CHAPTER 3

CIRCUIT DESCRIPTION

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INTRODUCTION

1. To assist in the understanding of the following circuit description the functional description and block diagram given in Chapter 1 should be read first.

2. The circuit diagram comprises Figures 3.1, 3.2 and 3.3. Figure 3.1 shows the switch functions and p.c.b. interconnections with the main p.c.b. shown in functional form. Figures 3.2 and 3.3 show the circuit of the main p.c.b., power amplifier and DC/DC converter. In the following description the receive path is considered first followed by the transmit path.

3. The d.c. supply to most circuits, except the transmitter output stages, is +9V. As some circuits are common to both RX and TX paths the inputs and outputs to these circuits must be from the RX path when the equipment is in the RX mode and from the TX path when in the TX mode. This is achieved by applying 9V RX to the RX circuits during reception and by applying 9V TX to the TX circuits during transmission, these voltages being switched by the PTT switch.

RECEIVE PATH

Radio Frequency Stage

4. The received signal is routed from the 50 ohm or whip antenna connector via the bandswitch S3, the antenna tuning unit (L4), the antenna changeover relay contact RL1/1, the passband filter and main p.c.b. pins 28 and 29 to the primary of the broadband ferrite transformer T1, which matches the signal to the base of the r.f. amplifier VT3.

5. The cross-connected silicon diodes D1 and D2 protect the r.f. amplifier against high energy electrostatic or r.f. voltages.

6. The collector load of VT3 is the transformer T2. The output of T2 (4 turn winding) is applied to the image suppression filter (ISF) which suppresses all frequencies above 8MHz. Added attenuation at the i.f. is provided by a notch filter in the ISF which is factory adjusted by C9. R7 in the primary circuit of T2 ensures a flat response up to 8MHz.

Balanced Mixer

7. Output from the image suppression filter is matched to the primary of transformer T3, the secondary of which is connected to the balanced diode bridge D20 and D21 in the centre tapped secondary of transformer T13. High level output from the channel oscillator buffer amplifier VT19 is fed to the primary of T13 at a frequency equal to the channel frequency plus the i.f. frequency. The diode bridge mixer balances out the oscillator signal and the mixer difference signal at the i.f. frequency is fed to the primary of tuned transformer T4.

Sideband Filters

8. The output from transformer T4 is fed via capacitive divider C15 and C16, to the switching diodes D5 and D6 at the input of the sideband filters F1 and F2. With the USB/LSB switch S1B set to USB, 9V positive is applied to diodes D5 and D7 which conduct and open the signal path to the USB filter. With the USB/LSB switch set to LSB, 9V positive is applied to diodes D6 and D8 which conduct, and open the signal path to the LSB filter. The wanted sideband is fed to the junction of capacitors C24 and C25 connected across the primary of T5. It should be noted that because of frequency inversion the u.s.b. filter has l.s.b. characteristics and vice versa.

10,7MHz IF Amplifier

9. I.F. amplifiers VT5 and VT6 operate in the common emitter mode with audomatic gain control while VT7 operates at a fixed gain. Tuned transformers T6, T7 and T8 provide interstage matching and selectivity, and T9 is a broadband matching transformer.

10. The emitter current of VT6 is fed via R32 to the metering circuit.

Balanced Demodulator

11. The secondary winding of T9 matches the i.f. signal to the balanced diode demodulator D14 and D15. High level excitation at 10,7015MHz from carrier crystal oscillator VT16 is applied to the demodulator via T10. Balancing of the mixer is effected by RV4 and C69. Audio voltage is fed via decoupling network C40, C41 and R39, to the input of the first audio amplifier VT8.

Audio Amplifiers

12. The audio pre-amplifier VT8 operates in common emitter mode and feeds VT9, which drives the complementary push-pull class B stage VT10 and VT11. The quiescent current of the class B stage is controlled by diodes D10, D11 and RV1. Audio output is developed across preset level control RV2, the slider of which is connected to pin 2 on both front panel audio sockets, via pin 27 of the main p.c.b.

Automatic Gain Control

13. The audio output appearing at the junction of R56, R57 and C49 is fed via R74 and C70 to diode detector circuit D16 and D17 in the base circuit of VT17. Under no signal conditions, VT17 draws no current, and the gain of the i.f. stages VT5 and VT6 is controlled by the setting of the pre-set potentiometer RV5 and the receiver manual gain control RV6. Under signal conditions, the a.f. signal is rectified in diodes D16 and D17 and a positive voltage proportional to the audio output is developed across R75. This positive voltage, filtered by C71, R76 and C72, is applied to the base of VT17 and its collector current increases. The resulting voltage drop across R77 is applied to the bases of i.f. amplifiers VT5 and VT6, resulting in a reduction of the combined gain of the controlled stages.

AM Reception

14. With the MODE switch S4 set to AM, h.t. is removed from the 10,7MHz oscillator VT16. The 9V supply is applied via switch S4H contact 6 to switching diodes D3 and D4 in the sideband filter circuit. These diodes conduct to connect both filters in parallel and provide the a.m. characteristics for the incoming i.f. signal. During reception the 9V RX supply is applied to the anode of D42 and resistor R120 is earthed through contact 6 of S4B. The resulting positive voltage at the cathode of