PW 'STOUR' TOP-BAND TRANSCEIVER

PART 6

David G. BARRELL G4BMC

In this concluding part we present the remaining v.f.o. board details together with board switching and layout and final alignment details

Relay and Front Panel Switching

Two six pole changeover relays were available from scrap equipment and these were utilised to switch the d.c. voltages required. The r.f. switching, apart from the antenna changeover and Tune facility, was accomplished using diode switching.

The circuit diagram showing all relay connections and front panel switches is shown in Fig. 40. This circuit shows the transceiver in the following modes:

1) The ON/OFF switch is set to ON.
2) The TUNE switch is in the OFF position.
3) The transmit-receive switch is set to receive.
4) The r.i.t. switch is set to ON.
5) Relays RLA and RLB are in the receive position (i.e. the relays are at rest).

As mentioned previously the block labelled r.i.t. circuitry is not a printed circuit board and the components associated with this board are located on a tag strip.

The two blocks labelled 8a and 8b are in practice one board, i.e. board 8 the voltage regulator and a.g.c. sections of the transceiver.

The meter shunt, required during transmit, is not shown on this diagram. (See Fig. 7.)

There are three spare sets of contacts on relay RLB which may eventually be used for other functions but are not as yet used.

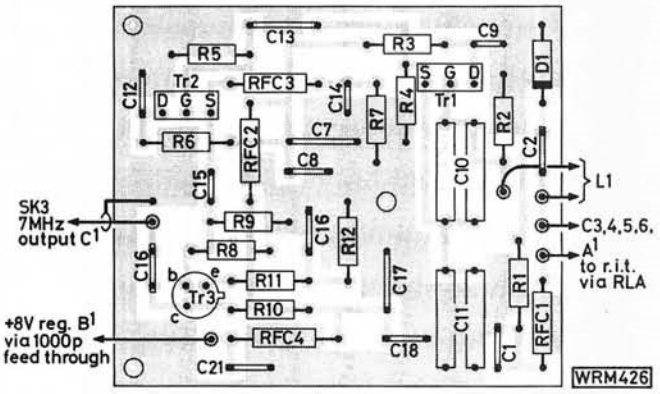
Wiring and Internal Layout

The prototype layout of the transceiver is shown in Figs. 41 and 42. The layout did not appear to be at all critical. During testing the various boards were gradually mounted onto an old aluminium chassis, with eventually the v.f.o., p.a. and driver boards "hung in" on the bench; it was quite a sight! This proved to be a successful method for the initial testing of different prototype boards. One point worth noting is that "filter ringing" occurred on three totally separate filter boards unless they were firmly mounted to the main chassis along with the other boards.

If the layout shown is used then a screen will be required between the 9MHz oscillator board and the balanced modulator. It is further suggested that the crystal end of the board is adjacent to the modulator board, as the lowest power level occurs here. The screen improved the carrier balance by about 10 dB!

Either in this design or in any other layout attempted, the following points should be borne in mind:

1. As stated earlier in the article all r.f. connections must be made using 50Ω coaxial cable, earthed at both ends.



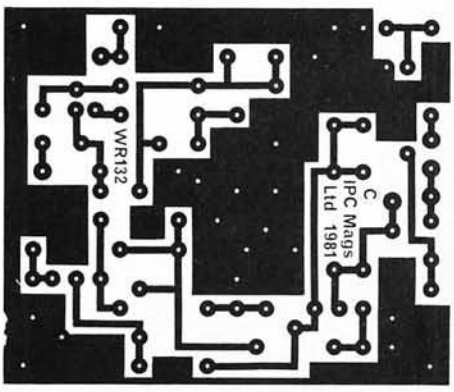


Fig. 39: Board 10 (v.f.o.) component layout and p.c.b. track pattern, shown full size

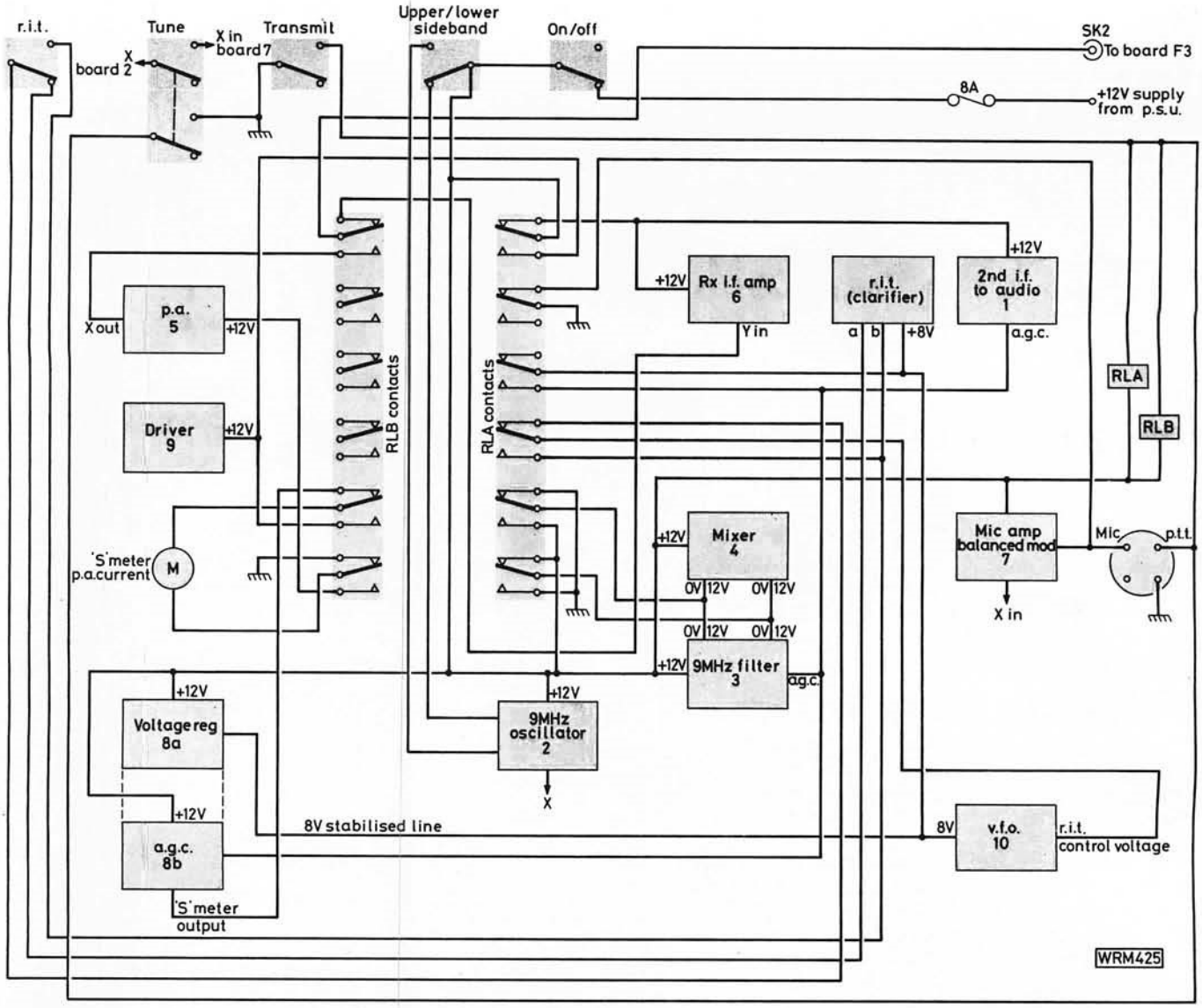


Fig. 40: Relay and front panel switching diagram

2. The earth connection between relay RLA and the microphone input on board 7 should either be very short or via screened cable.
3. Screened cable should be used to wire both the volume control connections and the microphone input.
4. The driver board and p.a. should not be able to "see" the balanced modulator, filter board, mixer board or filter F1.
5. It is a great help if the p.a. board is made as a plug-in unit. This was accomplished by using "flying" leads with miniature b.n.c. connectors for the r.f. connections. Simple phono plugs of the in-line variety were used for the +12 V and speaker connections. This allowed the top cover to be completely detached whilst working on other sections of the transceiver. (The top cover had the p.a. board and speaker attached to it.)
6. Large bunches of wires should be laced together wherever possible for neatness; waxed cotton works well for this if available.
7. Use thick cable for all wiring which will feed the p.a. (This applies right from the cable entry point.)
8. All wiring of d.c. leads to boards should be as direct as possible without crossing back and forth over the boards themselves.
9. Avoid the use of an all-aluminium box if possible as the warp on such boxes can never enhance stability.
10. The v.f.o. unit should be made as a totally separate unit and then bolted to the main chassis.

Readers who intend to operate the Stour should be in possession of the appropriate licence issued by the Home Office to those who have passed the City and Guilds Radio Amateurs' Examination. Details may be obtained from: The Home Office, Radio Regulatory Department, Amateur Licensing Section, Waterloo Bridge House, Waterloo Road, London SE1 8UA.

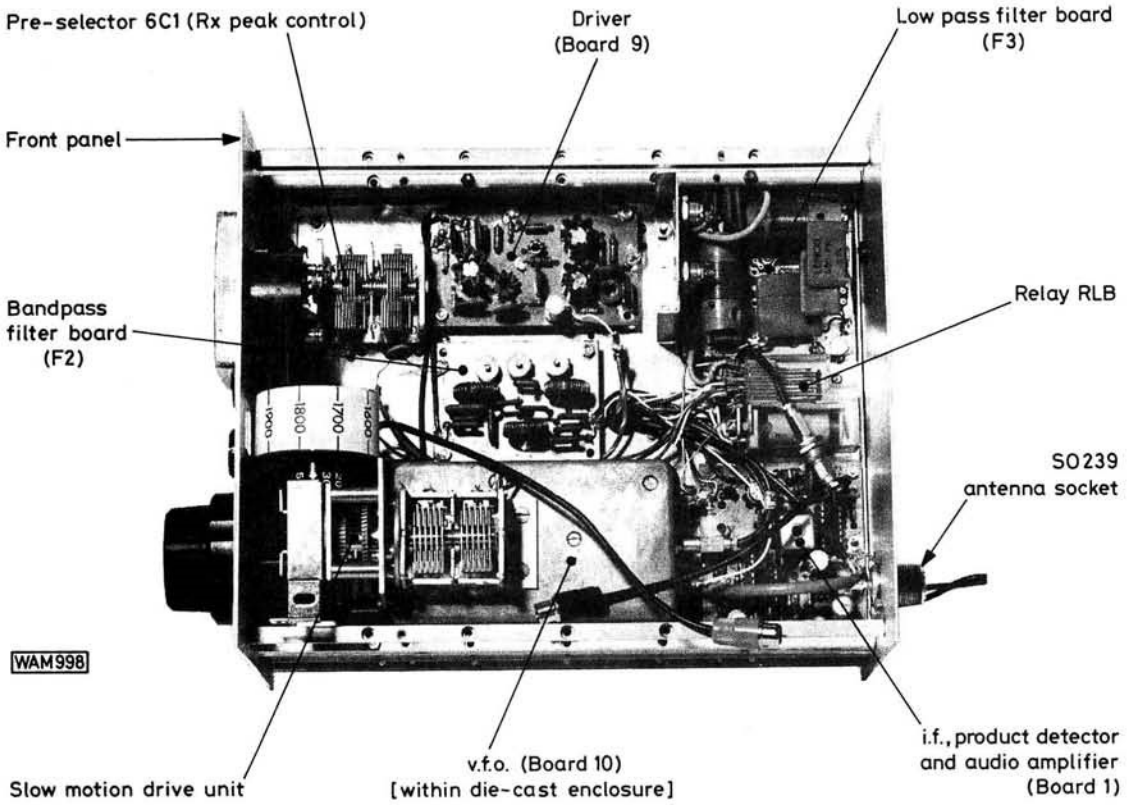


Fig. 41: General layout plan view of the transceiver upper side

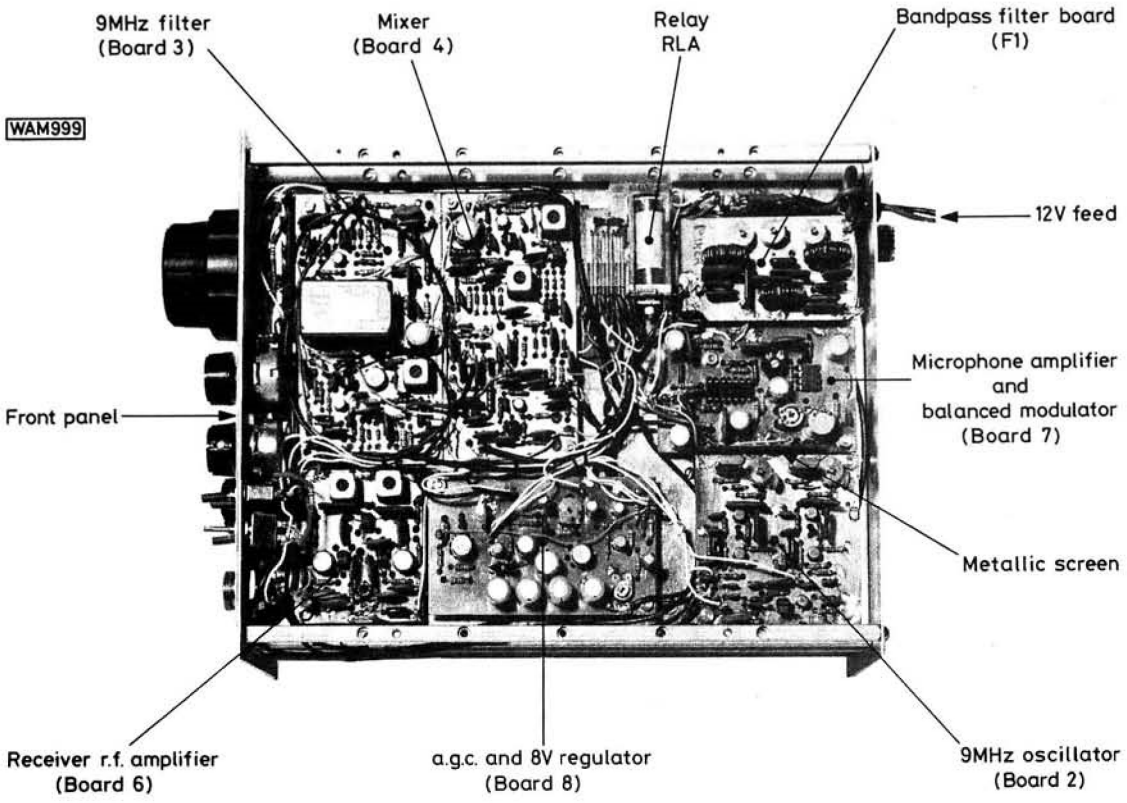


Fig. 42: General layout of the transceiver under side

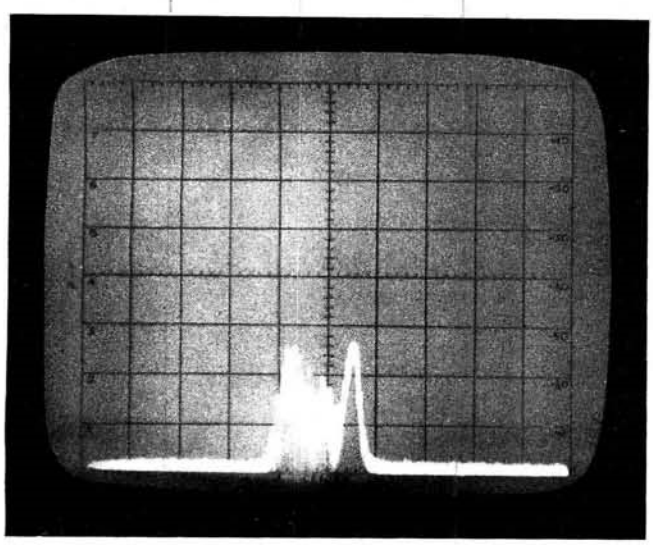


Fig. 43: Photograph showing spectrum of suppressed carrier plus noise

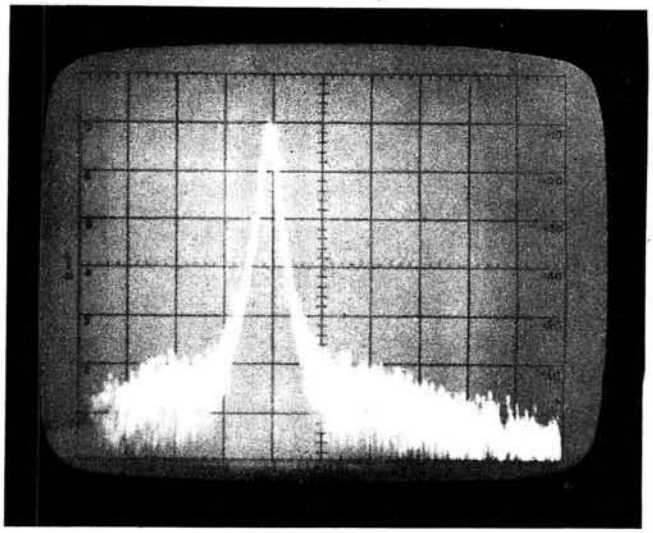


Fig. 45: This photograph shows a single tone at 18W output. The difference between Figs. 43 and 45, the carrier suppression, may be seen to be approximately 45dB

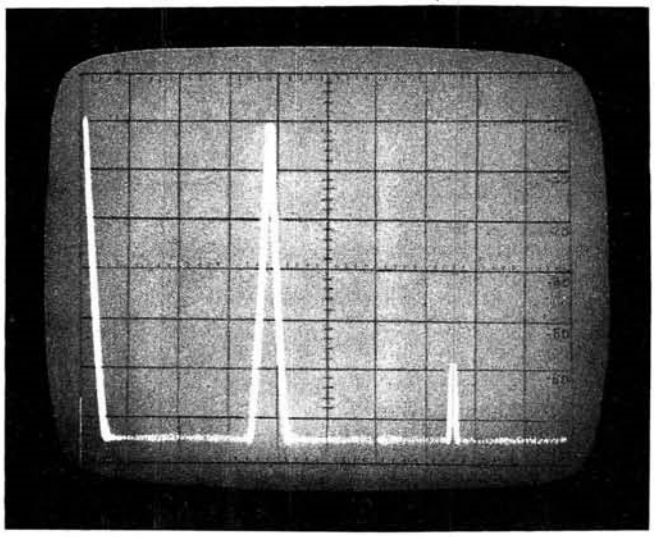


Fig. 44: The fundamental frequency plus the second harmonic at 80m. This may be seen to be approximately 50dB down on the wanted signal. The noise floor at about 65dB down is the only other signal present; all other spurii are therefore >60dB down

11. All p.c.b.s should be mounted using spacers which, if possible, should be soldered to the boards. This makes removal and fitting very much simpler.
12. On the prototype the boards were initially mounted on the underside of the chassis using nuts and bolts which were fixed to the chassis. The protruding bolt then passed through the spacer and p.c.b. where a further nut secured the board itself. When all the boards beneath the chassis had been mounted they were removed to enable the holes to be drilled for the top board.

This method would only be necessary if the boards were all mounted either side of the centre chassis plate. In order not to waste the space beneath the v.f.o. box the latter was mounted on rubber spacer washers which also gave some vibration protection to the v.f.o.

Correction

On the circuit diagram, Fig. 27, of the Microphone amplifier board 7, there is no link between pins 4 and 10 of IC2. The p.c.b. and overlay are correct.

Additional Alignment Details

Board 1 Peak L1 during receive for maximum output.

Board 2 Adjust 2C2 and 2C2a to obtain the correct frequency of the upper and lower sideband crystals. If no measuring equipment is available then on receive tune in to a fairly strong s.s.b. signal and adjust 2C2 to obtain a clean sounding signal. Further adjustments may be carried out on the air during transmit with the aid of a local station. This adjustment is fairly critical but the author set the rig up on the air without any problem.

Board 3 Adjust 3L1 for maximum output during receive.

Board 4 Adjust 4L4 and 4L6 during receive for maximum output.

Board 5 Adjust 5R7 to obtain a 250mA standing current (measured at the input to the p.a. board).

Board 6 Adjust 6L1 and 6L2 for maximum output during receive.

Board 7 7R10 should be adjusted for minimum carrier output by either of the following methods (carrier balance).

1. If a receiver covering 160m is available then listening to the carrier whilst adjusting 7R10 will show a definite carrier null. This should be quite pronounced.
2. If no receiver is available then the p.a. current should be monitored and minimum current should be obtained at the null point when adjusting 7R10.

For both the above tests the microphone should be removed and the transceiver set to s.s.b. transmit (upper and lower sideband).

7R1 should be set up so that normal speech peaks drive the p.a. meter to around 2 amps.

ALL the adjustments were made at the author's QTH and the test results are those obtained with the rig set up in this way, a test meter and 160m receiver being all that was used. ●