CONVERTING THE FRG-7 RECEIVER TO TRANSCEIVE EXCITER

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WHEN the author opened his FRG-7 to change the filter for one suitable for SSB working, he realised that there was plenty of room to convert the unit for transceive operation. After investigation of the board layout and circuit diagram the idea became even more exciting.

Description

The microphone signal is amplified by an SL630 and fed to the balanced modulator, SL640 (Figs. 1 and 2). The double sideband signal is fed to the filter by a small co-ax cable. SSB output from the filter is fed back to the exciter board into a 455 kHz IF amplifier; the gain of this amplifier is adjustable by RV1, which adjusts the negative feedback. The amplified SSB signal is fed to the mixer, SL640, and mixed with the 2.5-3.5 MHz VFO to produce a sideband signal tunable between 2 and 3 MHz by the main dial; this signal is fed *via* a 1K resistor into T401, where it is tuned and amplified. The output is taken from the drain of Q401 *via* a small reed relay mounted alongside on the chassis.

This signal, about 100 mV. p/p, is fed by miniature co-ax to the HF exciter board, Figs. 3 and 4, where it is mixed in an SL641 with the signal from TP109. The output at 54 MHz is amplified and filtered in the Mosfet stage, then fed to an SL640 and mixed with the VHF VFO. The output is a signal which, among others, is tunable between 1.6 and 30 MHz; this signal passes through a 3:1 wideband transformer and relay to the input of S2a. The RF stage is used on transmit to filter and amplify this signal, the output

Table of Values
Fig. 1

C101, C102,
C106, C108 = 2 μF tant.
C103, C109, C112,
C114, C115, C117 = 0.001 μF cer.
C104 = 0.0001 μF cer.
C105 = 0.002 μF
C107, C110, C111,
C113, C116 = 0.01 μF cer.
IFT1 = 455 kHz (from old transistor radio mixer)

R101, R102,
R105 = 220 ohm
R103 = 22K
R104 = 10K
RV101 = 2K2
IC1 = SL630
IC2, IC4 = SL640
IC3 = SL610
TR1 = BC107

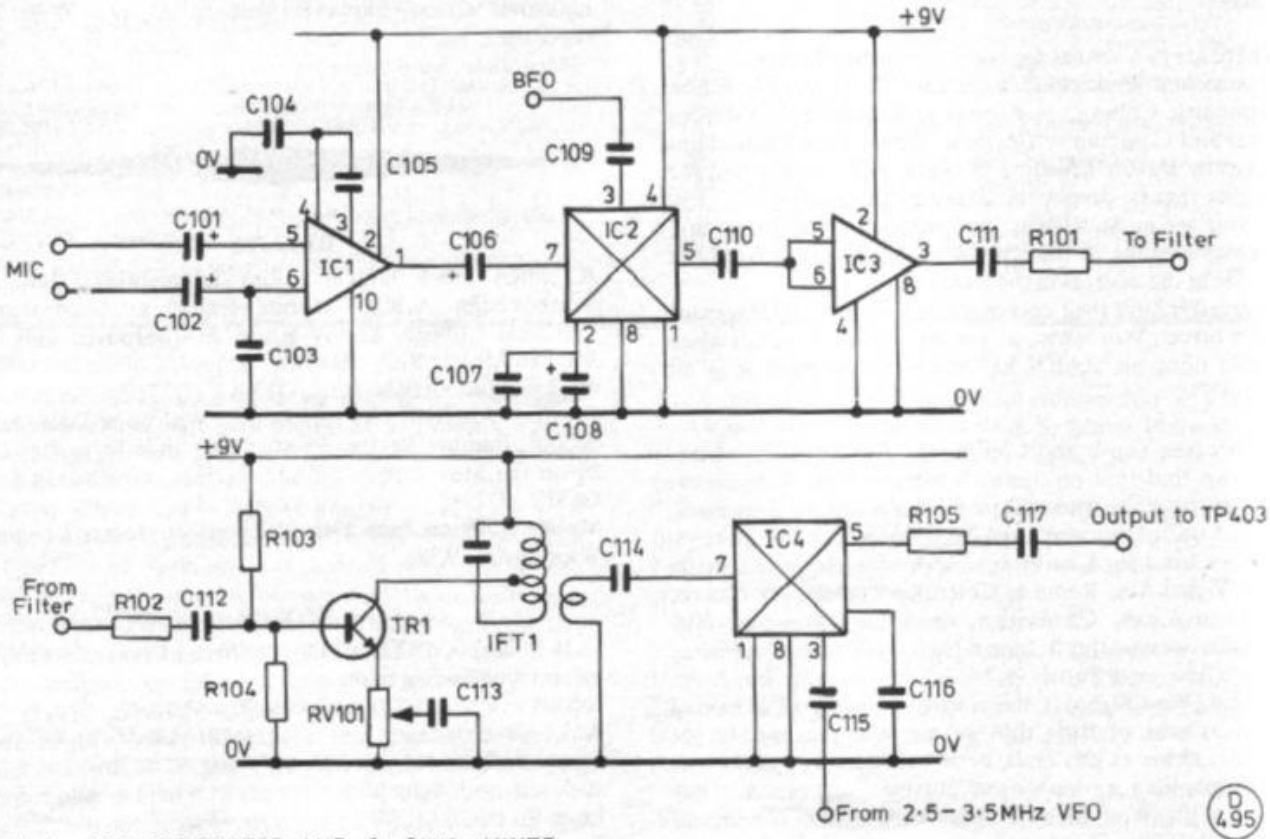

Fig.1 SSB GENERATOR AND 2–3MHz MIXER

being taken from the gate of Q102 *via* a relay — where an output of about 1 volt p/p is available at 50 ohms.

Owing to a mishap which put the original transformer 'to sleep', the writer is unable to comment on whether the original transformer is able to handle the additional load, but it is suspected that it could. However if it is considered necessary to change the transformer, take care of its positioning as the magnetic field can modulate the VFO.

Order of Modification

The first thing to be done is to arrange the method of disabling the stages not required on transmit. The IF stages are muted by cutting the track between R424 and R427, joining a wire to R424 and connecting this to the receiver's 9v. supply. Also it is necessary to disable the two HF mixers and the HF IF amplifier; again this is easily accomplished by cutting the track.

Next, arrange the outputs from the various oscillators. The VHF VFO output is taken from TP101; VC201 may require slight tuning to get the "Set MHz" dial to read correctly. The 52.5 "down convert" signal is taken from TP109. However, the output is a little low so C160 is increased to 30 pF; this also means that T116 may need very slight trimming to ensure that the 'lock' light goes out over

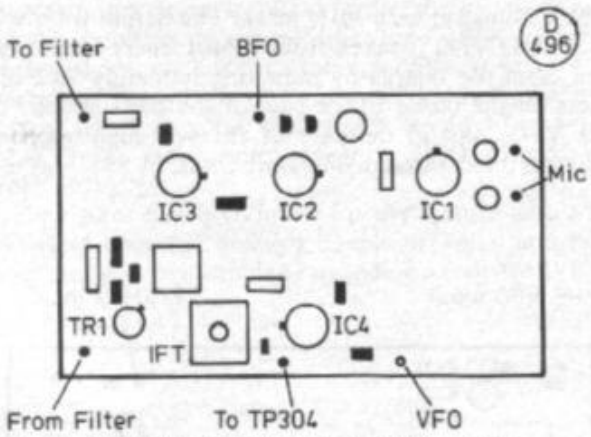

Fig. 2 SSB GENERATOR AND 2-3MHz MIXER (BOARD 1)

Table of Values
Fig. 3

C200, C202, C203, C210, C212, C213, C214 = 0.001 μF disc
C201, C206, C207, C208, C211, C215, C216 = 0.01 μF disc
C204, C209 = 2.5 pF
C205 = 100 pF
VR201, VR202 = 2K2
R201, R202, R208, R209 = 22K
R203 = 47K
R204, R205 = 33K
R206 = 220 ohm
R207, R210, R211 = 100 ohm
IC201 = SL641
IC202 = SL640
TR201 = BC108
TR202 = BC109
TR203 = 40822 (*Ambit*)

Coils: 5 turns tapped 2½ turns on Toko 10K coil formers from *Ambit*; resonating capacitor 13 pF.
Note: all resistors are ¼-watt.

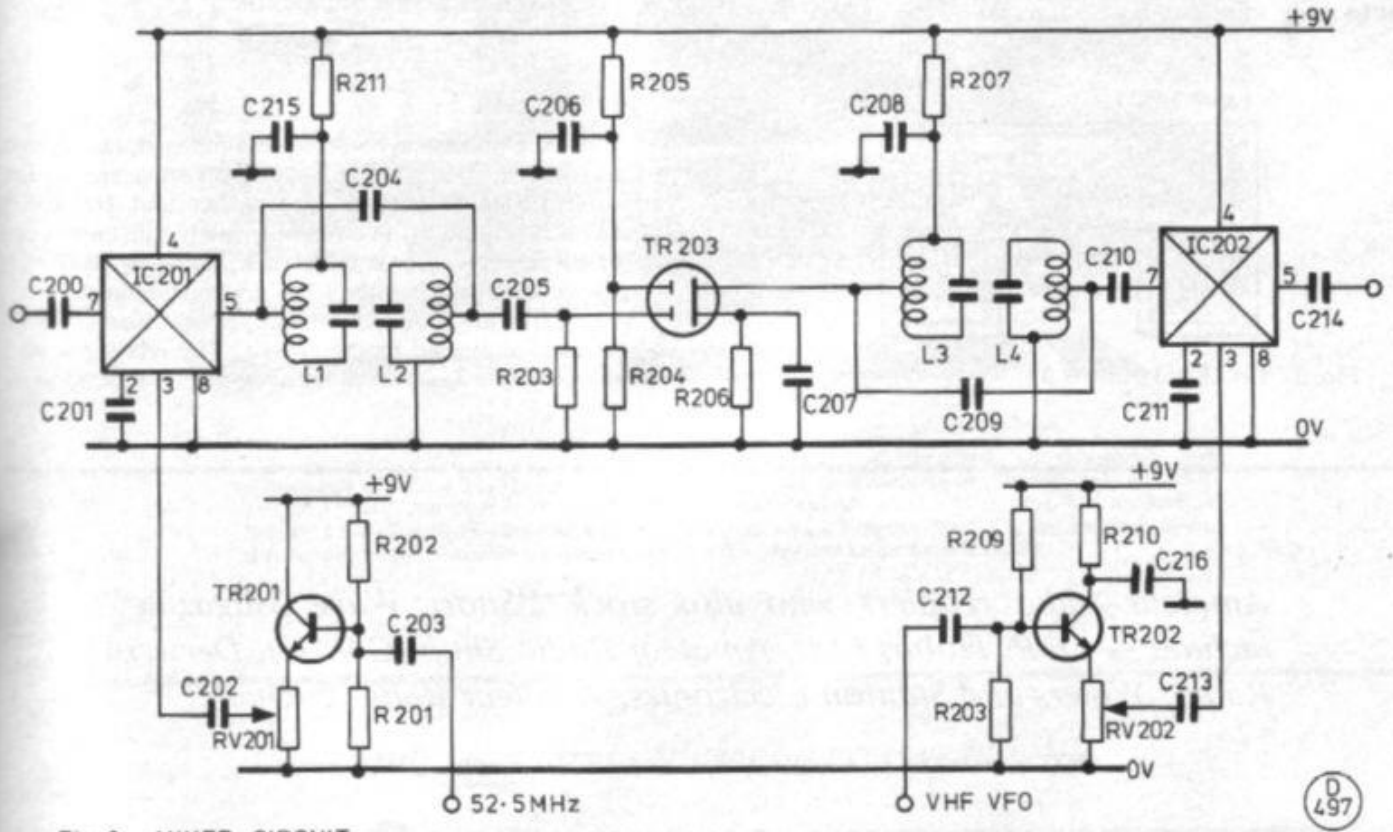

Fig. 3 MIXER CIRCUIT

the entire range at each MHz mark. The output for the 2.5 to 3.5 MHz VFO is taken from TP404: these outputs are taken from the boards by mounting miniature 2K2 ohm presets on the board in the case of the BFO and 2.5-3.5 MHz VFO, and in the case of the two high-frequency oscillators direct through miniature co-ax.

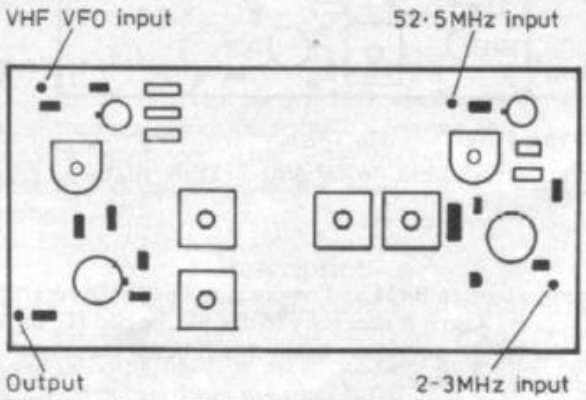

Fig. 4 HF MIXER (BOARD 2)

The MFL-455 filter supplied by *Ambit International Ltd.* was used in this design: unfortunately, however, this is no longer available in the UK. Therefore, whichever filter is decided upon care must be taken, especially on the receive side, that the matching of the filter is correct: this will ensure that the passband of the filter is as flat as possible.

The filter board is mounted on the underside of the IF strip using wire feet, just to the rear of the original filter position. Two miniature co-ax's are taken from the input and output of the filter assembly towards the rear of the set and going to the sideband generator.

The next problem is to match the output of the final to the input of the RF stage. Emitter followers were tried, but the most successful arrangement was a wideband transformer of five turns quadfilar-wound onto an FX2049 balun transformer core and wired as 3:1. This worked as well as anything tried and, being passive, was much easier to install.

The output of the RF stage is taken from the gate of Q102 where R12 joins the board; it is impossible to use the same relay as for the input switching for this position, because of the feedback produced in the RF stage. However, the spare relay contact on the input relay can be used to switch the 9v. supply on transmit and receive.

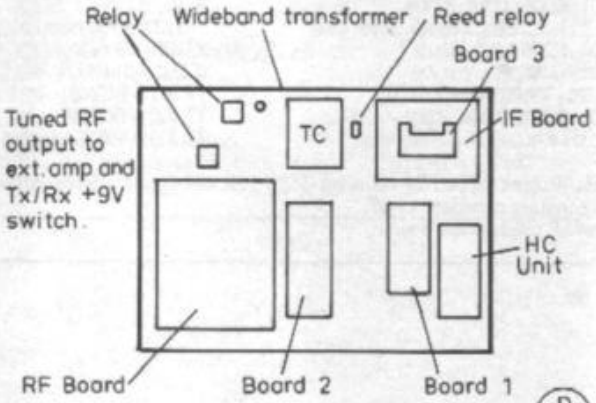

Fig. 6 TRANSCEIVER UNDERSIDE

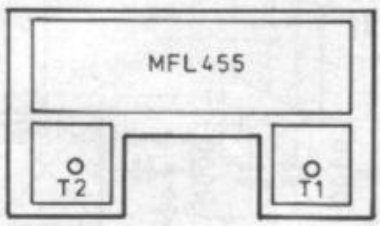

Fig. 5 FILTER (BOARD 3)

After these preliminary works are completed, tested, and found to be satisfactory, the more constructive side of the conversion can be tackled. The exciter and HF mixer boards are separate for two reasons: firstly, the boards are easier to position in two pieces and, secondly, different boards can be tried out without too much rebuilding.

The boards are mounted on *Radiospares* plastic pillars which are *Superglued* to the chassis. The relays are also mounted using a single drop of *Superglue*; if required these

joints can be broken without too much difficulty. The reed relay is mounted in the same way.

The foil pattern has not been given as the boards in use have not been optimised. However the basic component layout is shown, from which the design can be easily deduced.

Conclusion

It must be stressed that this is not a modification to be undertaken lightly: although the writer had the rig on the air within two weeks, it took a further three months to iron out the problems. It is hoped that the G3ROO design will work without any additional design optimisation, but as a second set has yet to be converted this is by no means certain! At this point the author would like to thank G2ACG for many hours spent in QSO correcting the problems.

The rig has now been in use for five months with a small wideband amplifier giving a couple of watts, and reports have been very favourable — including a couple of VK's.