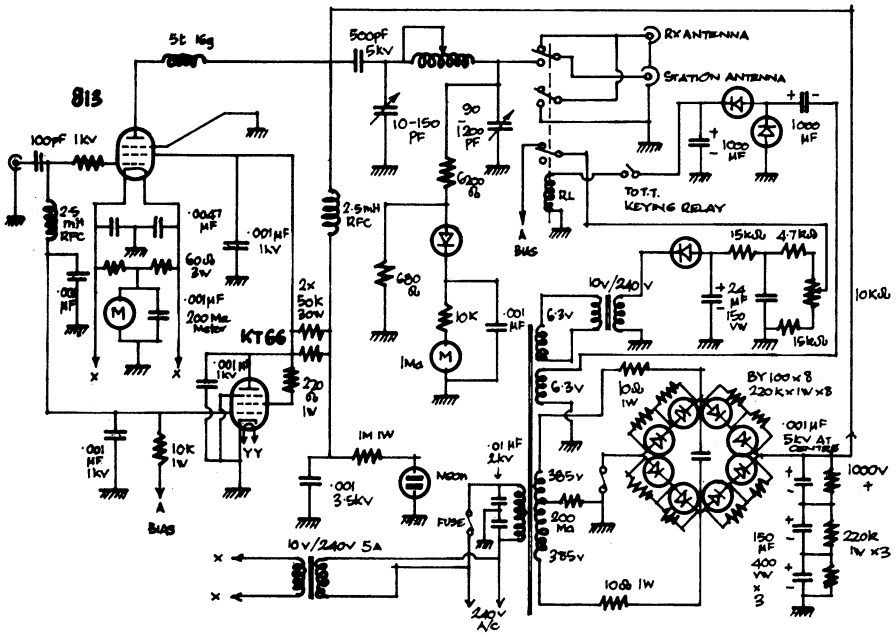
The coil former itself was salvaged from elderly transmitting gear and, being rigid and dimensionally stable with temperature change, is ideally suited to its new job. A modern substitute could well be a suitably sized pyrex glass test tube from the local chemist.

The external VFO is powered by the same supply that feeds the original internal VFO, which has been retained for emergency use. The respective VFO power supply rails and signal outputs are switched by a DPDT switch as shown in the circuit diagram. Signal output from the VFO in use is injected into the existing VFO buffer by means of the 33pF capacitor to its base.

At the time of writing, the new external VFO has been operational for only a few months. However, the evident stability of the unit on air has, in the author's opinion, more than justified the additional effort required to construct it.

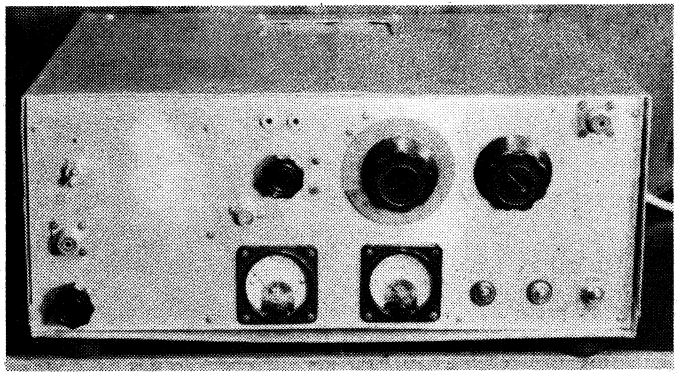
The second stage of the modification program, a "linear amplifier," involved nothing novel so far as the circuit was concerned. Indeed for the more acute readers the circuit will no doubt appear somewhat familiar, if only in parts. For the various parts refer to EA April 1967 p81 and EA April 1962 p65. The only novelty is the way the bits have been put together.

The power transformer was gleaned from an old television set and a number of high voltage components from an elderly naval RF power amplifier. The output tube is an 813 which is still available, in Sydney at any rate, and the clamper tube a KT66 which is far cheaper than the originally recommended KT88. The

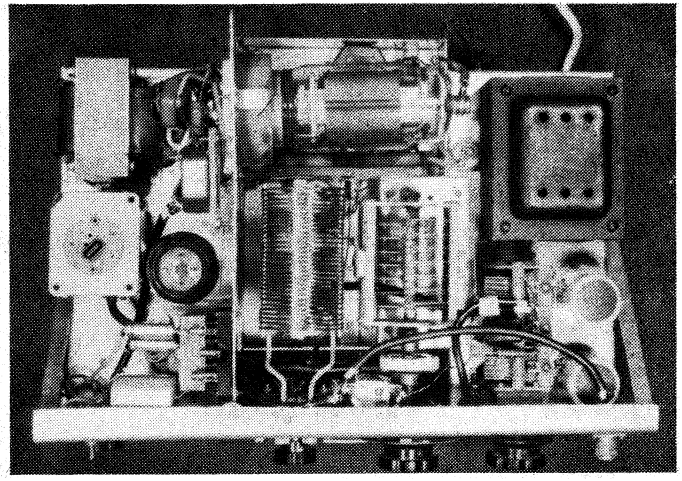


Above is the circuit diagram of the author's linear amplifier. The circuit was adapted from two previous designs published in April 1962 and April 1967.

Upgrading the Tucker Tin Mk II



A view of the completed linear amplifier. The meters shown monitor RF output and output tube cathode current.



Internal view of the completed linear amplifier. The 813 output tube is situated at top.

filament transformer for the 813 is available from Ferguson Transformers and supplies 5 amps at 10 volts.

Normal RF techniques were employed and the device worked first time. This was probably because the author was very careful in wiring up, not fancying the idea of trouble shooting a defective project with 1000 volts floating around. Apart from the question of high voltage there would seem to be a moral there.

Finally a caveat. Despite the fact that the afore described modified rig is regularly heard on 3.62MHz and seems to put out an entirely acceptable signal, the author is an amateur and not an electronics engineer. The project was thus largely assembled and made to work on a cut and try, suck it and see basis. For this purpose a lot of meters, evident in the final equipment, and an oscilloscope have been essential.

The author cannot guarantee that the modifications will work for anyone else or take any responsibility for anyone who misjudges the lethal potential of 1,000 volts at 150 milliamps. With that comment the author will look forward to meeting any other amateur who runs the Tucker Tin, modified or otherwise.