RA. 217

H.F. COMMUNICATIONS RECEIVER

VOLUME 2

MAINTENANCE MANUAL

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RA.217 MAINTENANCE MANUAL

PREFACE

Handbook Guide

This Volume contains detailed information for maintenance purposes. It is assumed that the user also has a copy of the RA.217 Operators Manual, to which reference should be made for general information concerning installation, operation, and technical principles.

Variants

Chapters 1 to 8 of this Volume refer to the basic RA.217 receiver. Details of any variant models will be given in appendices, which will be inserted immediately prior to the illustrations at the rear of the handbook.

RA.217 MAINTENANCE MANUAL

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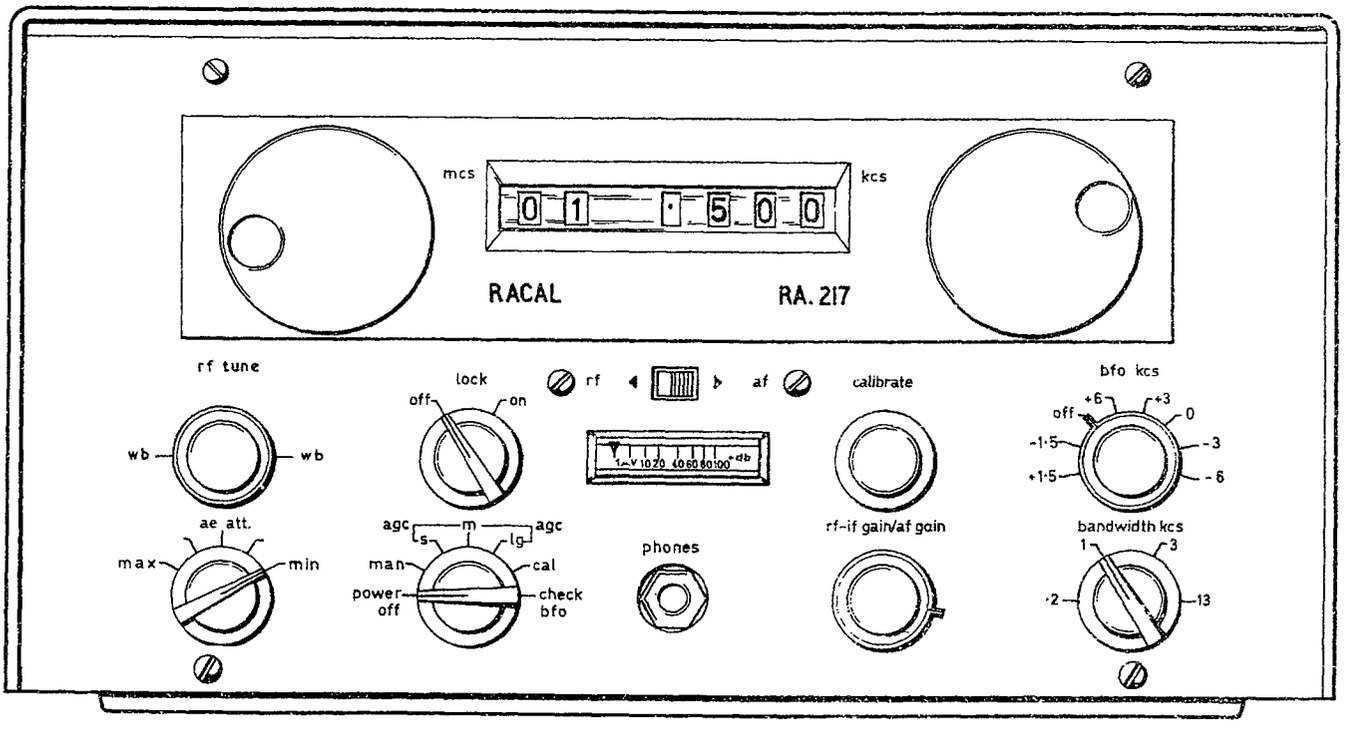
ILLUSTRATIONS



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H.F. Communications Receiver Type RA. 217

HANDBOOK CHANGE INFORMATION

At RACAL, we continually strive to keep up with the latest electronic developments by adding circuit and component improvements to our equipments.

Sometimes, due to printing and despatch requirements, we are unable to incorporate these changes immediately into printed handbooks. Hence, your handbook may contain new change information on following pages.

The user is recommended to hand-amend this handbook, as soon as possible, in accordance with the corrections, if any, which follow this sheet.

NOTES

TECHNICAL SPECIFICATION

Frequency Range:	1 to 30 MHz
Modes of Reception:	D.S.B., M.C.W., C.W., S.S.B. (U.S.B. or L.S.B.)
Tuning:	Digital presentation in units of kilohertz with interpolation calibration at 200 Hz intervals.
Resetting Accuracy:	±200 Hz
Calibration Accuracy:	±500 Hz (when calibrated to nearest 100 kHz checkpoint)
Calibration:	A 100 kHz signal, derived from the 1 MHz standard crystal oscillator having an accuracy of 5 parts in 10^6, provides checkpoints at 100 kHz intervals.
Frequency Stability:	(a) ±50 Hz over 8 hours at constant ambient temperature and humidity after 2 hours from switching on. (b) Better than 50 Hz per degree Centigrade at constant humidity after 2 hours from switching on.
Antenna Input:	(a) Nominal impedance 75 ohms unbalanced (b) Wideband, or tuned in five automatically selected bands: (i) 1 to 2 MHz (ii) 2 to 4 MHz (iii) 4 to 8 MHz (iv) 8 to 16 MHz (v) 16 to 30 MHz
Sensitivity:	3 kHz bandwidth: C.W., S.S.B: 1 μV for 15 dB signal/noise ratio. M.C.W., D.S.B: (30% modulated at 400 Hz) 3μV for 15 dB signal to noise ratio.

Selectivity:

Four alternative I.F. bandwidths are selected by means of a front panel switch:

	-3 dB	-60 dB
1.	13 kHz (nom)	30 kHz (nom)
2.	3 kHz (nom)	9 kHz (nom)
3.	1 kHz (nom)	4 kHz (nom)
4.	0.2 kHz (nom)	2 kHz (nom)

Cross Modulation:

For a wanted signal of level up to 1 mV and with appropriate use of Aerial Attenuator (AE ATT) control, an interfering signal 20 kHz removed and modulated 30% must have a level greater than 45 dB above that of the wanted signal to produce a cross modulation of 3%. The ratio of wanted to unwanted signal level is improved at the rate of 2 dB per cent up to 10% off tune.

Intermodulation:

Better than 80 dB on 1 μV for interfering signals at least 10% removed from the wanted signal.

Blocking:

For levels of wanted signal of up to 1 mV, and with appropriate use of the Aerial Attenuator (AE ATT control) an interfering signal 20 kHz removed must have a level 56 dB greater than the wanted signal to reduce the signal-to-noise ratio by 3 dB.

Spurious Response to External Signals (Image, etc):

(a) External signals less than 10% off tune shall be greater than plus 60 dB relative to 1 microvolt to produce a spurious signal equivalent to 1 microvolt.

(b) With tuned aerial (antenna) external signals more than 10% off tune shall be greater than plus 80 dB relative to 1 microvolt to produce a spurious signal equivalent to 1 microvolt.

Internally Generated Spurious Responses:

Not greater than 2 dB above noise level in a 3 kHz bandwidth

Noise Factor:

Not greater than 10 dB throughout entire range.

I.F. Output: (A.G.C. 'on')

(a) At 1.6 MHz: 0.1V at high impedance (nominal)

(b) At 100 kHz : 0.27V (1 mW) nominal in 75 ohms.

(c) At 455 kHz : 0.22V (1 mW) nominal in 50 ohms.

Automatic Gain Control:

(a) Time constants:

		Attack (nominal)	Decay (nominal)
(i)	Short	15 mS	15 mS
(ii)	Medium	50 mS	200 mS
(iii)	Long	100 mS	4 Sec

(b) Output Change:
An increase in input of 85 dB above 2 μV will produce a change in output level of not greater than 4 dB.

B.F.O.

(a) Variable ±8.0 kHz.
(b) Crystal controlled ±1.5 kHz.

A.F. Output:

(a) Headphone output: 10 mW in 600 ohms

(b) Line output: 1 mW in 600 ohms

A.F. Distortion:

Less than 3%

A.F. Response:

100 to 6000 Hz. Flat within 3 dB.

Hum Level:

40 dB below rated output

Metering:

(a) 'S' Scale - dB ref 1 μV.

(b) Line Level

Controls:

(a) Meter Switch (AF Level/carrier level)

(b) Frequency Readout - In-line Digital

(c) 'Megacycles' Tuning ('Megahertz')

(d) 'Kilocycles' Tuning ('Kilohertz')

(e) System Switch

(f) B.F.O. Variable and Crystal Selector

(g) R.F./I.F. Gain Control

(h) A.F. Gain Control

(i) R.F. Tuning

(j) Tuning Lock

(k) Calibrate - Fine Tune

(l) I.F. Bandwidth

(m) Antenna Attenuator

External Connections:

(a) Antenna Input

(b) I.F. Output 1.6 Mc/s (MHz)

(c) A.F. Line Output

(d) A.F. Phone Output

(e) A.G.C. Line

(f) Power Input

(g) I.F. Output 100 kc/s (kHz) or 455 kc/s (kHz)

(h) Unbuffered Detector

(i) 2nd V.F.O. Output

(j) 2nd V.F.O. Input (high level 2V e.m.f. 75 ohms: low level 100 m V e.m.f. at 75 ohms)

(k) 1 Mc/s (MHz) Output

(l) 1 Mc/s (MHz) input (high level 2 V e.m.f. into 75 ohms: low level 100 mV into 75 ohms)

(m) 1.5 Mc/s (MHz) or 1.7 MHz output from 100 kHz I.F. Unit, or 1.145 Mc/s (MHz) output from 455 kHz I.F. Unit

(n) 1.5 Mc/s (MHz) input for 100 kHz I.F. Unit, or 1.145 Mc/s (MHz) input for 455 kHz I.F. Unit (see note below)

(o) L.F. Adaptor Input

(p) Panoramic Adaptor Output

NOTE: 1.7 MHz may be supplied to the I.F. Converter in lieu of 1.5 MHz but 100 kHz sidebands are then inverted.

Power Supplies:	Alternative power units are available as follows: (a) 100-125V or 200-250V, 45-400 Hz, single phase a. c. (b) (i) 100-125V or 200-250V, 45-400 Hz, single phase a. c. or (ii) 21-27V d. c., positive earth only. (c) 9-15V or 18-30V d. c., positive or negative earth.
Power Consumption:	7VA approx. (RA.217A)
Dimensions:	(a) In cabinet: 7 in high x 13 in wide x 13 in deep (18 cm) (33 cm) (33 cm) (b) For standard 19 in rack mounting: 7 in high x 19 in wide x 15 in deep (18 cm) (48 cm) (38 cm)
Weight:	(a) In cabinet: 35 lb (16 kg) approx (b) For standard 19 in rack mounting: 40 lb (18 kg) approx
Environmental Conditions:	The equipment is, in general, designed to meet the requirements of specification DEF 133 L2, operating within the ambient temperature range of -5^{o}C to $+55^{o}$C. Storage temperature: -40^{o}C to $+70^{o}$C
Construction:	The unit is of modular construction

CHAPTER 1

DETAILED CIRCUIT DESCRIPTION

INTRODUCTION

1. The RA.217 is constructed on a modular system, the separate modules themselves being composed of smaller assembly units. This type of construction lends itself to a servicing system based on replacement units and simplifies the incorporation of improved designs or special facilities. Many of the board assemblies contain further coil or transformers sub-assemblies etc., but it is strongly recommended that the user should regard the printed circuit board assembly as the smallest item suitable for unit replacement. In accordance with this principle the receiver can be dismantled into the following main items. Each principal heading indicates a module, with the printed circuit boards contained in that module listed beneath.

MODULE ASSEMBLIES

2. Units and Sub-Assemblies		Racal Part Number	
R.F. Unit Assembly	Fig. 4	CA.28140	
1. Aerial Filter		AA.28188	
2. Coil and Switch Assembly		BA.34082	
3. R.F. Amplifier Board		BA.28185	
4. H.T. Filter		AA.28179	
1st Mixer and 40 Mc/s Filter Assemblies		BA.28191	Not used
1. 1st Mixer Board		BA.28201	on main prod-
2. 40 Mc/s Filter		AA.28197	uction version.
1st Mixer and 40 Mc/s Filter Assembly	Fig. 8	BA.28211	
1. 1st Mixer Board		BA.28215	
2. 40 Mc/s Filter		AA.28197	
2nd Mixer Assembly	Fig. 9	BA.30959	
1. Mixer Board		BA.28177	
3rd Mixer Assembly	Fig. 11	BA.35970	
1. Mixer and Filter Board		BA.35966	

Units and Sub-Assemblies			Racal Part Numbers	
1st V.F.O. Assembly	Fig. 5		CA.28120	
1. Oscillator Board			BA.35195	
2. Buffer Amp (to 1st Mixer)			BA.32535	
3. Buffer Amp (to Harmonic Mixer)			BA.28128	
2nd V.F.O. Assembly	Fig. 10		CA.28101	
1. Oscillator Board			BA.35808	
2. Buffer Amplifiers			BA.35807	
1 Mc/s Amps, Osc. and Calibrator	Fig. 6	(part of	CA.28276).	
1. 1 Mc/s Amplifiers			BA.32858	The overall module (CA. 28276) is usually referred to as the '37.5 Mc/s Generator' module although it also contains the 1 Mc/s and calibrator section
2. 1 Mc/s Osc. and Calibrator			BA.32860	
37.5 Mc/s Generator	Fig. 7	(part of	CA.28276)	
1. H.T. Filter			BA.28284	
2. Harmonic Generator Board			BA.32854	
3. } Harmonic Filter			BA.35836	
4. }				
5. Harmonic Mixer			BA.37894	
6. 37.5 Mc/s BufferAmp.			BA.32850	
37.5 Band-Pass Filter	Fig. 7		AC.28192	
I.F. Unit Assembly (455 kc/s i.f.)	Fig. 12		DA.28250/A	
(100 kc/s i.f.)			DA.28250/B	
1. 1st I.F. Amplifier			BA.31474	
2. Crystal Filter Assembly			BA.28252	
3. Main 1.6 Mc/s I.F. Amp and H.T.Filter			BA.30532	
4. Audio Amplifier Board			BA.31462	
5. Detector Board			BA.28236	
6. (a) Converter (Amplifier) Board (455 kc/s)			BA.34783/A	
(100 kc/s)			BA.34783/B	

7.	A.G.C. Board	BA.31466
8.	Converter (Osc. and Output)	
	(455 kc/s)	BA.34766/A
	(100 kc/s)	BA.34766/B
9.	Outlet Panel, Sockets 1 to 4	
	(455 kc/s)	BA.28258/A
	(100 kc/s)	BA.28258/B

B.F.O. Unit Assembly Fig. 13	BA.28259	
1. B.F.O. Switch Assembly	BA.28259	
2. 600 kc/s Oscillator Board	BA.30540	
3. Buffer Amplifier	BA.30542	

Power Unit Assembly (a.c. mains) Fig. 14	CA.28290	Type PU.408A
1. Main Assembly (less Component board)	CA.28290	
2. Component board Assembly	BA.28297	

MAIN CHASSIS GENERAL DETAILS

3. Before commencing a detailed description of each module a few points concerning the main chassis may be noted. The most suitable illustrations to refer to are the Interconnections diagrams Figs. 15 and 17 Users of receivers having serial numbers 01 to 26 should study the notes on these illustrations. The location of modules in the main chassis is shown in Fig. 18.

H.T. DISTRIBUTION

4. The -16V h.t. supply from the Power Unit is supplied without switching to the 2nd Mixer, 3rd Mixer, 1 Mc/s oscillator, I.F. Unit and B.F.O. unit. The -16V supply to those stages prior to the 2nd mixer, which are the R.F. Unit, 1st Mixer, 1st V.F.O. and 37.5 Mc/s Generator circuit, is controlled by the System switch. The switched h.t. to these units is routed via the switch SB and the terminal block TB2 which enables the switched h.t. to be connected to an external 1.f. adaptor unit, if required.

5. The switch SB which is fitted to receivers number 27 onwards, connects h.t. to the terminal 'r.f. h.t.' in all settings of the MC/S tuning control except '00'. When the MC/S control is turned to display '00' on the scale, a cam moves the microswitch SB to the opposite contact, thereby transferring the h.t. to the l.f. adaptor terminal of TB2. On receivers 01 to 26 the h.t. is permanently connected to the 'l.f. h.t.' terminal and an external link is made to the 'r.f. h.t.' terminal. This link should be removed when the Racal l.f. adaptor is fitted.

System Switch SE

6. It should be noted that the switch wafers rotate in an anti-clockwise direction when the control knob is turned clockwise. In the POWER OFF position the external supply to the power unit is disconnected by the opening of the switch contacts SC1 and SC2 which are operated by a cam on the shaft of the system switch SE. The function of each wafer of switch SE is described as follows.

7. Wafer SE 1F: This wafer controls the distribution of -16V h.t. to certain circuits as follows: In positions B.F.O. CHECK and CAL, -16V is supplied to the calibrator circuit and disconnected from terminal block TB2 and the units prior to the 2nd Mixer. In the MANUAL and A.G.C. positions of the switch the -16V is connected to TB2 and circuits prior to the 2nd mixer, and disconnected from the calibrator circuit.

8. Wafer SE 1B: An amplifier on the a.g.c. board receives h.t. via this wafer. In the MANUAL position the h.t. is disconnected thus preventing any a.g.c. action.

9. Wafer SE 2F: This wafer maintains an earth connection to the b.f.o. switch (SA 1F) except in the CAL position when the earth is disconnected in order to disable the b.f.o. during the calibration procedure.

10. Wafer SE 3B: An earth is provided only in the three a.g.c. positions of the system switch, thus completing the charge path of the appropriate time-constant capacitor in the I.F. Unit. The contact 'a.g.c. short' is connected to the Bandwidth switch in the I.F. Unit, the purpose of this is to prevent the use of short time-constant a.g.c. whenever the Bandwidth switch is set to either 0.2 kc/s or 1 kc/s. An unusual feature of SE3B is that the earth is connected to the adjacent wafer SE3F the rotor of which is connected to SE3B.

Meter Switch

11. In the R.F. position the + terminal of the meter is connected to the a.g.c. output in the I.F. Unit and the negative terminal

to earth via the slider of the set-zero potentiometer RV4. With nil signal input and with the RF/IF GAIN control at fully clockwise the a.g.c. line is at approximately 4 volts negative to earth, the meter can be set to zero by adjusting RV4. Any subsequent a.g.c. output then provides a meter indication of signal strength. In the A.F. position the meter is connected across the output of the rectifier bridge D1-D4 and indicates the level of the 1 mW 600Ω audio line.

MC/S Tuning Control

12. In addition to tuning the variable capacitor of the 1st v.f.o. this control is also connected via an interrupted gear to a shaft which turns the range selector switch in the r.f. unit, thus automatically selecting the appropriate coil for the frequency range.

13. A futher function of the MC/S control is that when set to indicate 00 a pair of microswitches (SA and SB on Fig. 15) are operated which disconnect the a.g.c. and h.t. from the r.f. unit, first mixer, first v.f.o. and 37.5 Mc/s generator and transfer these voltages to alternative terminals on the rear panel marked 'h.t. l.f.' and 'a.g.c. l.f.' from which they may be connected to an l.f. adaptor unit. The switches SA and SB are fitted to receivers number 27 onwards. Prior to this these services were completed by links on the rear panel. The links being removed when the l.f. adaptor is fitted to these early receivers.

KC/S Tuning Control

14. This control tunes the variable capacitor of the 2nd v.f.o. and has no auxiliary functions.

R.F./I.F. Gain, A.F. Gain, Line Level

15. These controls are described in the paragraphs headed 'I.F. UNIT'. The circuit connections are illustrated in Fig. 12 and Fig. 15.

Calibrate Control RV3

16. Refer to the paragraphs headed '2nd V.F.O.' and Fig. 10.

2nd V.F.O. Switch

17. Refer to the paragraph headed '2nd V.F.O.' and Fig. 10.

Plugs and Sockets

18. Several of the modules are connected to the chassis wiring via

Cannon mixed connectors which contain both pins and sockets. The part of the connector attached to the module is fitted with d.c. pins and coaxial sockets and is described as the plug (PL1). The mating socket is attached to the chassis wiring and carries d.c. sockets and coaxial pins. Diagrams of the mixed connectors are shown in Fig. 15 Interconnections.

Wiring Identification

19. Colour coding is employed to a limited extent for wiring identification but a system of wire numbering is also used. The wire number is marked on a white or yellow sleeve. Refer to Fig. 15 and Fig. 16 where the sleeve numbering is shown on the interconnections.

R.F. UNIT

20. The R.F. Unit provides filtering, pre-tuning and amplification of the r.f. signal, with delayed a.g.c. The module consists of three assemblies through which the signal passes in sequence, referring to Fig. 4 they are:-

(a) Antenna input and 0 to 30 Mc/s low-pass filter with protection diodes.

(b) Aerial (antenna) attenuation and pre-tuning stage.

(c) The r.f. amplifier stage with a.g.c.

Antenna Input and Filter

21. The antenna is connected to the rear panel socket SKT1, thence via a 500 mA fuse to the aerial filter circuit. An adjustable spark gap is provided to protect the antenna circuit against excessive accumulation of static charges, and the 500 mA fuse is a protection against a heavy surge such as might occur if the receiver is inadvertently tuned through the carrier frequency of an adjacent high-powered transmitter. Transistors can be damaged by transient surges and the user should, if possible, avoid tuning to powerful adjacent transmissions. The filter circuit L1, I2, L3 and C1 to C5 has a passband of 0 to 30 Mc/s which is designed to prevent any break-through at the 40 Mc/s intermediate frequency (1st i.f.) or at the image frequency (80 Mc/s). The filter also prevents any radiation of the first v.f.o. frequency from the antenna.

22. The protection diodes 1D1 and 1D2 which terminate the output of the filter are chosen for their characteristic of very high impedance to applied e.m.f.'s of low amplitude. The diode voltage/current characteristic is initially flat with a rapid change of slope which produces peak signal slicing at approximately 300 mV. Above this level complete protection

is given up to an e.m.f. of the order of 15 volts provided that such an overload is of brief duration.

Attenuator Circuit

23. The switch SA which is operated by the front panel control marked AE ATT introduces attenuation into the signal path in approximately 10 dB steps. In the minimum attenuation position of SA the switch is fully clockwise and the signal passes from 1L3 via 2SA2F to the switch 2SC without attenuation. As the switch is moved anti-clockwise the resistor network 2R4, 2R5 and 2R6 is connected, giving 10 dB attenuation. Subsequently, 2R1, 2R2 and 2R3 is connected to give -20 dB. To provide -30 dB the network 2R4, 2R5 and 2R6 is connected in series with the network 2R7, 2R8 and 2R9. Similarly, the maximum attenuation is provided in the fully anti-clockwise position of 2SA by 2R1. 2R2 and 2R3 arranged in series with 2R7, 2R8 and 2R9. To maintain specification for measurements such as cross-modulation, inter-modulation etc. it is essential to use the AE ATT control.

R.F. Tuning and Range Selection

24. This circuit comprises the following:-

(a) R.F. TUNE ganged variable capacitors 2C6a and 2C6b

(b) The switched r.f. range filters 2L1 to 2L5

(c) The range switch 2SB which is mechanically geared to the MC/S tuning control on the front panel.

(d) The microswitches 2SC and 2SD which are simultaneously operated by a cam when the R.F. TUNE shaft is set to either of the WB positions.

25. Range Selection As the MC/S tuning control is rotated an interrupted gear moves the shaft of the range switch 2SB at the appropriate points so that the correct r.f. filter (2L1 to 2L5) is selected according to the frequency in use. The range selection is in octave steps, 1 to 2 Mc/s, 2 to 4, 4 to 8, 8 to 16 and 16 to 32 Mc/s. Wafer 2SB2F selects the primary and 2SB3F the secondary of the filter. Wafers 2SB2B and 2SB3B short-circuit all the filters except the one in use. The signal path from the r.f. tuning selection is via 2SB4F to switch 2SD thence to 3VT2 on the r.f. amplifier board.

26. R.F. Tune and W.B. The ganged variable capacitors 2C6a and 2C6b provide tuning of the selected r.f. filter (2L1 to 2L5) under the control of the R.F. TUNE control on the front panel. If the control is

set against the stop at either extremity of its movement a cam on the shaft in the r.f unit operates the microswitches 2SC and 2SD thereby selecting the WB (wideband) condition. In WB the input signal by-passes the range selection and r.f. tuning circuits and is fed via transformer 2T1 and switch 2SD into the base of the first r.f. amplifier 3VT2.

R.F. Amplifier Board

27 The r.f. amplifier consists of two similar stages 3VT2 and 3VT3 each feeding into a low-pass filter. Considerable attention has been given to filtering and the amplifiers follow conventional practice, except for the method of applying automatic gain control which will be described in detail.

28. A.G.C. Action Consider the amplifier 3VT2. The gain of the amplifier can be varied according to the amount of capacitive by-pass applied to the emitter resistor 3R9. The emitter by-pass is via capacitor 3C4 the junction of diodes 3D3 and 3D4 and capacitors 3C2 and 3C3 to earth.

29. The by-pass impedance is determined by the conductivity of the diodes 3D3 and 3D4 and this in turn can be controlled by the amount of d.c. bias applied by the emitter level of the control stage 3VT1. The current through 3VT1 and hence the emitter voltage, is controlled by the a.g.c. voltage applied to the base of 3VT1.

30. Under conditions of minimum a.g.c. action (maximum amplifier gain) the voltage on the a.g.c. line is -4V. This is applied to the base of 3VT1 via 3R3. This causes 3VT1 to conduct heavily and draw the maximum current through the emitter path formed by the chain of diodes 3D1 to 3D6. Under these conditions the impedance of the by-pass from the emitter of 3VT2 is a minimum and amplifier gain is therefore at a maximum. It is essential that the diode chain has a low forward resistance. On later versions of the r.f. amplifier additional diodes are added in parallel for this reason.

31. Increasing signal strength may cause the a.g.c. voltage applied to the base of 3VT1 to become less negative, as a result the current in 3VT1 decreases and the impedance of the diode path increases, thereby reducing the gain of 3VT2. Under conditions of maximum a.g.c. the level at the emitter of 3VT1 may reach 0 volts but the diodes 3D5 and 3D6 (with 3R5) will ensure that the junction of 3D5 and 3D4 remains at approximately 1.5 volts negative, thus ensuring that the diode chain D1 to D4 is completely cut off, thereby interrupting the emitter by-pass circuit of 3VT2 and reducing the amplifier gain to a minimum.

32. Temperature Compensation The thermistor 3TH1 in parallel with 3R2 provides temperature compensation. With rising temperature

the current in 3VT1 tends to increase. This is counteracted by a decrease in the resistance of 3TH1 which has the effect taking the bias on 3VT1 towards a more positive level, thereby checking the increase in emitter current due to temperature rise.

33. Setting-Up 4RV1 The potentiometer 4RV1 is provided to allow for variations in diode characteristics, thus avoiding the necessity for selection or matching of components. Adjustment should be necessary only when putting a new amplifier board into service or following component changes. The setting is quite critical and adjustment should be made strictly according to the procedure given in the alignment chapter. The general principles of the adjustment procedure are as follows:

34. The system switch is set to Manual and the R.F./I.F. GAIN control is set to the maximum gain position, thereby causing the a.g.c. line to acquire a level of -4 volts to chassis. A d.c. voltmeter (AVO 8) is connected to the collector of 3VT1 (-ve) on the r.f. amplifier board.

35. Potentiometer 4RV1, which is mounted on a small component board on the forward face of the r.f. unit (refer to Fig. 18) should be adjusted so that the collector voltage of 3VT1 decreases (becomes less negative) as the transistor is brought towards saturation. The correct setting is the exact point where the collector voltage just ceases to change, indicating that the transistor has 'bottomed'. The actual reading on the voltmeter at which this occurs will probably be between 3 and 4V negative. A 'bottom' reading greater than -4 volts indicates that the diode chain has a high forward resistance which will be detrimental to amplifier gain. The forward resistance of any diode in the chain should not exceed 45Ω when measured on the 'ohms x 100' range of the AVO Model 8 test meter.

FIRST MIXER

FIRST MIXER (BA.28211) Fig. 8

36. A balanced mixer circuit is used to reduce the possibility of the second harmonic of a 20 Mc/s signal entering the 40 Mc/s filter. The incoming signal from the r.f. unit is fed via PL1 into transformer T1 and drives the emitters of VT1 and VT2 in push-pull. The first v.f.o. frequency is applied via PL3 and C4 to the bases of VT1 and VT2. The circuit is balanced by the potentiometer RV1.

37. The mixer output appears in the inductor L1 which is mounted in a sub-assembly with the remaining inductors of the 40 Mc/s filter, L2 to L8. Each coil has an adjustable core which combined with the critical spacing of the coils determines the response of the filter which has a passband 650 kc/s either side of 40 Mc/s. It is essential that the filter should have a sharp cut-off, particularly on the high frequency side, to prevent the first v.f.o. frequency entering the filter when the v.f.o. is operating at the lower end of its frequency range.

FIRST V.F.O.

38. The first v.f.o. consists of three sub-circuits mounted on individual boards. The oscillator is a conventional Hartley circuit tuned by the Megacycles tuning capacitor C1 which is not mounted on the board. The oscillator frequency range is 40.5 Mc/s to 69.5 Mc/s. Normally the lowest frequency used is 41.5 Mc/s when the Megacycles tuning control is set to 01. The oscillator output is taken from a tapping near the earthy end of inductor L1 and fed to two buffer amplifiers in parallel.

39. The two buffer amplifiers are identical circuits, the only difference being that one feeds out via plug PL2 to the first mixer stage and the other via PL1 to the harmonic mixer (37.5 Mc/s generator). A cascode circuit is employed to obtain adequate buffering, and the circuits are entirely conventional.

37.5 MC/S GENERATOR MODULE

NOTE: This module contains the following two main assemblies:-

(a) The 1 Mc/s Oscillator, Amplifier and Calibrator

(b) The 37.5 Mc/s generator assembly consisting of a harmonic generator mixer and amplifier. Refer to instructions in Chapter 7 para. 24 for obtaining access to this assembly,

The 1 Mc/s oscillator and calibrator assembly will be described first.

1 MC/S OSCILLATOR AMPLIFIERS AND CALIBRATORS Fig. 6

40. This assembly consists of two sub-circuits. One board contains the 1 Mc/s crystal oscillator and calibrator circuit, the other board contains the amplifier stages which provide buffering in the 1 Mc/s input and output circuits. The boards are mounted side-by-side on the upper (hinged) deck of the 37.5 Mc/s Generator Module.

1 Mc/s Oscillator

41. Transistor VT1 is contained in a conventional Pierce type of crystal-controlled circuit. The output is taken from the emitter via the capacitive divider C4 and C5 to provide the correct level at the base circuits of transistors VT2 and VT3 on the amplifier board. The 1 Mc/s crystal XL1 is contained in a holder and must be removed if an external 1 Mc/s reference source is connected to the receiver.

1 Mc/s Amplifier

42. Transistors VT2 and VT3 on the amplifier board can be driven by the 1 Mc/s oscillator or they can be supplied with 1 Mc/s (via VT1) from an external source such as a synthesizer. The output from VT2 is fed from the junction of R9 and R10 to the connector A3, thence to the rear panel socket '1 Mc/s OUT'.

43. Amplifier VT3 has a collector circuit which is modified by R15, C12 R17 which pre-shapes the output wave form to obtain a suitable drive for the harmonic generator. The effect of the pre-shaping is to convert one half-cycle of the sine wave to a peaked waveform capable of generating a wide range of harmonics. (see Chapter 4 page 4-9).

44. Amplifier VT1 buffers the 1 Mc/s input whenever a synthesizer or external frequency source is connected. The output from the collector is connected to the bases of VT2 and VT3 respectively.

Calibrator

45. The calibrator circuit is a regenerative divider which receives an input at 1 Mc/s from the amplifier VT2 and supplies 100 kc/s with harmonics via connector A2 to the 3rd mixer board. The divider circuit comprises transistors VT2 and VT3, and the diode mixer circuit D1 to D4.

46. The action of the divider is as follows: The 1 Mc/s input is applied via R9 to the centre tap on transformer L2. The circuit L2 and C12 is designed to resonate at 100 kc/s and any response at this frequency is amplified by VT3 whose collector circuit, L3 and C14, is tuned to 100 kc/s. The 100 kc/s in the secondary winding of L3 is fed back to the base of VT2 whose collector circuit L1, C10 is tuned to 900 kc/s. Thus 900 kc/s and 1 Mc/s are mixed in the diode ring circuit, the difference frequency (100 kc/s) is transferred via T1 to the base of VT3 and the divider action becomes self-sustaining. The output is taken via diodes D5, D6 and connector A2, to the third mixer module where the required range of harmonics is injected for calibration of the receiver KC/S scale.

47. The calibrator circuit functions only when the system switch (SE1F Fig. 15) is set to CAL or CHECK BFO. In other switch positions the h.t. supply via PL1 pin 4 is disconnected. When the calibrator is switched off it is essential that there shall be no leakage of 1 Mc/s into the third mixer stage. The leakage is prevented by diode D6 which is reverse-biased by a negative voltage in the 3rd mixer when the calibrator h.t. is disconnected, but when the -16V h.t. supply is re-connected it overrides the reverse bias and restores the output circuit. The diode D5 is inserted to prevent any effect on the bias of VT2 and VT3.

HARMONIC GENERATOR AND MIXER (37.5 MC/S GENERATOR) Fig. 7

48. This section consists of six small sub-assemblies which are numbered 1 to 6, the same numbering also being shown on the circuit diagram. The section is contained in the same module as the 1 Mc/s amplifier and calibrator. The combined module is commonly referred to as the '37.5 Mc/s Generator'

Harmonic Generator (Board 2)

49. The function of this stage is to produce a wide range of harmonics of 1 Mc/s, which it does by virtue of the pre-shaped 1 Mc/s input and the special characteristics of the diode D1. The capacitive property of the diode has the effect of producing a very fast edge possessing a high harmonic content which is applied to the base of VT1. The entire range of harmonics (up to at least the 32nd) must be amplified by VT1 without discrimination in favour of any particular frequency. The pre-set capacitor C1 can be adjusted to provide a constant amplitude over the harmonic range, measured at the output (pin 4). The diode D2 is provided as a safeguard against excessive base voltages. A similar diode connection is seen in the 37.5 Mc/s amplifier (D1 and D2).

Harmonic Filter (Boards 3 and 4)

50. This is a low-pass filter designed to pass all harmonic frequencies between 3 and 32 Mc/s but with a sharp cut-off immediately above 32 Mc/s. The output of the filter is applied to the base of VT1 on the harmonic mixer board.

Harmonic Mixer (Board 5)

51. A balanced type of mixer circuit is used so that the harmonic spectrum and the input from the first v.f.o. will tend to cancel each other at the output. The harmonic spectrum input is supplied via pin 2 to the base of VT1. The 1st v.f.o. output is supplied via pin 4 to the base of VT2.

Mixing takes place in the common collector circuit L1 C7 C8 which is tuned to 37.5 Mc/s. The output via pin 5 is fed to the cascode amplifier board. The circuit is balanced by potentiometer RV1 by which the bias on each transistor can be adjusted so that the emitter currents are equal. This adjustment is described in Chapter 3.

37.5 Mc/s Amplifier (Board 6)

52. This is a buffer stage in a cascode circuit mounted on board number 6. A cascode circuit is used to provide adequate buffering with a low noise figure. The capacitor C7 provides neutralizing feedback. The collector curcuit of VT2 (T1, C4) is tuned to 37.5 Mc/s and the secondary of T1, is connected to socket SKT1, which is mounted on an extension to mate with plug PL1, on the 37.5 Mc/s filter unit. In early deliveries of the receiver the capacitor C4 was contained in the transformer assembly, but in later versions is attached to the rear of the board.

37.5 Mc/s Filter

53. This is a separate unit mounted on the upper receiver chassis which is plugged into the output from the 37.5 Mc/s amplifier. The filter is designed and set-up to provide a passband of plus or minus 150 kc/s centred on 37.5 Mc/s. The correct alignment of this filter is vital to the satisfactory functioning of the Wadley system. The user is advised not to attempt any adjustment of the filter alignment.

SECOND MIXER Fig. 9

54. The second mixer produces the 2nd i.f. by mixing the 40 Mc/s i.f. spectrum with the 37.5 Mc/s injection, and selecting the 2 to 3 Mc/s difference frequency. The stage VT1 and VT2 is a cascode buffer amplifier similar to the buffer circuits in the 37.5 Mc/s generator module. The 37.5 Mc/s is supplied via connector A2 and pin 1, the test point TP1 is provided to check the injection level. The stage is neutralized by capacitor C19 and the collector circuit T1 and C3 is tuned to 37.5 Mc/s. The secondary of T1 forms part of the emitter circuit of the mixer stage VT3. In early deliveries of the receiver the capacitor C3 was mounted in the transformer assembly T1, but is now wired to the rear of the board.

55. The 40 Mc/s i.f. is supplied via A3 to the base of VT3. The resistor IR4 terminates the 40 Mc/s filter. Test points TP3 and TP2 are provided to check the signal and injection levels, respectively. The collector circuit L1 and C8 form part of the 2-3 Mc/s band-pass filter and is tuned to the difference frequency, which is in fact a spectrum of signals extending from 2 Mc/s to 3 Mc/s. The output is coupled via C9 to the remainder of the 2-3 Mc/s band-pass filter. Signals from an l.f. adaptor unit, which are in the

2 to 3 Mc/s band, can be fed in from the LF socket on the receiver rear panel via connector A1 and pin 5 to the input of the 2-3 Mc/s band-pass filter. The socket LF must be terminated by a 75Ω plug except when an L.F. Adaptor is in use. A panoramic adaptor can be connected to the rear panel socket PAN. This unit examines the spectrum of signals at the collector of VT2. The band-pass filter is terminated by a 39Ω resistor in the 3rd mixer stage.

THIRD MIXER

THIRD MIXER (BA.35970) Fig. 11

56. In the third mixer the 1 Mc/s spectrum of signal frequencies from the 2nd mixer (2-3 Mc/s) is mixed with a frequency (3.6 - 4.6 Mc/s) from the second v.f.o. The difference frequency contains the required signal intelligence at a frequency of 1.6 Mc/s. A 100 kc/s input from the calibrator which is supplied via the connector A3 provides harmonics to which the 2nd v.f.o. (KC/S) tuning scale can be aligned. Referring to Fig. 11 note that certain components in the module which are not mounted on the printed circuit board are distinguished by the prefix '1'.

Signal Input

57. The preceding 2 to 3 Mc/s band-pass filter (Fig. 9) is connected via socket A4 to the low-pass filter, formed by 1L1, 1C1 and 1C2, which has a cut-off at approximately 5 Mc/s. The function of the filter is to give additional protection against 6 Mc/s and 37.5 Mc/s.

58. The filtered signal spectrum is fed via 1C3 and 1L2 to pin 1 on the mixer board thence via the blocking capacitor C1 to transformer T1 of the diode mixer circuit.

Calibrator Input

59. Also applied to T1 is the harmonic input from the calibrator, via A3 and the diode 1D1. This input is switched off except when the System is at CAL or CHECK BFO but in order to ensure that there shall be no leakage of the fundamental 1 Mc/s, even though the calibrator is switched off, a suitable negative voltage is developed at the junction of R1 and R2. This reverse biases the diode in the calibrator output.

Input From Second V. F. O.

60. The variable 3. 6 to 4. 6 Mc/s from the second v. f. o. is supplied via the coaxial connector A2 to the band-pass filter formed by L7, L6, L4 and L2 and associated capacitors. Termination is provided by R7 in parallel with the primary of T2. The filter passband should extend from 3. 6 Mc/s to 4. 6 Mc/s with a fairly sharp cut-off above and below these limits. The filter is inserted to meet the following requirements:

(a) The second v. f. o. is a wide-band source and it is necessary to exclude the noise generated at the signal frequencies between 2 and 3 Mc/s, at 1. 6 Mc/s, and also at the image frequencies of 5. 2 Mc/s and 6. 2 Mc/s.

(b) If two receivers are connected in a master-slave relationship using a common 2nd v. f. o. , the filter will prevent cross-talk arising from coupling between the respective 2 to 3 Mc/s circuits which could occur via the 2nd v. f. o.

61. The input from the second v. f. o. is applied via T2 to the bases of the balanced amplifier stage VT1 and VT2. Note the test point TP2. The collectors of VT1 and VT2 are connected via R6 and R9 to the transformers T1 and T3 respectively in the diode mixer circuit.

Mixer Circuit

62. The mixer circuit consists of the diode ring D1 to D4 together with transformers T1 and T3. This type of mixer is selected for its linearity which cancels the 'odd order' mixing which tends to occur where the input spectrum has a fairly wide bandwidth (in this instance 2-3 Mc/s) and the i. f. output (1. 6 Mc/s) almost comes within the input spectrum.

63. The sum and difference frequencies from the mixer are fed via T3 into the filter formed by L3 and L5 with C3, C5 and C6. This is a wideband filter centred on 1. 6 Mc/s. Note the test point TP1 at the input to the filter. Associated with this test point is provision for connecting a 68Ω resistor for test purposes only. The 68Ω resistor is connected when aligning the filter to ensure that the coupling factor between L3 and L5 is less than unity. This alignment is done at the factory and should not normally be attempted by the user.

64. The amplifier VT3 provides the output required to drive the i. f. unit. The 1. 6 Mc/s output from the collector is taken via C12 and the coaxial connector A1 to the 13 kc/s bandpass filter unit, thence to the 1st i. f. amplifier in the I. F. unit. The resistor R14 matches the input impedance of the 13 kc/s band-pass filter unit.

SECOND V.F.O.

General

Fig. 10

65. The second v.f.o. assembly consists of an oscillator driving two wideband buffer stages. The oscillator can be tuned over the range 3.6 to 4.6 Mc/s by the KC/S tuning control of the receiver, also fine variations of tuning can be made by the 'calibrate' control. Two outputs are provided, one to the 3rd mixer and the other for external use. (2nd V.F.O. OUT). The oscillator stage can be switched off by setting the rear panel 2nd V.F.O. switch to IN which permits the receiver kilocycles tuning to be determined externally by either a synthesizer or the 2nd v.f.o. of a master receiver.

Oscillator Stage

66. The oscillator VT1 works into a tuned collector circuit comprising inductors L1 and L2, and the KC/S tuning capacitor C1 with its associated pre-set trimming capacitor. These tuning components are mounted on a separate sub-assembly.

67. The component L1 is an incremental inductor, the inductance of which varies in accordance with the flow of direct current in the secondary winding, thus providing a means of oscillator (and hence, kilocycles) fine tuning. The control current is derived from the negative supply and is adjusted by the slider of the CALIBRATE potentiometer RV3, which has a five-turn helical drive providing a variation in oscillator frequency of approximately one kilocycle for each half-turn. The control is engraved CALIBRATE but it may be used to make fine adjustments of kilocycles tuning during normal operating when the main tuning controls are mechanically locked.

68. The remainder of the oscillator circuit is conventional. The diodes D1 - D4 provide d.c. stabilization against possible variations in h.t. voltage arising from extreme temperature changes affecting the power unit. The oscillator output is taken from the junction of the coupling network R7 and R8 which minimises any loading effects on the oscillator tuned circuit.

69. The oscillator h.t. supply is connected to pin 5 via the 2nd V.F.O. switch which is mounted on the rear panel of the receiver. When this switch is set to OUT the 2nd v.f.o. is in operation and an output is available for external use if required. When the switch is set to IN the oscillator h.t. supply is disconnected and the 2nd v.f.o. frequency for the receiver must be fed in from an external source, such as a synthesizer or master receiver.

Amplifier Board

70. The diodes D2 and D3 enable the user to switch from internal 2nd v.f.o. to an external source, and vice versa, without the changing or removal of cable connections.

71. When the oscillator stage is running, the diode D2 is forward-biased by the negative supply which is connected through the 2nd V.F.O. switch (OUT position) thence via pin 5 on PL1 and R2 to the diode. This allows the oscillator output to pass via D2 to the amplifier VT1. At the same time the diode D3 is reverse-biased, thus isolating the external input.

72. When the 2nd V.F.O. switch is set to IN the negative supply is disconnected from pin 5 and connected instead to pin 4.of PL1 whence it is applied via R4 as a forward bias to diode D3. The external input can now pass via A1, C2 and D3 to the amplifier VT1. The resistor R6 terminates the input connector. In this condition diode D2 is reverse-biased thus isolating the oscillator circuit from the amplifier board.

73. The transistors VT1, VT2 and VT3 are wideband buffer stages which provide suitable output levels from the collector circuits. The output from the collector of VT2 is connected via C6 and socket A2 to the 3rd mixer, the resistor R18 provides the required 1 kΩ source impedance to the band-pass filter on the mixer board. The external output is taken via C9 from the collector of VT3, the resistor R22 providing the required 75 ohm source impedance for the connector.

B.F.O. UNIT Fig. 13

74. The B.F.O. unit consists of the 'B.F.O. KC/S' switch assembly and variable tuning capacitor, together with a 600 kc/s oscillator and a buffer amplifier. The b.f.o. frequency can be adjusted in fixed steps by the positions +6 to -6 of the B.F.O. KC/S switch SA and varied by the fine tune capacitor C4, which is controlled by the central knob of the B.F.O. KC/S control. Switch SA has certain other functions which are described in a later paragraph.

600 kc/s Oscillator

75. The oscillator VT1 is tuned by the inductor L1 and the variable capacitor C4. In parallel with C4 are four pre-set capacitors C2, C3, C5 and C6 which are connected in the +3, 0, -3 and -6 positions respectively of switch SA2F, each one providing a progressive reduction of oscillator frequency in 3 kc/s steps. The oscillator is initially set-up with the B.F.O. KC/S switch set to position '+6' and the variable control C4 set to its mid-travel position. The core of L1 is then adjusted to provide an output at 606 kc/s. In each of the subsequent switch positions (+3, 0, -3,

and -6) the appropriate capacitor C6, C5, C3 or C2 is adjusted to give the required frequency. The oscillator output is taken from the junction of R1 and R2 which provides a low-level input to the buffer amplifier.

76. The negative h.t. supply to the amplifier and oscillator is permanently connected, but the positive (earth) side of the supply to the 600 kc/s oscillator stage is connected via pin 5 and the +6 and -6 positions of switch wafer SA1F thence via a wafer on the System switch to earth. In the switch positions +1.5, - -1.5 and OFF the earth is disconnected from the B.F.O., thus switching off the 600 kc/s oscillator.

B.F.O. KC/S Switch SA

77. The function of each wafer will be described briefly.

78. SA1F: The wiper contact (tag 9) is connected to earth in all positions of the system switch (SE2F) except CAL. (Thus ensuring that the b.f.o. is switched off during the calibration procedure). The +1.5 and -1.5 positions of SA1F connect the earth to the detector board (i.f. unit) where it serves to connect the appropriate crystal for the s.s.b. oscillator circuit.

79. SA1B: In the OFF position of the B.F.O. KC/S switch an earth is made to pin 2 of the Detector board (i.f. unit) in order to connect the a.m. detector.

80. SA2F: Contacts 2 to 5 which correspond to switch settings +3 to -6 connect the pre-set capacitors C6, C5, C3 and C2 respectively across the b.f.o. tuned circuit.

81. SA2B: In every switch position except OFF an earth is made to pin 3 of the Detector board (i.f. unit) in order to connect the product detector circuit.

B.F.O. Buffer Amplifier

82. This amplifier is designed mainly to buffer the b.f.o. from the Detector board circuits. The output is taken from the secondary winding of T1 which provides the low impedance required by the mixer in the Detector board. The adjustable core of T1 together with C2 tunes the output, and R5 ensures sufficient bandwidth to accept the plus or minus 8 kc/s variation of b.f.o. frequency.

I. F. UNIT

General

Fig 12

83. The I. F. Unit is a module containing eight sub-circuit assemblies which will be referred to as boards. To assist identification each board in the unit is marked with a figure as follows:

(1) 1st I. F. Amplifier
(2) Bandwidth Switch
(3) 1.6 Mc/s I. F. Amplifier
(4) Audio Amplifier
(5) Detector Board
(6) Converter Amplifier and Output
(7) A. G. C. Board
(8) Converter Osc. and mixer.

These same identification figures are inserted in the circuit illustration (Fig. 12).

Connections

84. Connections between the circuits in the I. F. Unit and other parts of the receiver are made via the 37 way fixed plug PL1, which engages with the free socket SKT11. In Fig. 12 the pins of PL1 are shown in various parts of the circuit diagram to assist clarity. Refer to the overall interconnection diagram Fig 15 for further details. External connections to the I. F. Unit are made at the rear of the receiver via a panel containing four coaxial sockets, and a terminal block TB1. There is a single coaxial connection at the front of the i. f. unit.

First I. F. Amplifier and Bandwidth Switch (Boards 1 and 2)

85. This is a conventional wideband amplifier. The 1.6 Mc/s from the third mixer is applied via SKT1 to the base of VT1 on board number 1. The tuned collector load which has a wide bandwidth, provides a dual output of 100Ω and 1 kΩ from tappings on L1. The output is connected direct to the subsequent i. f. amplifiers when the Bandwidth switch SA is set to 13 kc/s (contact 4 on SA3). In other positions of the Bandwidth switch the output is taken from L1 via pin 4 and connected via SA1 to one of the three crystal filters, which provides a choice of 0.2 kc/s, 1 kc/s or 3 kc/s bandwidth according to the setting of the switch.

Bandwidth Switch SA

86. SA1: The function of SA1 has been described in the previous paragraph.

87. SA2: The function of SA2 is to ensure that the a.g.c short time-constant is not operative when the 0.2 kc/s or 1 kc/s crystal filter is in use. If the system switch is set to a.g.c. 'S' the Bandwidth switch over-rides it, as follows.

88. In the 'Long' or 'Medium' a.g.c. positions of the System switch the time constant is selected by connecting an earth to the appropriate capacitor (C14 or C15) in the A.G.C. Board, but the 'short' position of the system switch is connected via PL1 pin 32 to wafer SA2B of the Bandwidth switch. When the Bandwidth switch is set to 0.2 kc/s or 1 kc/s this line is connected to pin 8 and C15 on the A.G.C. board, which means that the 'medium' time-constant is provided instead of the 'short'. To sum up; 'long' and 'medium' a.g.c. is available in all positions of the Bandwidth switch; 'short' is available only on 13 kc/s and 3 kc/s.

98. SA3 and SA4: These wafers insert the resistors R3, R4 and R6 between the crystal filters and the succeeding i.f. amplifiers. The networks are designed to present an impedance of 100Ω to each filter and at the same time to equalize the different insertion losses. This minimises any change of signal level between the different bandwidth settings.

Main 1.6 Mc/s I.F. Amplifier Board

90. The second, third and fourth i.f. stages are mounted on sub-circuit board number 3. The three amplifiers VT1, VT3 and VT4 employ conventional pre-tuned collector circuits with damping resistors R4, R16 and R20 respectively, to ensure a wide bandwidth. A moderate amount of stabilizing feedback is applied to each stage by an un-bypassed resistor in each emitter circuit. The transistor VT2 together with the diode D1 and associated components form part of the a.g.c. system and will be described in more detail.

91. The transistor VT2 is connected in the emitter circuit of VT3 and is in effect a variable feedback device which determines the gain of VT3 under the control of the a.g.c. voltage. The a.g.c. voltage is fed in at pin 3 and via R9 to the base of VT2. Consider first the state when the signal is weak. The a.g.c. line will be at its maximum negative level. This causes VT2 to saturate and offer a low impedance, thus reducing the amount of un-bypassed resistance in the emitter circuit of VT3, resulting in higher gain.

92. Increasing signal strength causes the a.g.c. level to become less negative, and VT2 conducts less heavily, thus increasing the resistance in the emitter circuit of VT3 which results in lower gain. The combined effect of D1 with R7, R8 and R9 is to modify the characteristic of VT3 so that the curve of amplifier gain plotted against change of a.g.c. volts is less abrupt, thus improving the stability of the circuit.

93. The 1.6 Mc/s output from VT3 is taken from two tappings on L2. One output is taken via C11 to the buffer amplifier VT4. This stage is similar to the preceding amplifiers but is provided with an additional hum-filtering capacitor C14. The other output from L2 goes to a 1.6 Mc/s amplifier on the A.G.C. Board. The circuit description will continue by tracing the signal path as it leaves the i.f. amplifier via C16 and pin 5 en-route to the Detector Board.

Detector Board

94. The Detector board (5) contains the a.m. and product detectors, also the crystal oscillator for s.s.b. reception. The a.m. detector operates only in the OFF position of the B.F.O. switch and the product detector operates in all the remaining positions. The switching of these circuits depends upon the biasing of various diodes.

A.M. Detector

95. In the OFF position of the B.F.O. switch +ve h.t. (earth) is applied via pin 2 and R8 to resistor R3 and diode D2. This forward biases the diode thus completing the collector circuit of VT2. At the same time the current through R3 saturates VT1 thus completing the emitter circuit of VT2, via R6, VT1 and R5. The diode D1 is reverse biased by the negative rail connection via the path R4, R11, R19 and R18. Hence VT2 acts as a conventional 1.6 Mc/s amplifier with the collector circuit tuned by the inductance of T1 with capacitor C1.

96. The 1.6 Mc/s signal appears in the secondary windings of T1. The signal across pins 1 and 6 of T1 is detected by the diode D4, the load being formed by R11, R19 and R18. The detected signal is filtered by C6, L2 and C8, and passed via C9 to the audio emitter-follower VT3. Thence via C7, pin 8 and PL1 pin 7 to the A.F. GAIN potentiometer. A detector output is taken from pin 8 on the Detector board to pin 7 of the terminal block TB1 at the rear of the receiver.

97. It will be noted that the output circuit of the b.f.o. amplifier VT4 is connected to the emitter circuit of VT2. Whenever the a.m. detector is in operation, a contact on the B.F.O. switch cuts off VT4 to ensure that the signal-to-noise ratio is not degraded by noise injected from this source.

Product Detector

98. The product detector utilizes the circuit of VT1 and VT2 but with certain changes achieved by diode biasing. Due to the setting of the B.F.O. switch (all positions except OFF), pin 2 is open circuited and pin 3 is connected to earth. A -ve voltage is applied via R9 and R8 which cuts off

VT1 via R3, and reverse biases D2. Thus, with VT1 cut off, the emitter path of VT2 is through R5, the secondary winding of T2, R7 and R6. The earth on pin 3 supplies h.t. + through R11, R4 and D1 to complete the supply to VT2. at the same time it disables the a.m. detector by a reverse bias on D4. The output from the b.f.o. amplifier VT4 in the secondary of T2 is supplied to the emitter circuit of VT2, and the 1.6 Mc/s signal from the main i.f. amplifier board is supplied to the base of VT2. The product detector output is taken from the junction of R4 and R11. This audio output then follows the path described for the a.m. detector.

S.S.B. Oscillator

99. Transistor VT6 on the Detector board is a crystal oscillator stage which operates in the +1.5 and -.15 positions of the B.F.O. switch, provided the system switch is not set to CAL. (In the CAL position all b.f.o. circuits are disabled to prevent interference with the calibration procedure).

100. The oscillator frequency is determined by the crystal XL1 (B.F.O. switch set to +1.5) or by XL2 (B.F.O. switch set to -1.5) according to whether the oscillator is to run 1.5 kc/s above or 1.5 kc/s below, the 1.6 Mc/s i.f. Each crystal has a pre-set capacitor in parallel (C21 and C22) for alignment purposes.

101. When the B.F.O. switch is set to -1.5 and the system switch is set to any position except CAL, +ve h.t. is connected via plug PL1 to pin 15 on the Detector Board and through R32 to the diode D7. This forward biases D7 which conducts, thereby completing the crystal circuit for VT6 which oscillates at the frequency of XL2. Crystal XL1 remains open circuited by the reverse bias on diode D6 due to the negative rail connection. In the +1.5 position of the B.F.O. switch the forward bias is removed from D7 and applied to D6 via R33, thus connecting XL1. Diode D7 reverts to the reverse biased condition. The oscillator output is taken from the emitter of VT6 and fed from the capacitive divider C18 and C19 which via R24 provides the correct impedance into the base of the mixer VT5.

Mixer-Amplifier VT5

102. This stage operates as an amplifier when the B.F.O. switch is set to the +1.5 and -1.5 positions, and as a mixer in all positions from +6 to -6. The function of the mixer is to combine the 1 Mc/s from the receiver crystal source with the variable 600 kc/s from the b.f.o.

103. Mixer Action The emitter of VT5 is connected via plug PL1 to the output winding of the 600 kc/s transformer in the b.f.o. module. Thus, whenever the B.F.O. switch is set to any of the positions from +6 to -6, the b.f.o. frequency is supplied to VT5. The base of VT5 is connected via C17 and plug PL1 to the receiver 1 Mc/s crystal source. The output from VT5, which is 1.6 Mc/s, plus or minus any variation applied by the B.F.O. fine tuning control is taken via the tapping on L3 to the amplifier VT4.

104. Amplifier Action When the B.F.O. switch is set to +1.5 or -1.5 the 600 kc/s b.f.o. frequency is removed and VT5 amplifies the crystal frequency 1601.50 or 1598.50 kc/s fed in from VT6 and passes it via L3 to VT4.

Amplifier VT4

105. This is a conventional amplifier with stabilizing feedback provided by R16. The collector circuit is tuned by T2 and C12, and damped by R17 to ensure sufficient bandwidth. The output from T2 secondary is connected to the emitter circuit of VT2. When the B.F.O. switch is set to OFF, VT4 is not required and is cut off by disconnecting R19 from earth as mentioned in paragraph 97.

A.G.C. Board

106. The a.g.c. board (number 7) contains two amplifiers operating at 1.6 Mc/s, followed by the a.g.c. detector and d.c. amplifier feeding into the time-constand circuits. The remainder of the board is concerned with providing d.c. amplification and impedance matching, manual gain control facilities etc. Provision is made for connecting the a.g.c. circuit to a companion receiver in dual diversity operation.

Amplifier VT1

107. This is a 1.6 Mc/s amplifier tuned by L1 in the collector circuit. The input at 1.6 Mc/s is applied via C1 to the base of VT1 and separate outputs are taken from tappings on L1. The output via C5 is at a level of 100 mV for external use and is connected, via pin 3 to the 1.6 Mc/s OUT socket on the rear panel of the receiver. The output via C4 is fed to the base of VT2 and also to the converter board via pin 4. It is reduced in level by the capacitive divider formed by C4 with C3. This arrangement is necessitated by the requirement to obtain two different levels from the one output circuit.

Amplifier VT2

108. Transistor VT2 is a 1.6 Mc/s amplifier with a collector circuit tuned by L2 with C9. The inductor L2 is connected as a step-up transformer so that the stage presents a high impedance to the a.g.c. detector.

109. The emitter of VT2 is connected via pin 5 and plug PL1 to the system switch wafer SE2B. This wafer connects -16V to VT2 on all switch positions except MANUAL. In the MANUAL position the -16V is disconnected from VT2 thus disabling the a.g.c. system.

A.G.C. Detector

110. The amplified 1.6 Mc/s from VT2 is coupled to the a.g.c. detector D1 via C10. The components R13, R14, C12 and C13 form an r.f. filter between D1 and the emitter-follower VT3.

A.G.C. Output

111. Under weak signal conditions current flows in VT3, causing a voltage drop across R15 which reverse-biases the diodes D2, and D3 via the time-constant network C14, C15, C16, R16, R17 and RV1. The a.g.c. output voltage at pins 14, 15 and 16 will be at its maximum negative level.

112. An increase in signal strength will cause the voltage at the base of VT3 to become more negative and less current will flow in R15. The diodes D2 and D3 become forward-biased, leading to a fall in current through VT4, therefore the voltage across R21 will be less negative This causes a change of current in VT5 The output of VT5 is coupled to the emitter-follower VT6 via the RF/IF GAIN potentiometer RV5. Thus an increase in signal strength causes a less negative voltage on the a.g.c. line.

113. The final a.g.c. output is taken via three parallel paths from the emitter of VT6. The output at pin 15 is used within the i.f. unit to control the main 1.6 Mc/s amplifier. The output from pin 14 goes via PL1/SKT11 pin 23 to the l.f. a.g.c. terminal in terminal block TB2 at the rear of the receiver, where it may be connected to the a.g.c. line of another unit such as an l.f. adaptor. The output via pin 16 and PL1 pin 15 is connected to the 'S' meter on the front panel when the meter switch is in the R.F. position thus providing an indication of r.f. signal strength.

Diversity A.G.C.

114. The a.g.c. line voltage from an associated dual-diversity receiver or i.s.b. adaptor can be connected to the junction of diodes D2 and D3 via a terminal at the rear of the receiver, thence to pin 6 on the board.

Audio Amplifier Board

115. This is board number 4. The circuit is conventional and will therefore be described only briefly. The a. f. output at the Detector board is taken via the slider of the A. F. GAIN control and PL1/SKT11 pin 25 to the base of the driver transistor VT1. Input capacitors C2 and C3 are in parallel so that l. f. attenuation can be provided by the removal of C3, if desired. Negative feedback is provided by R3. The push-pull stage VT2 and VT3 operates in class A in order to eliminate the need for any setting-up adjustments; negative feedback is applied by R9 and R10. The 10 mW output is supplies to the PHONES jack socket on the front panel and also to the rear panel terminal block TB1 (10 mW 600Ω).

116. The line amplifier VT4 is supplied with an a. f. signal via the slider of the Line Level pre-set control and PL1/SKT11 pin 26. The additional input capacitor C10 may be removed if attenuation of the a. f. input is required. The output at 1 mW is taken from the secondary winding of transformer T3 to the meter diodes. The output to line is via PL/SKT11 pins 35 and 36 to the rear panel terminals marked '1 mW 600Ω'.

I. F. Converter

117. Although the i. f. converter circuitry is mounted on two separate boards (6 and 8) it should be regarded functionally as one circuit. Two types of converter are available but only one is fitted to a particular receiver, one produces a 455 kc/s output and the other a 100 kc/s output. The circuit differences are confined to the oscillator crystal frequency, coils L1 and L2 on board 6 and the values of components R12 and C9. Resistor R10 on board 6 is not fitted to the 455 kc/s version. The values shown in the circuit of Fig. 12 refer to the 455 kc/s converter.

118. The output of the crystal oscillator V11 on board 8 is fed via C3 and pin 3 to the amplifier VT1 on board 6. The output from the amplifier returns via pin 4 to board 8 where it is applied to the emitter of the mixer stage VT2. The signal input at 1. 6 Mc/s is applied via pin 5 to the base of VT2. The circuit L1, C8, C9, C10 and L2 provides filtering at the required i. f. Resistor R12 and capacitor C9 determine the passband, the values shown are for the 455 kc/s converter. These values are changed in the 100 kc/s version in order to maintain the same passband at the lower frequency.

119. The mixer output is taken from a tap on L2, and via pin 7 to board 6 where it feeds into the base of VT2 which is part of the d. c. coupled two-stage amplifier VT2 and VT3. The direct coupled amplifier has overall feedback via R9 which gives a very low impedance at the input to V2 and contributes to the excellent thermal stability. The amplifier also has good linearity which minimises problems which might otherwise arise from intermodulation products.

120. On board 6 the output circuit of VT3 (L1 and C8) is pre-tuned to the appropriate i.f. (455 kc/s or 100 kc/s). The resistor R10 is inserted only on the 100 kc/s converter in order to off-set the higher 'Q' of L1 at the lower frequency. From a tap on L1 the output goes to the coaxial socket SKT4 on the rear panel. This socket will be engraved either 455 kc/s or 100 kc/s, according to the type of converter board which is fitted to the i.f. unit. It should be noted that the required termination is 50Ω for the 455 kc/s, and 75Ω for the 100 kc/s converter.

121. If the RA.217 is connected to a suitable frequency synthesizer, channel oscillator or master receiver, the production of the final i.f. can be locked to the external source by a frequency injected in lieu of the crystal XL1. When an external source is connected, the crystal XL1 must be removed from its socket. For the 100 kc/s i.f. a frequency of either 1.5 Mc/s or 1.7 Mc/s may be supplied to the '1.5 Mc/s IN' socket. It should be noted that if 1.7 Mc/s is used the i.f. sidebands are inverted.

122. The RA.217 may be used in a master-slave relationship with another receiver. For this purpose the crystal oscillator frequency is fed to the slave receiver via the socket 1.145 Mc/s OUT (or 1.5 Mc/s OUT).

POWER SUPPLY MODULES

NOTE: The alternative types of power unit module for the RA.217 are listed in the Technical Specification. The standard module is the PU.408A which is described below. The other types of power unit will be described in an appendix, or in a supplement attached to a particular system handbook. When connecting ancillary units to the RA.217 receiver it is essential that the correct power module is fitted to the receiver, otherwise overloading may occur.

A.C. Mains Power Unit Type PU.408A (A.C. Only)

123. The unit consists of a main assembly to which is attached a printed circuit board containing the stabilizer circuitry. Mounted on the main assembly are the connector socket SKT1, the mains transformer, the input and output fuses, filtering capacitors and voltage selector switch. The printed circuit board contains the bridge rectifier and most of the stabilizing and d.c. smoothing components except the potentiometer 1RV1 capacitor 1C3 and power transistor 1VT1. These components are given the prefix '1' to show that they are mounted on the main assembly and not on the board.

124. The voltage selector switch has only two positions, 200-250 and 100-125 volts. The stabilizer circuit can compensate for any variations of mains supply voltage within these settings. The mains input to the power unit is switched by the micro-switches which are mounted on the

receiver main chassis and operated by the System switch shaft.

Stabilized D.C. Circuit

125. The bridge rectifiers D1 to D4 are connected across the secondary of the power transformer T1 via the 500 mA fuse FS2 and provide a d.c. output across the filter capacitor 1C3. Transistor 1VT1 completes the connection to the negative output line and stabilizes the output by acting as a series regulator under the control of the d.c. amplifiers VT1 to VT3. The diodes D5 to D8 provide temperature compensation.

126. The output from the board can be set to -16 volts by adjustment of the potentiometer 1RV1. Once set up, the circuit will maintain a stable output despite variations in either output load or mains supply voltage. The corrections for output load changes are made by transistors VT2 and VT3, whereas input voltages changes are sensed by VT1.

127. Output Stabilization Let it be assumed that due to increased loading there is a fall in output voltage, i.e. it becomes less negative. This changes the base voltage of VT3 in a positive direction, hence the base (and emitter) of VT2 go more negative, thus causing the regulator transistor 1VT1 to conduct more heavily and supply additional current from the power source to offset the increased loading which caused the initial drop in negative voltage. Capacitor C2 eliminates high frequency ripple which would otherwise cause instability.

128. Input Stabilization The base voltage of transistor VT1 on the printed board is derived from the potential chain formed by diodes D5, D6 and resistor R1. Any change of level at the base of VT1 is transferred via VT2 to the base of the power transistor 1VT1 to change the output current in 1VT1 so as to nullify the initial change of supply voltage.

129. Let it be assumed that the rectified output voltage across 1C3 increases (becomes more negative). This causes the junction of D6 and R1 and hence the base of VT1 to become more negative. This is transferred, via the base and emitter circuit of VT2, as a positive-going change at the base of the power transistor 1VT1. This reduces the collector current of 1VT1 to the power transistor 1VT1. This reduces the collector current of 1VT1 to offset the rise in the negative supply level.

130. It may be noted that the voltage across the filter capacitor 1C3 varies considerably according to input voltage and output load. For example, with a 250 volt a.c. supply and no load the voltage across 1C3 may reach 31 volts, whereas with the full load current and a 200-volt supply, only 20 volts (approx.) will appear across 1C3.

CHAPTER 2

TEST AND MAINTENANCE EQUIPMENT

The following items of test equipment are required for the procedures in Chapter 3 and 4.

R.F. Signal Generator (2 required)

Frequency Range	10 kc/s to 70 Mc/s
Output Impedance	75 ohms
A.M. Modulation distortion less than 10%	
Example: Marconi TF144H, with 50 to 75 ohms adaptor and 20 dB pad for each instrument.	

Multimeter AC/DC

Sensitivity	20 000 ohms/volt
Range	0 to 300 volts
Accuracy	2% of full seale
Example	AVO Model 8

Electronic Voltmeter (RF Voltmeter)

Input impedance	Not less than 1 megohm
Range (0 dB = 0.775 volts)	Minus 50 dB to plus 10 dB
Frequency Range	Up to 70 Mc/s
Example	Airmec Type 301

Electronic Voltmeter (L.F.)

Input Impedance	Not less than 1 megohm
Range (0 dB = 0.775 volts)	Minus 50 dB to plus 10 dB
Example	Advac VM77

Digital Frequency Meter (Counter)

Frequency Range	D. C. to 70 Mc/s
Accuracy	Internal reference frequency 1 part in 10^6 plus or minus 1 count.
Example	Racal Type SA550 with probe for high input impedance.

Output Power Meter

Frequency Range	100 c/s to 6000 c/s
Input Impedance	600 ohms
Example	Marconi TF. 893A

Noise Generator

Example	Marconi TF. 1106

Oscilloscope

Frequency Range	0 to 30 Mc/s with dual trace.
Example	Tektronix 545A

Waveform Analyzer

Frequency Range	100 c/s to 10 kc/s; capable of measuring to 40dB minimum.
Example	Wayne Kerr A321

Audio Signal Generator

Frequency Range	100 c/s to 15 kc/s
Example	

Telephone Headset — 600 ohm impedance

Tools

Spanner: $\frac{1}{4}$ inch AF (For coaxial connectors)
Screwdrivers: Various
Hexagonal wrench (Allen keys): various sizes
Soldering iron.

Terminating Resistors

100 ohms	$\frac{1}{4}$ watt
75 ohms	$\frac{1}{4}$ watt
50 ohms	$\frac{1}{4}$ watt
330 ohms	$\frac{1}{4}$ watt

Heat Shunt

Required when soldering certain coil assemblies to the printed circuit board. Refer to Chapter 7 page 7-13, for details.

CHAPTER 3

PERFORMANCE CHECKS

INTRODUCTION

1. The instructions in this chapter provide a series of checks on receiver performance suitable for use subsequent to an overhaul, or in the event of adverse reports on receiver performance. Suitable test equipment is listed in Chapter 2. The tests should be performed in the order given. A satisfactory result must be obtained from the test being made before continuing with the next.

2. The performance requirements which are stated for each test refer to a newly-manufactured factory-aligned receiver, and should not be applied too rigidly to a receiver which has been in use for a considerable time. Furthermore, the user should assess the accuracy of his own test equipment when evaluating test results. Do not attempt to improve the receiver performance by adjusting any preset trimmer or core etc. other than in an approved test procedure.

MECHANICAL INSPECTION

3. (1) Check that all modules are inserted and made secure, with covers in position.

(2) Check all plug and socket connections

(3) Check correct setting of the following switches at the rear of the receiver.

(a) Mains Voltage Selector (200-250, 100-125 or DC as appropriate)

(b) 2nd V.F.O. IN/OUT to OUT

(4) Check that fuses are of correct value and secure in their holders.

(5) Set the LOCK control to OFF

(6) Check all controls for smooth operation

(7) Connect power supply to receiver

SYSTEM CHECK

4. (1) Remove the receiver cover and perform the mechanical inspection (para. 3).

(2) Connect headphones to PHONES socket.

(3) Insert the 75 ohm terminating plug into socket LF (rear panel)

(4) Connect the signal generator (impedance 75 ohms) to the ANTENNA socket.

(5) Set the signal generator to 3.5 Mc/s at 1 microvolt e.m.f. 30% modulation at 400 c/s.

(6) Set the receiver KC/S control to indicate 500 and the MC/S control to indicate 3.

(7) Set the other receiver controls as follows: -

(a) RF TUNE to WB

(b) AE ATT to MIN

(c) BANDWIDTH KC/S to 3.0

(d) RF/IF GAIN fully clockwise (maximum gain)

(e) AF GAIN mid-position

(f) CALIBRATE control to mid-position

(g) BFO KC/S to OFF

(8) Set the System switch to CAL.

(9) Adjust KC/S tuning control around the 500 kc/s indication until a beat note is heard in the phones. If necessary, calibrate scale by setting KC/S control to indicate exactly 500 and adjust CALIBRATE control to give zero beat note.

(10) Set System switch to CHECK B.F.O. Alter KC/S tuning by approximately 10 kc/s. Switch BFO KC/S control through positions +6 to -6. Note that correct change of beat note occurs at each change of setting.

(11) Set System switch to MAN

(12) Re-set KC/S control to indicate 500

(13) If necessary, adjust signal generator frequency so that its signal is clearly received in the phones.

(14) Set RA.217 meter switch to A.F. position

(15) Adjust preset Line level control RV1 (see Fig. 18 chassis top) and note that meter indication changes with variation in setting of RV1

(16) Connect the -ve lead of a d.c. voltmeter, set to the 10 volt range, to the a.g.c. line on the R.F. Unit (negative).

NOTE: Terminal "A.G.C., R.F." on the receiver rear panel may be used, but a direct check on the R.F. Unit (green/white wiring) is also desirable.

(17) Set the RA.217 meter switch to R.F.

(18) Set the System switch to the AGC positions L, M and S in turn. Check that -ve 4 volts is indicated on the d.c. voltmeter in each position.

(19) Check that the RF/IF GAIN control is fully clockwise, then adjust the 'Meter Set Zero' preset control RV4 (see Fig. 18, chassis top) so that 1 μV is indicated on the RA.217 meter.

(20) Connect the -ve lead of the d.c. voltmeter (10V range) to terminal 'AGC RF) on the rear panel. The indication should be -ve 4 volts approximately.

(21) Increase signal generator output in 10 dB steps up to +40 dB check that the a.g.c. level as shown by the d.c. voltmeter reading decreases at each 10 dB step. Also check that the RA.217 meter indicates approximately the appropriate 'S' level at each 10 dB step.

(22) Reduce the signal generator output level until the indication on the receiver front panel meter is 1 μV.

(23) Set the System switch to POWER OFF. Remove the d.c. voltmeter.

(24) Connect an electronic voltmeter to the socket 2nd VFO OUT at the rear of the receiver.

(25) Set the System switch to MAN

(26) With 2nd v.f.o. switch set to 2nd VFO OUT. Note that an indication is obtained on the electronic voltmeter.

(27) Set 2nd v.f.o. switch to 2nd VFO IN. (To do this the locking plate must be removed). Check that the indication noted in (25) has been removed.

(28) Re-set 2nd v.f.o. switch to 2nd VFO OUT. The locking plate need not be replaced until the 2nd VFO output level has been checked (para. 6).

Crystal Frequency Check

NOTE 1: Receivers supplying a 100 kc/s i.f. output are fitted with a 1.5 Mc/s crystal; if the i.f. output is 455 kc/s the corresponding crystal frequency is 1.145 Mc/s.

NOTE 2: It will be necessary to remove the covers from the 37.5 Mc/s Generator module and the I.F. unit to make the adjustments.

5. (1) Connect a digital counter to the rear panel socket 1.5 Mc/s (or 1.145 Mc/s)

(2) Set the System switch to MAN

(3) Check that the digital counter indicates 1.5 Mc/s (or 1.145 Mc/s) ±2 c/s.

(4) If necessary adjust the trimmer capacitor C4 in the Converter board of the I.F. Unit to achieve the 1.5 Mc/s indication (See Fig. 18 View Right Hand Side and Fig. L12)

(5) Transfer the digital counter to the rear panel socket 1 Mc/s OUT.

(6) Adjust the trimmer C7 located on the 1 Mc/s board in the 37.5 Mc/s Generator Module (see Fig. 18 chassis underside) and Fig. L6. C7 is beside the crystal base)

(7) The digital counter should indicate 1 Mc/s ±2 c/s.

Auxiliary Inputs and Outputs

NOTE: The receiver will have either a 1.5 Mc/s crystal (100 kc/s i.f.) or a 1.145 Mc/s crystal (455 kc/s i.f.)

6. (1) Set the System switch to MAN

(2) Terminate with 75 ohms each of the following sockets in turn and connect an electronic voltmeter to the terminated outlet. The outputs should be as follows:

TABLE 1

Socket	Required Output
(a) 1 Mc/s OUT	Not less than 50mV in 75 ohms in each case.
(b) 1.5 Mc/s OUT or 1.145 Mc/s OUT	
(c) 2nd VFO OUT	

(3) Set the System switch to POWER OFF

(4) Disconnect the a.c. power from the receiver

(5) Remove the 1 Mc/s crystal from the 37.5 Mc/s Generator module (see Fig. 18, chassis underside)

(6) Remove the 1.5 Mc/s (or 1.145 Mc/s) crystal from the I.F. Module (Fig. 18).

(7) Set the 2nd VFO IN/OUT switch to IN

(8) Re-connect the power to the receiver. Set the System switch to MAN.

(9) Connect a signal generator sequentially to the sockets listed in Table 2 below. The generator output to be as stated in each case. Connect an electronic voltmeter and measure the output at the sockets listed in the right hand column of Table 2. The output in each is to be not less than 50mV into 75 ohms.

TABLE 2.

Connect Sig. Gen to these Sockets	Sig. Gen Frequency	Sig. Gen. Output (75Ω source)	Measure output at the sockets
1 Mc/s IN LOW	1 Mc/s	100 mV e.m.f.	1 Mc/s OUT
1 Mc/s IN HIGH	1 Mc/s	2.0V e.m.f.	1 Mc/s OUT
2nd VFO IN LOW	4 Mc/s	100 mV e.m.f.	2nd VFO OUT
2nd VFO IN HIGH	4 Mc/s	2.0V e.m.f.	2nd VFO OUT
1.5 Mc/s IN	1.5 Mc/s	100 mV e.m.f.	1.5 Mc/s OUT

(10) Set the System switch to POWER OFF. Replace the 1.5 Mc/s (or 1.145 Mc/s) and the 1 Mc/s crystals in their correct positions.

KC/S Tuning (2nd V.F.O.) Calibration Check

7. (1) Set the KC/S tuning control to indicate exactly 000.

(2) Set the System switch to CAL

(3) Set the BFO KC/S switch to OFF

(4) Connect the digital counter to the 2nd VFO OUT socket

(5) Adjust the CALIBRATE control until the counter indicates 4.6 Megacycles plus or minus 50 c/s.

(6) Set the KC/S tuning control to indicate exactly 100 kc/s Note the indicated frequency on the counter which will be 4.5 Mc/s plus or minus any calibration error. Adjust the CAL control to give a counter reading of 4.5 Mc/s ± 50 c/s.

(7) Reset the KC/S tuning control to indicate 000 and note the counter reading which should not differ from 4.6 Mc/s by more than 200 c/s.

(8) Repeat operations (5), (6) and (7) but in (6) set the KC/S tuning to 200 and adjust for a counter indication of 4.4 Mc/s

(9) Continue to repeat operations (5), (6) and (7) at each multiple of 100 kc/s on the tuning scale. At each 100 kc/s increment in the tuning scale the counter indication decreases by 0.1 Mc/s.

(10) Set the KC/S tuning to 500 and adjust the CALIBRATE control for an audio null.

(11) Measure the fine tune frequency range of the CALIBRATE control as follows:

(a) Set the CALIBRATE control fully clockwise reset the KC/S tuning control to give an audio null and note the frequency indicated on the counter.

(b) Set the CALIBRATE control fully anti-clockwise and again tune the KC/S control for an audio null again noting the frequency indicated on the counter.

The difference between the counter indications for (a) and (b) should be 8 kc/s.

(12) Disconnect the digital counter from the receiver

MC/S Tuning (1st V.F.O.)Calibration Check

NOTE: A digital counter capable of reading up to 70 Mc/s is required for this check.

8. (1) Connect a digital counter to either of the free coaxial plugs of the 1st VFO module. (PL1 beside the tuning gear is very accessible. Refer to Fig.18, left-hand side)

(2) Set the System switch to MAN

(3) Set the MC/S tuning scale to indicate 01

(4) The digital counter should display a frequency of 41.5 Mc/s plus or minus 20 kc/s. If necessary make a careful adjustment of the MC/S control setting to obtain this reading

(5) Adjust the MC/S tuning control over its full range of free movement but without changing the scale indication. The digital counter should indicate a variation of plus or minus 0.12 Mc/s approximately.

(6) Set the MC/S tuning control to 29 and adjust carefully

(7) The digital counter should display 69.5 Mc/s plus or minus 20 kc/s.

(8) Set the MC/S tuning successively in steps of 1 Mc/s from 01 to 29 on the scale. The digital counter should display 41.5 Mc/s at 01 increasing by 1 Mc/s at each step. All frequencies should be plus or minus 20 kc/s. At each Mc/s point, free movement of the MC/S control should produce a frequency variation of approximately plus or minus 0.12 Mc/s on the digital counter display.

(9) Remove all test equipment. Re-connect PL1 to its chassis socket.

B.F.O. Calibration

9. (1) Remove the cover from the I.F. Module

(2) Connect a digital counter to test point TP1 on the detector board in the i.f. module. (On the collector of VT1, Fig. 12)

(3) Set the system switch to CHECK B.F.O.

(4) Operate the BFO KC/S control through all positions. Check that the digital counter indicates the frequency in accordance with Table 3.

TABLE 3
BFO CHECK

BFO Control Setting	Measured Frequency at TP1 on Detector Board
+1.5	1 601 500 c/s ± 2 c/s
-1.5	1 598 500c/s ± 2 c/s
+6	1 606 000 c/s or higher
+3	1 603 000 c/s or higher
-3	1 597 000 c/s or lower
-6	1 594 000 c/s or lower

(5) In the 0 position of the BFO KC/S switch check that the BFO variable control gives a frequency shift of approximately plus or minus 3 kc/s.

(6) Remove the test equipment. Replace the cover on the i.f. module.

Overall Receiver Sensitivity Check

NOTE: It is assumed that the Power meter to be used is terminated in 600 ohms. If the instrument to be used is not so fitted, a 600 ohm termination must be connected when measuring any 600 ohm line output.

10. (1) Connect the Power meter to the 10m W 600Ω terminals on the rear panel terminal block TB1.

(2) Check that socket LF is fitted with the 75Ω terminating plug

(3) Connect the H.F. electronic voltmeter to the unterminated 1.6 Mc/s OUT socket. The cable between socket and voltmeter must be short.

(4) Connect the signal generator to the ANTENNA socket. Set the generator to 3.5 Mc/s modulated 30% at 400 c/s. Output level 1 μV e.m.f. from 75Ω source.

(5) Set the receiver controls as follows:

(a) AE ATT to MIN

(b) RF TUNE to WB

(c) BFO KC/S to OFF

(d) RF/IF GAIN fully clockwise (maximum gain)

(e) BANDWIDTH KC/S to 3

(f) System switch to MAN

(6) Tune receiver MC/S and KC/S controls to 3.5 Mc/s and make fine adjustments to obtain maximum output on the electronic voltmeter.

(7) Observe the maximum level indicated on the electronic voltmeter which should be not less than 60 mV.

(8) Adjust AF GAIN control for maximum output on the power meter. Note the indicated level which should be not less than 10 mW.

(9) Transfer the power meter to the 1 mW 600Ω terminals on TB1

(10) Set the Line Level preset control RV1 (see Fig. 18 chassis top) to maximum clockwise position. Note the power meter reading which should be not less than 1 mW.

(11) Adjust the Line Level RV1 to give exactly 1 mW on the output power meter.

(12) Set the RA.217 meter switch to AF

(13) Ensure that the RA.217 meter indicates 1 mW plus or minus 2 dB.

(14) Transfer the H.F. electronic voltmeter to the 100 kc/s OUT (or 455 kc/s OUT) socket on the rear panel, the output to be terminated in 75 ohms for 100 kc/s output, or in 50Ω for the 455 kc/s output. Note the output level:

(a) For 100 kc/s output the level shall be not less than 230 mV.

(b) For 455 kc/s output the level shall be not less than 185 mV.

(15) Set the System switch to MAN

Bandwidth Sensitivity

11. (1) Connect the digital counter to the Direct Output High, of the signal generator.

(2) Adjust the signal generator accurately to a frequency of 3.5 Mc/s as indicated on the counter.

(3) Disconnect the counter and re-connect the signal generator terminating pad. Set the output to CW Output e.m.f. 1 mV.

(4) Connect the signal generator to the ANTENNA socket.

(5) Connect the H.F. electronic voltmeter to 1.6 Mc/s OUT socket using short leads.

(6) Set the RA.217 controls as follows:

(a) AE ATT to MIN

(b) RF TUNE to WB

(c) RF/IF GAIN fully clockwise (maximum gain)

(d) BANDWIDTH KC/S to .2 (200 c/s)

(e) BFO KC/S to OFF

(f) System switch to MAN

(7) Tune the receiver for maximum output on the electronic voltmeter. Note the level obtained as a reference.

(8) Repeat operation (7) with the BANDWIDTH KC/S switch set to positions 1, 3 and 13 kc/s in turn. The electronic voltmeter indications should be compared with the reference level noted in (7)

Bandwidth Setting		Required Level
1 kc/s	minus	4 dB relative to 200 c/s
3 kc/s	minus	5 dB relative to 200 c/s reference.
13 kc/s	minus	15 dB relative to 200 c/s reference.

Single-Signal Selectivity

12. (1) Check that the signal generator has been accurately tuned to 3.5 Mc/s, and connected as described in para. 11 (1) to (4).

(2) Connect the H.F. electronic voltmeter to the 1.6 Mc/s OUT socket.

(3) Connect the digital counter also to the 1.6 Mc/s OUT socket using a sensitive probe, or connect the counter to the amplifier output of the electronic voltmeter.

(4) Set the receiver controls in accordance with para. 11 operation (6).

(5) Tune the receiver MC/S and KC/S control to obtain the maximum indication on the electronic voltmeter. Note the output level obtained, as a reference.

(6) Detune the signal generator until the indication on the electronic voltmeter is 3 dB below the output level noted in (5). Note the change in signal generator frequency and deduce the bandwidth, which should be 200 c/s plus or minus 50 c/s.

(7) Reset the signal generator frequency to 3.5 Mc/s and then repeat operation (6) but detuning to the minus 6 dB level, measuring and noting the bandwidth. Repeat the procedure for the 40 dB bandwidth. It may be necessary to increase the signal generator output for the 6 dB and 40 dB tests.

(8) Calculate the 'shape factor' i.e. the ratio of the bandwidth at the minus 40 dB point to the bandwidth at the minus 6 dB point. The shape factor should be not greater than 15 to 1.

(9) Reset the signal generator to 3.5 Mc/s and repeat operations (5) to (8) in the 1, 3 and 13 kc/s positions respectively, of the BANDWIDTH KC/S switch. Check that the bandwidths are in accordance with the following table.

TABLE 4

BANDWIDTHS

Bandwidth Kc/s Switch	Minus 3 dB Bandwidth	Shape Factor
1	1 kc/s ± 100 c/s	Not greater than 4:1
3	3 kc/s ± 300 c/s	Not greater than 3:1
13	13 kc/s ± 1300 c/s	Not greater than 3:1

Signal-to-Noise Ratio (CW)

13. (1) Connect the 600Ω power meter and also the L.F. electronic voltmeter to the '10 mW 600Ω' terminals

(2) Connect the signal generator to the ANTENNA SOCKET. Set the output to 1 μV. e.m.f. and the frequency to 3.5 Mc/s.

(3) Set the receiver controls as follows:

(a) RF TUNE to WB

(b) AE ATT to MIN

(c) BANDWIDTH KC/S to 3

(d) BFO KC/S to +1.5

(e) RF/IF GAIN fully clockwise (max. gain)

(f) A.F. GAIN fully clockwise (max. gain)

(g) Set the System switch to MAN

(4) Tune the receiver MC/S and KC/S controls to obtain maximum a.f. output as indicated on the electronic voltmeter.

(5) Set the System switch to AGC 'M' and adjust the A.F. GAIN Control until the power meter indicates a 10 mW output.

(6) Set the System switch to MAN and adjust the RF/IF GAIN control to restore the power meter reading to the 10 mW reference.

(7) Set the signal generator to CARRIER OFF

(8) Note the power meter reading which should be not less than 15 dB below the 10 mW reference.

(9) Set the signal generator to CARRIER ON and increase the generator output to 10 μV.

(10) Connect the l.f. electronic voltmeter in parallel with the power meter.

(11) Repeat the procedures (6) to (8) inclusive, noting the electronic voltmeter readings in each case. Check that the signal-to-noise ratio is improved by not less than 14 dB relative to the ratio noted in (8).

Signal-to-Noise Ratio (MCW)

14. On completion of the CW Signal-to-Noise Ratio check continue as follows:

(1) Set the BFO KC/S switch to OFF.

(2) Set the System switch to AGC 'M'

(3) Set the signal generator output to 30% modulation at 400 c/s at an e.m.f. of 3 mV.

(4) Set the RF/IF GAIN fully clockwise

(5) Adjust the AF GAIN for a 10 mW reference indication on the power meter.

(6) Switch off the modulation at the signal generator. Note the power meter reading which should be at least 15 dB below the reference level noted in (5)

Gain/Frequency Characteristic

15. (1) Connect a signal generator (75Ω source) to the ANTENNA socket. Set the signal generator to 1 Mc/s at 1 μV e.m.f. Maintain the generator e.m.f. at 1 μV throughout the tests.

(2) Connect the H.F. electronic voltmeter to the 1.6 Mc/s OUT socket using short leads.

(3) Set the receiver controls as follows:

(a) AE ATT to MIN

(b) RF TUNE to WB

(c) RF/IF GAIN fully clockwise (maximum gain)

(d) BANDWIDTH KC/S to 3

(e) BFO KC/S to + 1.5

(f) System switch to MAN

(g) Meter switch to RF

(4) Tune the receiver MC/S and KC/S Controls for maximum I.F. output; the electronic voltmeter shall indicate not less than 60 mV. Note the actual reading obtained.

(5) Set the signal generator successively to the following frequencies (at 1 μV) and repeat operation (4). Record the readings obtained.

1.5 Mc/s 2.0 Mc/s 3.0 Mc/s 4.0 Mc/s 6.0 Mc/s 12.0 Mc/s 16.0 Mc/s 24.0 Mc/s and 29.999 Mc/s.
Each output should be within a 6 dB range over the frequency band 1-30 Mc/s.

(6) Repeat operations (4) and (5) but with the RF TUNE control tuned to provide maximum response at each frequency. Each output should be within plus or minus 6 dB relative to the level obtained at the corresponding frequency in the wideband (WB) condition.

A.G.C. Characteristic Check

16. (1) Connect the signal generator to the ANTENNA socket

(2) Set the signal generator to 10.5 Mc/s, modulation 30% at 400 c/s, e.m.f. 2 μV.

(3) Connect the power meter to the 10 mW 600Ω terminals of the receiver.

(4) Set the receiver controls as follows:

(a) RF TUNE to WB

(b) AE ATT to MIN

(c) BANDWIDTH KC/S to 3

(d) BFO KC/S to OFF

(e) RF/IF GAIN fully clockwise (maximum gain)

(f) System switch to AGC (M)

(g) Meter switch to RF

(5) Tune the receiver MC/S and KC/S control to 10.5 Mc/s and adjust for maximum output on the power meter.

(6) Adjust the AF GAIN control to provide a reading of 1 mW on the power meter.

(7) Increase the signal generator output to plus 85 dB relative to 2 μV. Check that the power meter indication does not increase by more than +4 dB.

(8) Disconnect the signal generator and power meter.

Noise Factor Check

17. (1) Connect the noise generator (75Ω source) to the ANTENNA socket. Do not switch on the noise generator

(2) Connect the power meter to the 10 mW 600Ω terminals on the rear panel.

(3) Set the receiver controls as follows:

(a) AE ATT to MIN

(b) RF TUNE to WB

(c) BFO KC/S to +1.5

(d) BANDWIDTH KC/S to 3

(e) RF/IF GAIN fully clockwise

(f) Meter switch to R.F.

(g) System switch to MAN

(4) Check that the noise generator is switched off. Tune the MC/S and KC/S controls to 1.0 Mc/s. Carefully adjust the MC/S control for maximum indication on the power meter.

(5) Adjust the AF GAIN control to indicate a reference value of 1 mW on the power meter.

(6) Switch on the noise generator and increase its output until the power meter reading is increased by +3 dB. The increase in noise generator output (noise factor) to achieve this increase shall not exceed 10 dB. Switch off the noise generator.

(7) Repeat operations (4), (5) and (6) at the following frequencies:

1.5 Mc/s 2.0 Mc/s 3.0 Mc/s 4.0 Mc/s 6.0 Mc/s 12.0 Mc/s 16.0 Mc/s 24.0 Mc/s and 29.999 Mc/s

(8) Repeat operations (3), (4), (5), (6) and (7) but with tuned input (not WB). In operation (4) the RF TUNE control should be adjusted to resonance after the MC/S control has been set to the required frequency.

(9) Disconnect the noise generator and the power meter

First Mixer Balance Check

18. Do not remove the 1st Mixer cover. A suitable alignment hole is in the cover.

(1) Connect the signal generator to the ANTENNA socket.

(2) Set the signal generator to 3.5 Mc/s, CW., e.m.f. 1 μV.

(3) Connect the Power meter to the 10 mW 600Ω terminal

(4) Set the receiver controls as follows:

(a) AE ATT to MIN

(b) RF TUNE to WB

(c) BFO KC/S to +1.5

(d) BANDWIDTH KC/S to 3

(e) RF/IF GAIN fully clockwise (maximum gain)

(f) MC/S tuning to 3 and KC/S tuning to 500

(g) Meter switch to AF

(h) System switch to MAN

(5) Tune the receiver to 3.5 Mc/s and adjust the A.F. GAIN control to obtain a reading on the power meter of 1 mW, as a reference level.

(6) Note the dB setting of the attenuator on the signal generator as a reference (1μV).

(7) Set the signal generator frequency to 20 Mc/s

(8) Increase the signal generator output by plus 70 dB relative to 1 μV.

(9) Vary the signal generator tuning around 20 Mc/s until a reading is obtained on the power meter

(10) Balance the mixer by adjusting the potentiometer RV1 on the 1st Mixer board (Fig. L8) to obtain a minimum output on the power meter.

(11) Carefully adjust the signal generator output level to obtain the same reading on the power meter as the reference level noted in operation (5). Note the generator dB setting.

(12) The difference between the signal generator attenuator settings in operations (6) and (11) should be not less than 60 dB.

(13) Disconnect the signal generator

Spurious Response to Internal Signals

19. (1) Ensure that all module covers are secure.

(2) Connect the power meter to the '10 mW 600Ω' terminals

(3) Disconnect the signal generator and terminate the ANTENNA socket with 75Ω.

(4) Set the Receiver controls as follows.

(a) AE ATT to MIN

(b) RF TUNE to WB

(c) BFO KC/S to +1.5

(d) RF/IF GAIN fully clockwise

(e) BANDWIDTH KC/S to 3

(f) System Switch to MAN

(g) Set the MC/S and KC/S tuning to 01.000 initially.

(5) Adjust the MC/S tuning carefully for maximum noise in the phones.

(6) Adjust the A.F. GAIN control to obtain a level of 1 mW on the power meter.

(7) Turn the KC/S tuning control slowly and carefully through its range from 000 to 999. When a spurious response is heard in the phones, offset KC/S tuning until the response is no longer audible.

(8) Adjust the AF GAIN control to obtain a reference indication on the power meter of 1 mW.

(9) Retune the KC/S tuning to the spurious response and carefully tune to obtain a peak reading on the power meter.

(10) Note the increase in the power meter reading relative to the reference level obtained in (7). This increase should not exceed 2 dB.

(11) Repeat operations (5) to (10) at each setting of the MC/S control from 02 up to 29.

(12) Repeat operations (5) to (10), with the RF TUNE control adjusted to maximum noise setting at each MC/S setting from 01 to 29.

(13) On completion remove the 75Ω termination from the ANTENNA socket.

Spurious Response to External Signals

20. (1) Connect the signal generator to the ANTENNA socket

(2) Set the signal generator to 3.5 Mc/s, 1 μV e.m.f. CW.

(3) Connect the power meter to the '10mW 600Ω' terminals.

(4) Set the receiver controls as follows:

(a) AE ATT to MIN

(b) RF TUNE to the tuned condition

(c) BFO KC/S to +1.5

(d) RF/IF GAIN fully clockwise

(e) BANDWIDTH KC/S to 3

(f) System switch to MAN

(5) Tune the receiver MC/S and KC/S controls to the signal generator frequency. Adjust the RF TUNE control to resonance.

(6) Adjust the AF GAIN control to obtain a 1 mW reference level on the power meter.

(7) Detune the signal generator by approximately 10 kc/s and increase the signal generator output level to +80 dB.

(8) Tune the signal generator carefully from 3 Mc/s up to 4 Mc/s. At the same time, adjust the generator output level, as necessary, to maintain a constant 1 mW output level on the power meter. Check that each generator level setting is not less than 60 dB above 1 μV to provide the 1 mW reference.

(9) If a spurious response is located, which results in a signal generator level of less than 60 dB for the 1 mW reading on the power meter, proceed as follows:-

(i) Remove the cover from the 37.5 Mc/s Generator module. Refer to Chapter 7 para.24 for access instructions.

(ii) Make a small adjustment of the potentiometer RV1 on the Harmonic Mixer board (Fig.L7) to reduce the spurious response, as shown by a fall in the power meter reading.

NOTE: For access to the Harmonic Mixer board remove the cover from the 37.5 Mc/s Generator module. Release the pillar screws and hinge the 1 Mc/s/calibrator deck upwards. Refer to Fig.L7.

(iii) Adjust the signal generator output level to obtain the 1 mW level on the power meter. The signal generator level should be not less than plus 60 dB, in accordance with operation (8). If necessary make a further small adjustment of RV1 and repeat the test.

(iv) Replace the cover on the 37.5 Mc/s Generator module

(v) Repeat operation (8)

(10) Disconnect the signal generator.

Cross-Modulation

NOTE: This test requires two signal generators, referred to as generator (a) and generator (b).

21. (1) Connect the power meter to the '10mW 600Ω' terminals.

(2) Connect the two signal generators to the ANTENNA socket via a standard combining pad, which has a 6 dB insertion loss.

(3) Set up the two signal generators as follows:

(a) Unwanted signal: 3.480 Mc/s, 30% modulated at 400 c/s. Output level 20 μV. e.m.f.

(b) Wanted signal 3.500 Mc/s, 30% modulated at 400 c/s output level 20 μV e.m.f.

(4) Set the receiver controls as follows:

RF TUNE to WB

AE ATT to MIN (initially)

RF/IF GAIN to fully clockwise

BANDWIDTH KC/S to 3

BFO KC/S to OFF

System switch to AGC 'M'

(5) Tune the MC/S and KC/S controls to the frequency of signal generator (b).

(6) Adjust the AF GAIN control to obtain an indication of 10 mW on the power meter

(7) Switch off the modulation at signal generator (b). Note the power meter indication and check that the signal-to-noise ratio is better than 20 dB.

(8) Increase the output level of the unwanted signal (signal generator (a) until the power meter indicates 0.1 mW. The output level of signal generator (a) should not be less than 45 dB above that of signal generator (b) to conform with the cross modulation limit of 3%.

(9) If, for wanted signals in excess of 10μV e.m.f. at Antenna socket, the ratio of signal generator outputs is less than 45 dB, the AE ATT control should be set one or two steps towards MAX. Operations (5) to (8) should then be repeated. If necessary, further increase the AE ATT attenuation and repeat (5) to (8) until the 45 dB requirement is achieved.

(10) The test equipment should remain connected if the Blocking Test (para.22) is to be done.

Blocking

22. (1) Refer to para. 21 and carry out the instructions (1) to (6) inclusive.

(2) Switch off the modulation on the unwanted signal generator (a) and reduce its output level to 20 μV.

(3) Set the System switch to MAN

(4) Adjust the RF/IF GAIN for a reference indication of 10 mW on the power meter.

(5) Increase the C.W. output on generator (a) and increase its output level until the indication on the power meter is

reduced by 3 dB below the 10 mW reference. Check that the increase in level applied to generator (a) is not less than 56 dB.

Intermodulation Distortion

23. (1) Connect two signal generators and the power meter as instructed in para. 21 (1) and (2).

(2) Set signal generator (a) to a frequency of 3.0 Mc/s, CW, with an output e.m.f. of 2 μV. Switch off signal generator (b).

(3) Set the receiver controls as follows:

AE ATT to MIN

BFO KC/S to + 1.5

RF/IF GAIN to fully clockwise

AF GAIN fully clockwise

BANDWIDTH KC/S to 3

System switch to MAN

(4) Tune the receiver to 3.0 Mc/s and use the RF TUNE control to obtain the maximum audio output indication on the power meter. Adjust the RF/IF GAIN if necessary.

(5) Set the System switch to AGC 'M' and the RF/IF GAIN to fully clockwise. Adjust the AF GAIN for an indication of 1 mW on the power meter.

(6) Set the System switch to MAN. Reduce the RF/IF GAIN until the power meter again indicates 1 mW.

(7) Switch on the signal generator (b)

(8) Set up the respective signal generators as follows:

(a) To a frequency of 6.3 Mc/s, CW, with an output level 80 dB above 2 μV e.m.f.

(b) To a frequency of 3.3 Mc/s, CW, with an output level 80 dB above 2 μV e.m.f.

(9) Tune the generator (a) about the 6.3 Mc/s point to obtain an indication of output on the power meter.

(10) Increase the output levels of <u>both</u> signal generators <u>equally</u> until the 1 mW reference level obtained in operation (5) is restored. Check that both the generator output levels at this instant are not less than 80 dB above 2 μV e.m.f.

(11) Disconnect (and re-connect) signal generator (a) and (b) in turn and note that in each case the power meter reading is removed.

(12) Ensure that the receiver remains tuned to 3.0 Mc/s

(13) Set up the respective signal generators as follows:

(a) To a frequency of 3.6 Mc/s with an output level 80 dB above 2 μV.

(b) To a frequency of 3.3 Mc/s with an output level 80 dB above 2 μV.

(14) Repeat the procedures of (9) to (11) inclusive, at the frequencies set up in (13).

(15) Disconnect both signal generators.

Overall A.F. Response

24. (1) Set the signal generator to a frequency of 3.5 Mc/s; 30% external modulation at 1 kc/s; output e.m.f. 10μV, and connect to the ANTENNA socket.

(2) Connect the power meter to the '10m W 600Ω' terminals

(3) Set the receiver controls as follows:

RF TUNE to WB

AE ATT to MIN

RF/IF GAIN fully clockwise

BANDWIDTH KC/S to 13

BFO KC/S to OFF

System switch to AGC 'M'

(4) Tune the receiver MC/S and KC/S controls to 3.5 Mc/s

(5) Set the AF GAIN control to obtain a 1 mW reference level on the power meter.

(6) At the signal generator sweep the external modulation from 100 c/s to 6 kc/s, (ensure that the modulation depth remains constant) at the same time check that the power meter reading remains within plus or minus 3 dB over the range 100 c/s to 6 kc/s.

Overall A.F. Distortion

25. (1) Set up the equipment as in para. 24 operations (1) to (3). The receiver should be tuned to 3.5 Mc/s

(2) Set the A.F. GAIN control for an output of 10 mW on the power meter.

(3) Disconnect the power meter and connect the waveform analyser in its place. Set the frequency of the analyser to 1 kc/s.

(4) Measure the modulation distortion at 2.3 and 4 kc/s. The distortion should not exceed 3% at any harmonic.

(5) Connect the power meter to the 1 mW 600Ω terminals. Adjust the Line Level (Fig. 18 chassis top) preset control for an indication of 1 mW.

(6) Repeat operations (3) and (4) at the 1 mW terminals.

(7) Remove the waveform analyzer.

Hum Level

NOTE: The signal generator hum sidebands shall be better than -60 dB relative to the carrier level for this test to be valid.

26. (1) Set up the equipment as in para. 24 operations (1) to (3), except that the signal generator output level is to be 100 μV e.m.f.

(2) Tune the receiver to 3.5 Mc/s and adjust the A.F. GAIN for a 10 mW level on the power meter.

(3) Set the System switch to MAN and adjust the RF/IF GAIN control to obtain a 10 mW level on the power meter.

(4) Connect the l.f. electronic voltmeter in parallel with the power meter and note the level indicated.

(5) Switch off the modulation of the signal generator and note the level indicated on the electronic voltmeter, which should be not less than 40 dB below the level noted in (4).

CHAPTER 4

ALIGNMENT PROCEDURE

INTRODUCTION

1. The purpose of this chapter is to enable the modules of a receiver to be tested to a serviceable standard. The tests are designed to be as independent as is practicable, so that the checks on a particular module rely as little as possible on the correct functioning of another module, thereby providing a useful aid to the fault location chapter. If the user wishes to check the overall performance of the receiver, reference should be made to chapter 3.

NOTE: Throughout this chapter the signal generator output level in each test is given as e.m.f. unless otherwise stated. All r.f. voltages are r.m.s. unless otherwise stated.

CAUTION: Under normal conditions the receiver will maintain the factory alignment over a long period of time, consequently any other causes of trouble should be eliminated before re-alignment is undertaken If it becomes necessary to re-align any part of the receiver, only small angular adjustments of any trimmers or tuning slugs should be necessary. When replacing access covers, module shields, etc., ensure that all screws are firmly secured to prevent any spurious signals from affecting the receiver, but do not over-tighten, to the extent that screw-hole threads become damaged.

PROCEDURES

I. F. UNIT

Test Equipment

3. Signal Generator
D. C. Voltmeter
R. F. Voltmeter (Electronic Voltmeter)
Digital Frequency Meter (Counter)
0. 1 µF Capacitor 30V rating.

Initial Control Settings

4. RF/IF GAIN - Fully clockwise
AF GAIN - Fully clockwise
System Switch - MAN
BFO Switch - OFF
BANDWIDTH - 3 Kc/s

Alignment Procedure Fig. L-12 Fig. 12 Fig. 18

CAUTION: Coaxial Test connections to the 1. 6 Mc/s OUT socket at the rear panel must be short.

5. (1) Disconnect the input lead (PL3) from SKT1 at the forward end of the i. f. unit.

(2) Connect the RF Voltmeter to the socket 1. 6 Mc/s OUT using a short lead.

(3) Connect the DC voltmeter (10V range) to pin 3 on the Main I. F. Amplifier board (-ve lead)

(4) Adjust potentiometer RV1 on the AGC board to produce a reading of -4 volts on the voltmeter.

(5) Set the signal generator to 1. 6 Mc/s ± 10 c/s at an e. m. f. of 20 microvolts. (100Ω source impedance) Connect the generator to the i. f. input, SKT1, at the forward end of the I. F. Unit.

NOTE: Up to Receiver Serial Number 75 (approx.) an input e. m. f. of 10 microvolts should be used.

(6) Note the 1. 6 Mc/s output level on the RF voltmeter which should be between 80 and 150 mV. If below 80 mV, align the coils in the following order for maximum output on the RF voltmeter.

L1 on the AGC board
L2 and L1 on the Main I. F. Amplifier board
L1 on the 1st I. F. Amplifier board.

(7) Connect the 600-ohm power meter to the rear panel terminals '10 mW 600Ω'.

(8) Set the signal generator to 1.6 Mc/s modulated 30% at 1000 c/s and check that the audio output is not less than 10 mW (AF GAIN fully clockwise)

(9) If the 10 mW level is not obtained adjust L3 on the Main I.F. Amplifier board and T1 on the Detector board to obtain the 10 mW level on the Power meter.

(10) Switch off the modulation and set the BFO switch to +1.5 and -1.5 in turn. Note that the Power meter reads at least 10 mW in each setting.

(11) Set the BFO switch successively to the positions + 6 through to -6 and note that the 10 mW output is obtained in each setting.

(12) Set the BFO switch to OFF and the System switch to AGC 'S'.

(13) Increase the signal generator output level by +36 dB. Observe the change of reading on the RF voltmeter which should not exceed +3 dB. If the indication is satisfactory, omit the next operation.

(14) If, in operation (13) the RF voltmeter reading showed an increase of more than 3 dB adjust L2 in the AGC board to produce a minimum level in the RF voltmeter reading.

(15) Re-set the signal generator output according to operation (5)

(16) In the following i.f. converter check the user is asked to read "100 kc/s" or "455 kc/s" as appropriate to his particular receiver. Note that the terminations differ.

(17) Terminate the 100 kc/s OUT socket in 75 ohms (455 kc/s OUT in 50 ohms) Connect the RF voltmeter across the termination. For a 1.6 Mc/s 20 microvolt input to the i.f. unit the output should be not less than 230 mV into 75 ohms at 100 kc/s, or not less than 185 mV into 50 ohms at 455 kc/s. If the output is low adjust L1 on the converter amplifier board. If necessary adjust L2 and L1 on the converter oscillator board.

CAUTION: Peaking of the converter board inductors can adversely affect the selectivity characteristics. Set the BAND-WIDTH switch to 13 kc/s and tune the signal generator through the receiver passband; note that the response is symmetrical .

(18) Connect the digital counter to the 1.5 Mc/s OUT socket (1.145 Mc/s OUT). Check the appropriate frequency. If necessary adjust C4 on the oscillator board to obtain the required frequency ± 2 c/s.

(19) Remove the counter and connect the RF voltmeter in its place. A reading of not less than 100 mV should be obtained.

BFO Check

NOTE: Refer to Chapter 3 page 3-7 para. 9 for calibration check. If necessary align as follows.

6. (1) Connect a digital counter to test point TP1 on the detector board in the I.F. Unit via a 0.1 µF capacitor.

(2) Set the System switch to MAN

(3) Set the BFO variable control to the mid-point of its movement.

(4) Set the BFO KC/S switch to + 1.5. The counter should read 1601.50 kc/s ± 2 c/s. If necessary adjust the Trimmer capacitor C21 on the Detector board to obtain the correct frequency.

(5) Set the BFO KC/S switch to -1.5. The counter should read 1598.50 kc/s ± 2 c/s. If necessary adjust Trimmer capacitor C22 on the Detector board to obtain this frequency.

(6) Set the BFO KC/S switch to +6. Refer to Fig. L-13 and Fig. 18 (right hand side view to identify BFO board) Adjust coil L1 in the BFO board for a frequency of not lower than 1.606 000 c/s.

(7) Set the BFO KC/S switch as follows and adjust the appropriate capacitor on the 600 kc/s BFO board.

BFO Switch Setting	Capacitor to Adjust
+3	C6
0	C5
-3	C3
-6	C2

The frequencies should be as given in Chapter 3 para. 9.

(8) Remove all test equipment

(9) Leave the input lead to the i.f. unit (PL3) disconnected for the 3rd Mixer check which follows.

3RD MIXER

Test Equipment

7. Signal Generators (2)
RF Voltmeter (Electronic Voltmeter)

Initial Control Settings

8. System Switch - MAN
2nd VFO Switch (on rear panel) - IN
MC/S Tuning - set to 00 Mc/s
Calibrate Control - Mid-position of its travel

Alignment Procedure Fig. L-11 Fig. 11

9. (1) Connect the signal generator to the 2nd VFO IN 'LOW' socket on the rear panel.

(2) Connect the RF voltmeter to test point TP2 on the 3rd Mixer board.

(3) Set the Signal Generator to 5.6 Mc/s and set the attenuator on the generator for a convenient reading on the RF voltmeter (50 mV).

(4) Tune coil L4 for a minimum on the RF voltmeter

(5) Set the generator to 3 Mc/s and tune L6 for minimum on the RF voltmeter.

(6) Set the generator to 3.6 Mc/s and tune L7 for maximum on the RF voltmeter.

(7) Set the generator to 4.6 Mc/s and tune L2 for maximum on the RF voltmeter

(8) Repeat the above procedures until the response is flat within 3 dB from 3.6 to 4.6 Mc/s.

(9) Transfer the signal generator to the socket LF on the rear panel. (Remove the 75Ω terminating plug)

(10) Connect the RF voltmeter to pin 1 on the 3rd Mixer board.

(11) Set the generator to 3 Mc/s and set the generator output for a 50 mV reading on the RF voltmeter.

(12) Tune coil L1 on the 3rd Mixer for maximum on the RF voltmeter.

(13) Tune the generator from 2 Mc/s to 3 Mc/s and check that the output remains constant within 2 dB.

(14) Transfer the signal generator from the LF socket to pin 3 on the 2nd MIXER board. Set the generator accurately to 2.4 Mc/s ± 10 c/s. Adjust the generator output level to a p.d. of 10 mV measured at pin 3 on the 2nd Mixer board.

(15) Connect a second signal generator to the 2nd VFO IN 'LOW' socket on the rear panel. Set this generator accurately to 4 Mc/s ± 10 c/s and an e.m.f. of 100 mV

(16) With the input lead at the forward end of the I.F. Unit (PL3) disconnected, terminate the lead in 100 ohms. Connect the RF voltmeter across the termination.

(17) On the 3rd Mixer board tune coils L5 and L3 for maximum reading on the RF voltmeter.

(18) Check that a stage gain of not less than unity is obtained (calculated from the p.d. at pin 3 on the 2nd Mixer to the p.d. at the 100 ohm termination). Normally the gain is approximately +3 dB.

(19) Remove the test equipment. Replace the 75 ohm terminating plug in the LF socket. Reset the 2nd VFO switch to OUT.

2ND MIXER

Test Equipment

10. Signal Generator (2)
RF Voltmeter (Electronic Voltmeter)

Initial Control Settings

11. System switch - MAN
MC/S tuning - Set to indicate 00 Mc/s, to disable 1st VFO etc.

NOTE: On a few early receivers (up to serial number 026) the 00 Mc/s setting does not remove the h.t. from the 1st VFO etc. In such cases remove the link from the terminal 'h.t. r.f.' on the rear panel.

Alignment Procedure Fig. L-9 Fig. 9

12. (1) Remove the 1 Mc/s crystal from the 1 Mc/s module. Connect the RF voltmeter to TP2 on the 2nd Mixer board. Connect the signal generator to pin 1.

(2) Set the signal generator to 37.5 Mc/s and an e.m.f. of 10 mV.

(3) Tune coil T1 for maximum on voltmeter. The output should be approximately 100 mV.

(4) Connect the RF voltmeter to pin 3.

(5) Connect the signal generator to the socket LF on the rear panel. (Remove the 75 ohm terminating plug)

(6) Set the signal generator to 3.66 Mc/s and tune coil L2 for a minimum.

(7) Set the signal generator to 2.6 Mc/s and tune L3 for a minimum. The signal generator attenuator may have to be increased as the minimum is approached to obtain a reading on the voltmeter.

(8) Set the signal generator to 1.3 Mc/s and tune L6 for a minimum.

(9) Set the signal generator to 4.5 Mc/s and tune L5 for a minimum.

(10) Set the signal generator to 2.5 Mc/s and tune coils L1 and T2. for maximum.

(11) Set the signal generator to 2.1 Mc/s and tune L4 for a maximum

(12) Repeat operations (6) to (11) until a response is obtained which is flat within 3 dB from 2 to 3 Mc/s.

(13) Disconnect the signal generator and replace the 75Ω terminating plug in the LF socket

(14) Two signal generators are required for the following mixer test. Connect signal generator No. 1 to pin 1 of the 2nd Mixer board. Set the generator to 37.5 Mc/s at an e.m.f of 10 mV.

(15) Set signal generator No. 2 to 40 Mc/s and connect to pin 6 of the 2nd Mixer board. Adjust this generator for a.p.d. of 10 mV measured at pin 6.

(16) Connect the RF voltmeter to pin 3 (output) of the mixer board and check that a reading of 10 mV ± 3 dB is obtained.

(17) Disconnect all test equipment. Replace the link at the terminal 'h.t. r.f.' if it was removed (see note on previous page).

37.5 MC/S GENERATOR MODULE

1 Mc/s AMP, OSCILLATOR AND CALIBRATOR SECTION

Test Equipment

13. Signal Generator
RF Voltmeter (Electronic Voltmeter)
Digital Frequency Meter (Counter)
Oscilloscope

Initial Control Settings

14. System Switch - MAN

Alignment Procedure Fig. L-6 Fig. 6

NOTE: The 1 Mc/s and Calibrator Section is on the upper deck of the module.

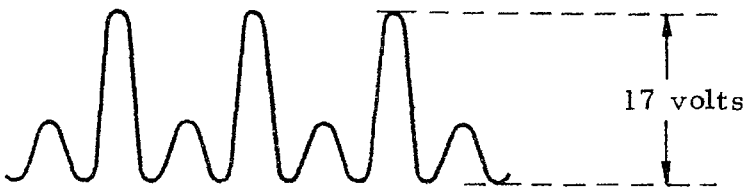
15. (1) Check that the 1 Mc/s crystal is secure in its holder on the oscillator board.

(2) Connect the RF voltmeter to the rear panel socket ' 1 MC/S OUT' and check for a reading of approx. 100 mV.

(3) Connect the counter to the '1 MC/S OUT' socket. The frequency should be 1 Mc/s ± 2 c/s. If necessary adjust capacitor C7 on the oscillator board to achieve the required frequency.

(4) Connect the oscilloscope to the junction of C12 and R17 on the amplifier board.

(5) Adjust the coil L1 on the amplifier board for maximum amplitude which should be approximately 17 volts. The approximate waveform is shown below.



(6) Remove the 1 Mc/s Crystal from the oscillator board.

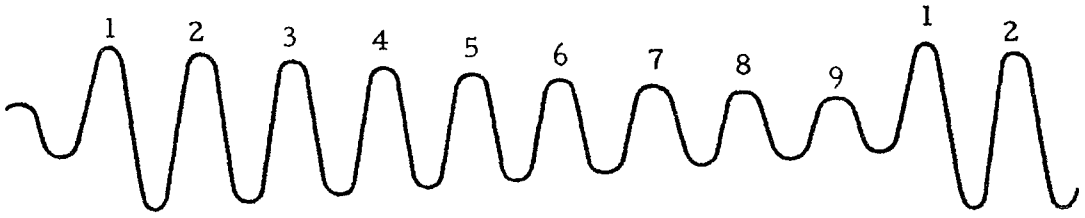
(7) Connect the signal generator to the '1 Mc/s IN' socket. Set the signal generator to 1 Mc/s and 100 mV e.m.f.

(8) Transfer the RF voltmeter to the junction of C4 and C5 on the oscillator board and check for a reading of approx. 100 mV.

(9) Replace the crystal. Disconnect the signal generator and RF voltmeter.

(10) Connect the oscilloscope to the collector of VT2 on the oscillator board. Adjust coils L1, L2 and L3 for the correct display as shown below.

(10a) 'CALIBRATE ON'



(11) Transfer the oscilloscope to the -ve side of D6. (pin A2 in corner of the board). The display should be 300 mV peak-to-peak.

(12) Remove the test equipment and proceed with a check of the lower deck of the module. Switch off the receiver.

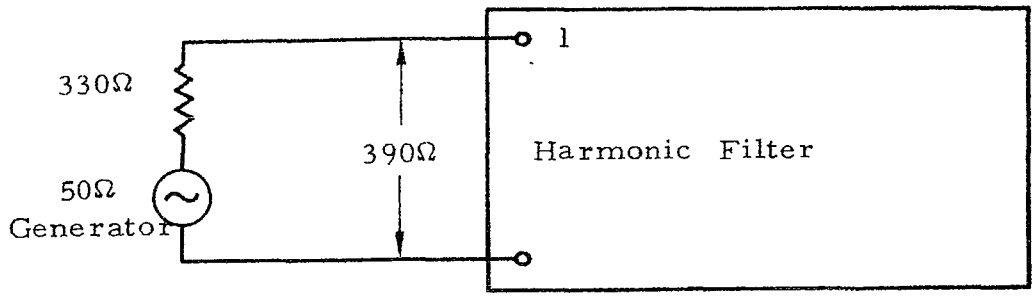
HARMONIC GENERATOR, MIXER AND 37.5 MC/S AMPLIFIER

16. Refer to Fig. L-7 and to Chapter 7 para.24 for access instructions.

(1) Separate the Harmonic Filter from the Harmonic Generator by unsoldering the lead from pin 1 on the Harmonic Filter.

(2) Connect the RF voltmeter to pin 2 on the Harmonic Mixer board.

(3) Connect a signal generator, source impedance 390 ohms to pin 1 of the Harmonic Filter. See diagram on next page.



(4) Set the signal generator output to 2 volts e. m. f. Explore the passband of the Harmonic Filter from 1 Mc/s to 32 Mc/s. The ripple should not exceed 3 dB. If necessary adjust capacitors C2, C4, C6 and C8 in the Harmonic Filter for minimum ripple.

(5) Set the signal generator to 33 Mc/s and check that the output is 8 dB down relative to the level at 32 Mc/s.

(6) Disconnect the signal generator and RF voltmeter. Reconnect the lead unsoldered in (1). Switch on the receiver.

(7) Connect the oscilloscope to pin 1 of the Harmonic Generator board. The amplitude should be as measured in para. 15 operation 5 (approx 17V p-p)

(8) Transfer the oscilloscope to pin 2 of the Harmonic Mixer board. The amplitude should be approx 1.2V peak-to-peak.

(9) Transfer the RF voltmeter to pin 5 on the Harmonic Mixer board.

(10) Connect the signal generator to pin 4 on the Harmonic Mixer board.

(11) Set the signal generator to 37.5 Mc/s at 2 mV e. m. f.

(12) Tune coil L1 in the Mixer to a maximum reading on the RF voltmeter which should indicate approximately 10 mV.

(13) Transfer the RF voltmeter to pin 4 on the 37.5 Mc/s Amplifier and adjust T1 on the amplifier for maximum indication. A level of approximately 100 mV should be obtained.

(14) At the bracket beneath the 1st VFO module disconnect the lead which goes to the 37.5 Mc/s Generator module. Connect the signal generator output to this lead (PL1) and inject 37.5 Mc/s at an e. m. f. of 20 mV.

(15) Connect the RF voltmeter to pin 5 on the Harmonic Mixer board. **Adjust RV1** on the Mixer board for a minimum reading on the RF voltmeter.

1ST MIXER

Test Equipment

17. Signal Generator (2) 3.5 Mc/s and 43 5 Mc/s
RF Voltmeter (Electronic Voltmeter)

Initial Control Setting

18. MC/S tuning - 03

Alignment Procedure

Fig. 8 Fig. 9

19. (1) Disconnect the two free coaxial leads which are attached to the 1st Mixer from their respective connections to the RF unit and 1st VFO

(2) Connect signal generator No. 1 to PL1 on the 1st Mixer lead normally fed from the RF unit. Set this generator to 3.5 Mc/s at a p.d. of 10 mV, measured at pin 2 on the 1st Mixer board.

(3) Connect signal generator No. 2 to PL3 on the 1st Mixer which is normally fed from the 1st VFO. Set this generator to 43.5 Mc/s at an e.m.f. of 200 mV.

(4) Connect the RF voltmeter to pin 6 on the 2nd Mixer board.

(5) Set the System switch to MAN and check that the RF voltmeter reads 10 mV ± 3 dB.

FILTERS

20. No information is given on the alignment of the 40 Mc/s or the 37.5 Mc/s Bandpass Filters because it is considered that the equipment and specialized skill required for satisfactory alignment of these filters is outside the scope of the average service department. A factory aligned unit should be fitted in the unlikely event of a defect in either of these units.

2ND V.F.O.

Test Equipment

21. Digital Frequency Meter (Counter)
RF Voltmeter (Electronic Voltmeter)

Procedure

NOTE: The 2nd VFO cover need not be removed.

22. (1) Refer to Chapter 3 page 3-5 and perform the Calibration Check in paragraph 7. If the frequencies are not correct make fine adjustment of C4, accessible through a hole in the module cover.

(2) Connect the RF voltmeter to the '2nd VFO OUT' socket on the rear panel across a 75 ohm termination. A level of 50 mV should be obtained.

(3) Transfer the RF voltmeter to the test point TP2 in the 3rd Mixer module (Fig. 11). A level of not less than 50 mV should be obtained.

1ST V.F.O.

Test Equipment

23. Digital Frequency Meter (Counter)
RF Voltmeter (Electronic Voltmeter)

Initial Control Settings

24. MC/S Tuning - not set to 00 Mc/s

Procedure

25. (1) Refer to Chapter 3 page 3-6 and perform the Calibration Check in paragraph 8.

(2) The 1st VFO output check is described in Chapter 5 page 5-5 operation (5)

R. F. UNIT

Test Equipment

26. RF Voltmeter (Electronic Voltmeter)
Signal Generator (75Ω source)
DC Voltmeter
Terminating Resistor (see Para. 28 below)
Coil Trimming Tool

Initial Control Settings

27. System Switch - Manual (MAN)
MC/S Tuning - not on 00 Mc/s
RF Tune - Wideband (WB)
AE ATT - Minimum (MIN)
RF/IF Gain Control - Maximum (fully clockwise)

R. F. Unit Output Impedance

28. Early deliveries of the R. F. Unit have differing output impedances, as follows:

Serial numbers:	01 - 26	150Ω
(Approx)	27 - 100	33Ω
	100 - onwards	47Ω

Antenna Filter Alignment

Fig. 4

29. To adjust the cores of the 0-30 Mc/s Filter, 1L1, 1L2 and 1L3 it is necessary to remove the Aerial Attenuator switch. This adjustment is therefore omitted from the following alignment procedure as the filter alignment is not critical and unlikely to need attention. The procedure is described in para. 34 for use if needed.

Aerial Attenuator (AE ATT) Check

Fig. 4 Fig. L-4

30. (1) Set the receiver controls according to para. 27.

(2) Check that the -4 volts is present on the a. g. c. line. (Refer to Fig. L-4 and measure at 4C4 on the small component board.

(3) Disconnect the R. F. Unit output coaxial lead from the 1st Mixer lead and terminate the R. F. Unit output (PL1) according to para. 28 above.

(4) Connect the RF Voltmeter to the termination in PL1.

(5) Set the signal generator to 3.5 Mc/s and connect the output to the ANTENNA socket.

(6) With the receiver AE ATT control set to MIN, adjust the signal generator output for a suitable dB reference on the RF Voltmeter. Note the signal generator and RF voltmeter levels.

(7) Set the AE ATT control one step towards MAX.

(8) Increase the signal generator output to restore the reference level established in (6)

(9) Note the increase in signal generator output, which should be 10 dB ± 1 dB.

(10) Repeat operations (6), (7) and (8) The increase in attenuation obtained at each setting of the AE ATT control should be as follows:

AE ATT Switch Setting		Change in Attenuation	
5	MIN	0 dB	(Reference)
4		-10 dB	± 1 dB
3		-20 dB	± 1 dB
2		-30 dB	± 1 dB
1	MAX	-40 dB	± 1 dB

(11) Re-set the AE ATT control to MIN

Coil Assembly Alignment

NOTE 1: The cores of coils 2L1 to 2L5 can be adjusted via holes in the receiver rear panel, but in some early deliveries of the receiver these holes may be absent.

NOTE 2: A special double-ended plastic trimming tool is supplied with the receiver for the adjustment of 2L1 to 2L5. Note that the longer and thinner end of the tool must be used for this adjustment.

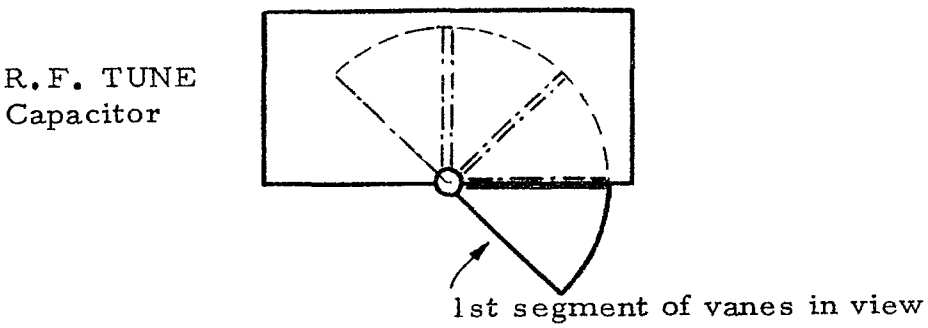
31. (1) Set the receiver controls as follows:

System switch to MAN
MC/S tuning to 01
RF/IF GAIN to maximum clockwise
AE/ATT to MIN

(2) Refer to the foregoing para. 30 and perform operations (2), (3) and (4).

(3) Connect the signal generator (75Ω source) to the ANTENNA socket. Set the generator to 950 kc/s at an e. m. f. of 10 mV.

(4) Turn the R. F. TUNE control to its extremity so that the vanes of the capacitor are fully meshed, then turn the control back about 45 degrees so that the slot of the first segment of the vanes is just emerging, as shown below.



(5) Insert the trimming tool into the core aperture of coil 2L1. Push the tool right through to the further end to engage the primary core. Turn the tool clockwise to set the core fully out.

(6) Partially withdraw the tool and screw the outer (secondary) core fully anti-clockwise, then screw the core clockwise until a maximum reading is obtained on the RF Voltmeter.

(7) Push in the tool and turn the inner (primary) core anti-clockwise for a maximum reading on the RF Voltmeter. Repeat (6) and (7) until no further increase in RF Voltmeter reading can be obtained. Note the final reading as a reference for use in operation (10).

(8) Set the signal generator to 2 Mc/s.

(9) Tune the R. F. TUNE control to obtain a maximum reading on the RF Voltmeter.

(10) Check that the RF Voltmeter reading is within 3 dB of the level noted in (7).

NOTE: If the reading noted in (10) is satisfactory, the following operation (11) should be omitted. It is normally done as part of a major overhaul when the R. F Unit is removed from the receiver.

R.F. Amplifier A.G.C. Adjustment

33. (1) The signal generator and RF Voltmeter should be connected as in the previous paragraph.

(2) Check that the System switch is at MAN and the RF/IF GAIN fully clockwise (maximum)

(3) Connect a d.c. voltmeter -ve lead to the collector of 3VT1 (Fig. L-4)

(4) Adjust potentiometer 4RV1 (which is on the small component board mounted externally on the forward face of the r.f. unit. (Fig. 18) until the collector voltage of 3VT1 just 'bottoms' A reference to the RF Voltmeter reading should show that the bottoming point of 3VT1 coincides with maximum r.f. gain. Refer to Chapter 1 paragraph 34 for a description of the procedure.

(5) Disconnect the signal generator and RF Voltmeter. Remove the terminating resistor from the output lead and re-connect PL1 to the 1st Mixer lead.

Antenna (0-30 Mc/s) Filter Alignment

NOTE: This alignment should not normally be required and should be considered only as part of a major overhaul.

34. (1) To remove the attenuator switch SA, slacken the grub-screws in the rearward side of the Eddystone coupler and remove the control shaft and coupler. Unsolder the connecting leads as necessary and remove the switch assembly.

(2) Connect the RF Voltmeter to the output lead of the 0-30 Mc/s filter.

(3) Connect the signal generator (75Ω source) to the ANTENNA socket. Set the generator to 43 Mc/s and an e.m.f. of 1 volt.

(4) Adjust the coils 1L1 and 1L3 for a minimum reading on the RF Voltmeter.

(5) Re-set the signal generator to 56 Mc/s and adjust coil 1L2 for a minimum reading on the RF Voltmeter.

(6) Remove the test equipment. Replace the attenuator switch and control shaft by reversing the instructions in operation (1).

(11) Adjust the appropriate trimmer capacitor (2C1) to obtain the maximum reading on the RF Voltmeter in accordance with the requirements of operation (10).

(12) Set the MC/S tuning control to 02.

(13) Set the signal generator frequency to 1.9 Mc/s

(14) Repeat operations (4) to (10) noting that in operation (5) the coil is 2L2 and that in operation (8) the signal generator frequency is changed to 4 Mc/s. In operation (11) the capacitor is 2C2.

(15) Set the MC/S tuning to 04 and the signal generator frequency to 3.8 Mc/s.

(16) Repeat operations (4) to (10) noting that in (5) the coil is 2L3 and that in (8) the signal generator frequency is changed to 8 Mc/s. In operation (11) the capacitor is 2C3.

(17) Set the MC/S tuning to 08 and the signal generator frequency to 7.8 Mc/s.

(18) Repeat operations (4) to (10) noting that in (5) the coil is 2L4 and that in (8) the signal generator frequency is changed to 16 Mc/s. In operation (11) the capacitor is 2C4.

(19) Set the MC/S tuning 16 and the signal generator frequency to 14.9 Mc/s.

(20) Repeat operations (4) to (10) noting that in (5) the coil is 2L5 and that in (8) the signal generator frequency is changed to 30 Mc/s. In operation (11) the capacitor is 2C5.

R.F. Amplifier Alignment

32. (1) Refer to paragraph 30 and set up the receiver and test equipment according to operations (1) to (4).

(2) Sweep the signal generator across the 1 to 30 Mc/s passband, note the RF voltmeter readings and check that the response does not vary by more than 6 dB relative to a 1 Mc/s reference point. If necessary adjust coils 3L1, 3L2, 3L3 and 3L4 on the amplifier board for minimum undulation in the passband. The cores of 3L1 and 3L2 are accessible via the tops of the coils, 3L3 and 3L4 are accessible from beneath the board via holes in the chassis member.

(3) Set the signal generator to 5.5 Mc/s and an e.m.f. 10 mV The RF Voltmeter should read not less than 30 mV. In receivers from serial number 100 (approx) an output level of at least 50 mV should be expected.

CHAPTER 5

FAULT LOCATION

INTRODUCTION

1. This chapter provides fault location advice at two levels. Paragraphs 2 to 11 assume that the only test equipment available is a universal test meter (Multimeter). The object being to locate an elementary fault. Paragraphs 12 to 15 assume the use of additional test equipment, and will direct the user to the appropriate paragraphs in Chapter 4 (Alignment).

PRELIMINARY CHECKS

2. If the receiver is newly installed check the following rear panel items:

(a) Mains voltage selector switch correctly set.

(b) 2nd V.F.O. switch set to OUT

(c) Antenna feeder connected to the ANTENNA socket.

POWER CHECK

3. Set the System switch to MANUAL. If the dial lights do not illuminate and the receiver appears dead, check the mains power source and both fuses on the rear panel. Ensure that the power unit module is properly fitted. If the dial lights are illuminated but the receiver appears dead (no noise) check as follows:

(1) Ensure that the headphones are serviceable and if possible check at the various audio output points (10 mW 600Ω or 1 mW 600Ω on the rear panel) as well as the phones jack socket. Check MC/S tuning not at '00'.

(2) Using the d.c. voltmeter (30 volt range or higher) check that -16 volts is present at the following points:

(a) At the connection of the violet coloured wire on the System switch, wafer 1, immediately to the rear of the front panel. If this reading is satisfactory the power supply unit is serviceable.

(b) On the rear panel at terminal 'h.t. r.f.'. If no voltage is present at this terminal refer to para. 4 overleaf.

4. On earlier production receivers (serial numbers 01 - 26) the rear terminals 'h.t., r.f.' and 'l.f.' must be linked, except when an l.f. adaptor is fitted. If uncertain as to whether or not a link should be fitted, proceed as follows:-

(1) Check that the MC/S tuning control is not set to 00.

(2) Switch on the power supply and set the System switch to MANUAL.

(3) With the testmeter measure -16 volts d.c. at the terminals marked 'h.t. l.f.' and 'h.t. r.f.' on the rear panel.

(4) If a reading is obtained at the h.t. terminal 'l.f.' and not at the terminal 'r.f.' a link should be fitted between the terminals.

(5) If no reading can be obtained at either h.t. terminal there is a fault in the power supply system.

INITIAL FAULT LOCATION PROCEDURE

Controls

5. Set the receiver controls as follows and check for signals or noise.

(1) Check that the mains power supply is switched on

(2) System switch to MAN

(3) B.F.O. KC/S switch to OFF

(4) Meter switch to R.F.

(5) A.F. GAIN to maximum

(6) BANDWIDTH switch to 3 kc/s.

(7) R.F./I.F. GAIN to maximum

(8) AE ATT control to the MINIMUM position (MIN)

(9) Ensure that the MC/S tuning control is not set to '00'.

General Diagnosis

6. The most useful indication in elementary fault diagnosis is receiver noise, or 'mush'. The controls should be set as listed in paragraph 5 and the receiver tuned over a suitable portion of the h.f. band. At each step of the Mc/s tuning control make a fine adjustment and listen for a rise in receiver noise level. If no noise can be heard, check that the phones are serviceable and, if possible, listen at an alternative audio outlet as well as at the phones jack socket.

7. I. F. Unit Check If noise can be heard, vary the setting of the BANDWIDTH switch. A change of noise level with the switch movement indicates that the i. f. unit is serviceable.

8. If no noise is heard, switch on the b. f. o. (B. F. O. KC/S switch to +3 or -3 kc/s). The meter (R. F. position) should show a reading and b. f. o. noise should be heard. If a meter reading is obtained but no noise is heard the fault is in the i. f. unit or audio output connections. If b. f. o. noise is heard the fault may be in the i. f. amplifier stages of the i. f. unit, or in various stages of the receiver prior to the i. f. unit.

9. Switch the BFO to OFF. BANDWIDTH to 3 kc/s. AE ATT control to MIN. Listen intently and slowly rotate the MC/S tuning control. If a very slight rise in noise level can be heard as the MC/S tuning passes through each resonant point it suggests that the 37. 5 Mc/s loop is functioning but that a fault may exist in the antenna, R. F. Unit, or 1st Mixer. Make the test in both of the WB settings as well as in the tuned antenna condition of the RF TUNE control. Thoroughly check the antenna system before proceeding to detailed check on the RF Unit and Mixer. Check that the adjustable spark gap adjacent to the antenna socket is not short circuited and that continuity is obtained through the 500 mA fuse mounted in the r. f. unit.

10. 1 Mc/s Check Set the System switch to CAL and tune the kc/s control to the 100 kc/s calibration check frequencies. If the calibration whistle is heard the 1 Mc/s oscillator is serviceable. If no whistles are heard, turn the System switch to CHECK B. F. O. and set the B. F. O. KC/S switch to +6, +3, -3 and -6 kc/s in turn. If no whistle is heard on either CAL or CHECK B. F. O. it suggests a faulty 1 Mc/s crystal oscillator.

11. If the checks in paragraphs 8 and 9 are satisfactory, set the System switch to MANUAL and the B. F. O. KC/S switch to OFF. Adjust the MC/S tuning control very carefully and listen for a rise in receiver noise level at a particular setting in each of the megacycle steps. If no rise in noise level occurs the 1st v. f. o. or its connections may be faulty. Check the following:-

(a) Use the testmeter to measure -16 volts h. t. at the connection of the violet wires to the small component board on the forward side of the r. f. unit. Check that both the violet wires are secure.

(b) Check the coaxial connections on the bracket beneath the 1st v. f. o. module on the left hand side of the receiver. Also, check at the feed-through coaxial connector in the vertical chassis panel above the Mc/s tuning gears. The coaxial leads to the connectors are coloured blue.

GENERAL FAULT LOCATION

NOTE: The following paragraphs will direct the user to detailed tests in Chapter 4.

12. If the noise indications of paras 7 to 9 are uncertain, check the receiver front end as follows.

Front End Check

13. (1) Connect a signal generator, 75 ohm source to the ANTENNA socket and set to 3.5 Mc/s at 5 mV p.d. (10 mV e.m.f.)

(2) Disconnect the coaxial lead from the front end of the I.F. Unit (SKT1) Terminate the free lead in 100 ohms.

(3) Connect the v. v.m. across the 100 ohm termination

(4) Set RF TUNE to WB.
AE ATT to MIN
System Switch to MAN
RF/IF GAIN fully clockwise

(5) Carefully tune the MC/S and KC/S tuning controls to 03.500. At the resonant point the v.v.m. reading should rise to 100 mV approx. If no reading, or very low reading is obtained proceed as described in next paragraph.

Fault Prior to I.F. Unit

14. (1) Refer to para 10 and check that 1 Mc/s oscillator is functioning. If no whistles are heard check the 1 Mc/s module as described in Chapter 4 para.15.

(2) At the rear panel move the 2nd VFO switch between the IN and OUT positions and listen for change of noise level. If noise level does not change the 3rd Mixer may be faulty. Make sure that the 2nd VFO switch is returned to the OUT position. Refer to Chapter 4 for further tests.

(3) If the 3rd Mixer check is satisfactory, but varying the MC/S control fails to produce any rise in noise level, proceed as follows.

(4) On the 2nd Mixer connect a v.v.m. to test point TP2. Rotate the MC/S tuning control slowly, and note the v.v.m. reading as a frequency is selected. The reading should rise to approximately 100 mV at each resonant point.

(5) If approx. 100 mV is not obtained in (4) check the 1st VFO outputs. Disconnect the free coaxial leads, which emerge from the 1st VFO module, from their respective bulkhead sockets on the main chassis. (Fig. 18) Terminate the lead which feeds the 1st Mixer in 47Ω and check for approx. 100 mV with the v.v.m. Terminate the lead which feeds the 37.5 Mc/s Generator in 27Ω, and check for approx. 100 mV with the v.v.m.

(6) If the 1st VFO outputs are satisfactory the 37.5 Mc/s Generator module must be checked in accordance with Chapter 4 para. 16.

(7) If the 37.5 Mc/s checks are satisfactory refer to Chapter 4 and check the 1st Mixer and R.F. Unit. Connect a signal generator, set to 5.5 Mc/s at a p.d. of 5 mV, (10 mV e.m.f) to the ANTENNA socket (75Ω source).

(8) Disconnect RF Unit output lead (PL1) from the lead to the 1st Mixer on the upper chassis. Refer to para. 28 in Chapter 4 page 4-14 and terminate the output lead. Connect the v.v.m. across the termination. Check the output in accordance with Chapter 4 para. 32. Try WB and tuned antenna conditions. Set the RF/IF GAIN to maximum. A low output may indicate an a.g.c. fault.

(9) With the System switch to MAN and the RF/IF GAIN to maximum, the d.c. reading on the a.g.c. line should be -4 volts. A suitable measuring point is the rear panel terminal 'a.g.c., r.f.'. If this a.g.c. level is not obtained a fault in the i.f. unit is probable. If the -4V level is satisfactory the r.f. amplifier gain may be tested with the a.g.c. removed, as follows:

(10) On the r.f. amplifier connect two 0.1 μF capacitors between the -16V line and the junction of diodes 3D1 and 3D2, and 3D3 and 3D4, respectively, thereby removing the gain control from 3VT2 and 3VT3. Note the resulting increase in output. If the increase in gain is significantly greater than 4 dB the a.g.c. circuit should be investigated. The forward resistance of the diodes 3D1 to 3D4 and 3D7 to 3D10 should be checked. When measured on the 'ohms x 100' range of the AVO8 testmeter the forward resistance of any one of the diodes should not exceed 45Ω.

Fault in the I.F. Unit

15. A systematic check on the I.F. Unit is described in Chapter 4.

CHAPTER 6

ROUTINE MAINTENANCE

GENERAL

1. The RA.217 receiver should require no mechanical maintenance until a considerable period of service has elapsed, provided that the receiver has been treated with reasonable care. It is important that modules should be carefully but firmly replaced following removal and that all covers should be clean and secure, to maintain the high standard of screening which is necessary. Make sure that no cover-screws have suffered stripped threads due to overtightening.

LUBRICATION

2. No lubrication is needed for at least the first year of service. Fast moving shafts are carried in sealed races which require no lubrication. Certain slow moving surfaces are carried in 'oilite' bearings which after appreciable service may each be given a single drop of thin molybdenised oil at intervals of approximately six months. A drop or two of oil may also be given to the control-lock pivot points and the stop-collars of the MC/S and KC/S tuning system. Remove any surplus lubricant to prevent the accumulation of dirt.

3. If the smooth portion of the periphery of the interrupted gear appears to be dragging against the small gear on the r.f. range shaft, a thin smear of molybdenised grease may be applied to the periphery A recommended grease is Castrol Spheerol BM3.

CHAPTER 7

DISMANTLING AND RE-ASSEMBLY

WARNING: BEFORE DISMANTLING ANY PART OF THE RECEIVER DISCONNECT THE MAIN POWER SUPPLY AT ITS SOURCE.

INTRODUCTION

1. This chapter describes how to remove the modular units of the receiver. Detailed re-assembly instructions are not given in those cases where it is feasible to interpret the dismantling procedures in the reverse order. Detailed instructions are given however, for re-assembly of the R.F. Unit, 1st V.F.O. and 2nd V.F.O. due to the requirement for accurate setting of variable controls in these modules. Reference to figure 18 will assist identification of the required module.

CAUTION: When re-fitting a module which requires the mating of a fixed plug and socket, take care that the plug and socket are correctly aligned before applying pressure to the module. Otherwise pin damage may result.

REMOVAL OF RECEIVER COVER

2. The receiver cover is fastened by two spring-loaded catches, which are immediately behind each bottom corner of the front panel. When the catches are released the cover may be raised at the front, pivoting on lugs at the rear of the receiver.

(1) Locate the plunger of each catch and press upwards to release.

(2) Raise the front of the cover, pivoting on the rear bottom corners. To remove completely, lift the cover vertically at the same time press the lower portion backwards to slip the cover off the retaining lugs. The cover is then quite free.

In this chapter it will be assumed that the receiver top cover has been completely removed. Dismantling instructions will proceed from that point.

REMOVAL OF RECEIVER BOTTOM COVER

3. Remove the screws from the plastic feet and remove cover.

FRONT PANEL

4. The front panel may be easily removed leaving all the switches, meter etc. in position. The removal of the panel is normally of no benefit in servicing except for giving improved access to the system switch, power microswitches and r.f./i.f. gain potentiometer.

5. Tools: Hexagonal key
Screwdriver
Spanner

6. Removal

(1) Using a suitable hexagonal key slacken the grub-screws and remove all control knobs.

(2) The panel is held by four screws, one in each corner, with nuts and washers at the rear. Remove these nuts and screws.

(3) Remove the two chromium screws in the centre of the panel adjacent to the meter.

(4) The panel can now be withdrawn

POWER UNIT

7. Removal

(1) Remove the four retaining screws from unit on the rear panel and ease the unit gently towards the rear.

8. Re-assembly

(1) Insert the unit squarely and apply gentle pressure, evenly, to ensure correct mating of the plug and socket.

(2) Replace the four retaining screws.

I.F. UNIT

9. Tools: Medium and large screwdrivers: Spanner .25" AF

10. Removal

(1) Unplug the 37-way connector (SKT11) located behind the i.f. unit.

(2) Using the spanner, undo the external coaxial connector (PL3) from the socket at the forward end of the i.f. unit.

(3) Slacken the grub-screws in the bellows coupling (i.f. unit end) of the bandwidth switch. (This coupling is located beneath the b.f.o. unit). Slide the switch shaft and coupling towards the front panel.

(4) Remove the cover from the i.f. unit (4 screws).

(5) Within the i.f. unit release the four shrouded captive screws in the base of the module. (Refer to Fig. 18) Do not undo the similar screws which retain certain sub-circuits.

(6) Lift the i.f. unit slightly and at the same time move the unit towards the front panel until the rear sockets are clear of the rear panel aperture. Lift out the unit.

B.F.O. UNIT

11. Tools: Hexagonal key for control knobs
Screwdrivers
Soldering iron
Spanner .25" AF

12. Removal

(1) Remove the i.f. unit. (This is not absolutely essential, but is recommended).

(2) Remove the BFO KC/S control knobs

(3) Remove the cableform clamp from the b.f.o. unit (screw and nut).

(4) Unplug the coaxial lead from the forward end of the i.f. unit (Disregard this instruction if the i.f. unit is already removed).

(5) Make a note of the cableform connections to the switch assembly and component board at the upper part of the b.f.o. unit

(6) Unsolder the cableform from the switch assembly and component board.

(7) Release the two retaining screws and lift out the b.f.o. unit.

1st MIXER AND 40 Mc/s FILTER

13. Tools: Assorted screwdrivers
Spanner .25" AF

14. Removal

(1) Remove the power unit module from the rear panel

(2) Remove the base cover from the receiver (screws are in plastic feet).

(3) Within the receiver on the underside remove one screw from the 'MAINS' end of the warning label MAINS VOLTAGE. Slacken the other screw so that the label can be turned to one side in order to provide access to the depths of the chassis.

(4) Having moved the warning label, locate a single small screw on the underside of the main chassis casting (partly concealed by wiring, (see Fig. 18) which is coincident with the centre of the 1st Mixer and filter strip on the upperside. Remove this screw.

(5) On the upperside of the receiver disconnect the coaxial connectors PL1 and PL3. Connector PL1 is in the flying lead lying beside the 1st Mixer module, and PL3 is connected to the feed-through socket SKT2 in the vertical chassis panel above the Megacycle tuning gears. (Fig. 18)

(6) Remove the retaining screw from each end of the 1st Mixer and 40 Mc/s filter module.

(7) Lift the module upwards keeping it level to avoid distortion of the fixed coaxial connectors.

15. Re-assembly

(1) When re-assembling ensure that the fixed plugs are correctly aligned with the sockets before pressing home the module. Insert the two retaining screws in the module but do not fully tighten until the centre screw in the underside is secure.

(2) Replace the central screw on the underside and replace the screw in the MAINS VOLTAGE label.

37.5 Mc/s FILTER

16. Tools: Assorted screwdrivers

17. Removal

(1) The procedure for removal and re-assembly is the same as for the 1st Mixer and 40 Mc/s filter unit except that there

are no coaxial leads to be disconnected. Refer to para. 14 and perform operations (1) to (7) but omitting operations (5). Read '37.5 Mc/s filter' in place of '1st Mixer and 40 Mc/s filter'. When re-assembling remember to replace the central screw and the MAINS VOLTAGE label on the underside of the chassis.

2nd MIXER

18. Tools: Assorted screwdrivers

19. Removal

(1) Remove the power unit from the rear panel

(2) Remove the receiver bottom cover (4 screws in the plastic feet).

(3) Within the receiver on the underside of the chassis casting remove four small screws which are located in the casting. When finally releasing the screws hold the mixer module in position with the other hand.

(4) On the top chassis remove the cover from the mixer module.

(5) With the cover removed, grip the pillars and ease out the module.

3rd MIXER

20. Tools: Assorted screwdrivers

21. Removal Follow the procedure described for the 2nd Mixer. The retaining screws on the underside of the main chassis are partly concealed by the cable loom.

1 Mc/s OSCILLATOR AND CALIBRATOR

37.5 Mc/s GENERATOR

22. These two units are contained on separate sub-units mounted in a single module. Following removal of the module the two sub-units can be separated, if necessary, but this involves delicate work with a low-wattage soldering iron.

Tools: Medium or large screwdriver

23. Module Removal

(1) Remove the bottom cover of the receiver

(2) Disconnect the Cannon connector (SKT9) on the underside of the receiver.

(3) Disconnect the coaxial connector from the bracket below the 1st VFO module.

(4) On the upper chassis of the receiver identify the four retaining screws of the module, (Fig 18). Two of these are accessible via cut-away recesses in the component board near the front panel, and two beside the 1st Mixer and the 37.5 Mc/s B.P. Filter respectively.

(5) Undo the four screws and pull out the unit from the underside of the receiver.

24. Sub-Unit Separation

(1) The upper deck is the 1 Mc/s and calibrator unit, the lower unit contains the harmonic generator, harmonic mixer and 37.5 Mc/s circuit.

(2) Remove the cover from the upper unit (four screws)

(3) Release the four captive screws in the base of the upper unit. The upper unit can now be hinged upwards.

(4) Remove the cover from the lower unit to obtain access for adjustment and servicing.

(5) To completely remove a unit it is first necessary to unsolder two wires from the lower unit, using a low-wattage soldering iron, as follows:

(6) Unsolder the violet-coloured wire from the base of the lower unit.

(7) The blue coaxial lead can be unsoldered from the underside of the small transverse board on the lower unit. Undo the screws holding the board and lift upwards to give access to the unsoldering point. Use the minimum heat necessary to free the joint.

1st. V.F.O.

25. Tools: Medium or large screwdriver

Soldering iron

Spanner .25" AF

NOTE: See special instructions for re-assembly in para. 27.

26. Removal

(1) Remove the bottom cover of the receiver and place the receiver left side uppermost.

(2) Unsolder the sleeved violet lead from the small component board located adjacent to the r.f. unit and behind the attenuator switch shaft.

(3) With the spanner undo the coaxial connector PL1 which is located on the side panel near the front of the receiver above the Megacycle gearing.

(4) With the spanner undo the coaxial connector PL1 on the small bracket beneath the 1st v.f.o. unit.

(5) Hold the 1st v.f.o. firmly in position with one hand. With the other release the four captive screws on the underside of the shelf on which the module is mounted. Four access holes for the screwdriver are provided in the baseplate on the receiver.

(6) When the retaining screws are free the 1st v.f.o. can be lifted off.

27. Re-assembly

NOTE: It is assumed that all other parts of the receiver are installed and are serviceable.

(1) Set the tension of the 1st v.f.o. anti-backlash gear as follows:

(2) Turn the two sections of the module gear wheel in opposite directions until spring tension is felt and the gear teeth are in alignment, then tighten one screw to hold the two sections of gear in this position.

(3) Put the 1st v.f.o. module in its position in the chassis and hold with two or three turns on each fixing screw.

(4) Connect up the h.t. (solder the violet wire to the sub-panel attached to the r.f. unit).

(5) Connect a digital counter to one of the coaxial output leads from the 1st v.f.o.

(6) Connect power to the receiver and set the system switch to MANUAL.

(7) Set the Mc/s tuning control to '01'.

(8) Lift the 1st v.f.o. module sufficiently to disengage tuning gear drive and turn the v.f.o. tuning shaft by hand until 41.5 Mc/s ± 10 kc/s is indicated on the counter.

(9) Carefully lower the 1st v.f.o. module so that the gears are in mesh.

(10) Note that the frequency in the counter is still 41.5 Mc/s but with a tolerance of plus or minus 20 kc/s.

(11) If the frequency is satisfactory the tension screw in the v.f.o. gear wheel (operation (2)) should be slackened thus providing anti-backlash engagement between the gears.

(12) Rotate the Mc/s tuning control over the range 01 to 29 Mc/s The v.f.o. frequency should track from 41.5 to 69.5 Mc/s in steps of one megacycle with a tolerance of ±20 kc/s at each point.

(13) Remove the digital counter and connect the coaxial leads to the 1st mixer and 37.5 Mc/s generator. (Which were removed in para. 26 operations (3) and (4)).

2nd V.F.O.

28. Tools: Screwdrivers

Hexagonal socket key

NOTE: See special instructions for re-assembly.

29. Removal

(1) Remove the i.f. unit. This reveals the bellows coupler between the shaft and gearing of the 'kilocycles' tuning capacitor.

(2) Slacken the grub-screws at the tuning capacitor end of the coupler on the vertical shaft.

(3) With one hand hold and 2nd v.f.o. module firmly in position from below. With the other release the four retaining screws on the upper side of the chassis. These screws are grouped around the vertical assembly of the tuning mechanism. Do not allow the module to move about as the screws are loosened as this may distort the tuning mechanism. This is equally important when re-assembling.

(4) When the screws are free the module may be carefully withdrawn from beneath the chassis.

30. Re-Assembly

NOTE: It is assumed that the i.f. unit is removed.

(1) In the receiver on the kc/s tuning shaft slacken the two grub-screws in the collar which retains the lock-washers in position. This collar is adjacent to the worm drive.

(2) Set the kc/s tuning control to indicate '+ 125'

(3) Set the control lock on the front panel to ON.

(4) Remove the cover from the 2nd v.f.o. module.

(5) Place the 2nd v.f.o. module in its correct position in the chassis, taking care that the fixed plug and socket engage correctly and at the same time observing through an aperture in the side member that the v.f.o. capacitor spindle enters the drive coupler.

(6) In the 2nd v.f.o. module put the capacitor vanes in the fully-meshed position.

(7) Hold the module in position; screw up the fixing screws and tighten fully.

(8) Tighten only one grub-screw in the drive coupler

(9) Put the control lock to OFF

(10) Set the kc/s tuning control to indicate '+ 020'

(11) Put the control lock to ON

(12) On the kc/s tuning shaft press the end collar forward along the shaft against the lock washers. With the other hand spin all the lock washers fully clockwise to a stop position so that a spiral line is formed. Hold the collar against the lock washers and tighten up the grub-screws in the collar. If, when the collar is held in the locked position, no grub-screw is visible, hold the collar firmly against the lock washers, put the control lock to OFF and turn the kc/s tuning control gently until the grub-screw is accessible, then tighten up. Turn the control again and tighten the second grub-screw.

(13) With the control lock OFF rotate the kc/s tuning control and check that the control is 'stopped' at approximately + 020 at one extremity and at 980 at the other extremity.

(14) Replace the cover on the 2nd v.f.o. module.

(15) Connect the power supply to the receiver.

(16) Set the CALIBRATE control to the electrical centre of its travel.

(17) Set the System switch to CAL and set the KC/S tuning to '1000'

(18) Set System switch to CAL: check calibration at this point (do not move CALIBRATE control)

(19) If calibration is appreciably in error, slacken the grub screw referred to in operation (8) and move the capacitor vanes to give accurate calibration.

NOTE: One degree of angular rotation will give approx. 7 kc/s of change in frequency.

(20) Tighten both the grub screws in the drive coupler.

(21) Set KC/S tuning to 000 and check the calibration which should be satisfactory. If there is an error of up to 1 kc/s the trimmer capacitor (which is in parallel with the tuning capacitor) may be adjusted to correct this. Then re-check the calibration at 1000 on the KC/S scale.

(22) Refer to Chapter 3 (PerformanceCheck) paragraph 7 and do the Calibration check operations (1) to (9). If the measurements are outside the limits stated, the vanes of the 2nd VFO capacitor should be very carefully adjusted by the recognised 'knifing' method.

R.F. UNIT

31. Tools: Assorted screwdrivers

Assorted Hexagonal socket keys

Soldering iron

32. Removal

(1) Remove the cover from the R.F. Unit.

(2) Disconnect the coaxial lead from the 1st mixer lead on the upper chassis.

(3) Unsolder the violet wires from the small component board which is attached to the forward side of the r.f. unit.

(4) Unsolder the screened leads and earth from the same component board, also the capacitor C4 from the chassis earth.

(5) Slacken the grub-screws in the unit side of the Eddystone coupler which connects the AE ATT control shaft and detach the AE ATT control shaft and coupler.

(6) On the r.f. range control shaft, beneath the 1st v.f.o. module, slacken two grub-screws in the third small boss from the front. This will allow the outer shaft to slide.

(7) Slacken the grub screws in the second small boss from the front.

(8) Within the r.f. unit, on the r.f. range shaft, slacken two grub-screws in the hub of the gear wheel.

(9) Within the r.f. unit slacken the grub-screws in the Eddystone coupler on the r.f. tune (inner) shaft.

(10) Forward of the coupler is the 'wb' cam beneath a metal plate. Slacken the two grub-screws in this cam, using the hexagonal key. Access to these screws is via the upper side of the cam housing.

CAUTION: Set the RF TUNE control to a WB position so that the WB cam is gripped in position while the RF TUNE shaft is withdrawn.

(11) Within the r.f. unit hold the r.f. range driving gear wheel in position. Ease the outer control shaft towards the front panel. At the same time pull out the RF TUNE control knob. The inner and outer shafts will thus be drawn clear and the gear wheel left unattached. Lift out the wheel and store safely.

(12) Within the r.f. unit release the four shrouded, captive, screws which retain the unit.

(13) Pull the r.f. unit forward to clear the antenna plug from the rear panel, then lift out the unit.

NOTE: Remove the WB cam if it is to be fitted to a replacement RF Unit.

33. Re-Assembly

(1) Place the r.f. unit (without its cover) in position in the main chassis. Feed coaxial lead to 1st mixer through the hole in chassis frame and connect to 1st Mixer lead.

(2) Turn the aerial attenuator switch in the r.f. unit to the maximum clockwise position.

(3) Slide the AE ATT control shaft and Eddystone coupler on to the aerial attenuator switch shaft.

(4) Hold the AE ATT control at the MIN position on the front panel and tighten the grub-screws on the Eddystone coupler.

(5) In the R.F. Unit check that the WB cam is placed in its approximate position so that the RF TUNE shaft can be passed through the cam to the coupler.

(6) In the r.f. unit turn the r.f. range switch gear wheel, by hand, fully anti-clockwise against the stop, and then one position clockwise.

(7) Place the driving gear wheel (removed when dismantling) in mesh with the switch gear wheel so that the grub-screws are accessible. Do not tighten the grub-screws at this stage.

(8) Feed the inner and outer sections of control shaft rearwards and into the driving gear hub.

(9) Feed the inner control shaft (RF TUNE) through the gear hub, the 'wb' cam and the Eddystone coupler.

(10) Tighten the grub-screws in the Eddystone coupler.

(11) Turn the RF TUNE control so that the variable capacitor is fully meshed.

(12) Adjust the position of the 'wb' cam so that both 'wb' micro-switch plungers are depressed as indicated by the maximum movement of the phosphor-bronze arms.

(13) Tighten the grub-screws in the cam.

(14) In the r.f. unit check that the range switch is in the correct position as described in operation (6).

(15) Set the Mc/s tuning control on the front panel to indicate '16'

(16) Set the outer control shaft so that the small shaft gear is engaged with the interrupted gear wheel of the Mc/s control.

(17) Tighten the grub-screws in the driving gear wheel in the r.f. unit.

(18) Rotate the Mc/s tuning control from 00 to 16 and note that the switch in the coil assembly of the r.f. unit changes range as the digits 2, 4, 8 and 16 respectively are moving into view on the front panel Mc/s indicator. If the change of range does not occur exactly at the correct points, slacken off the grub screws in the driving gear and repeat operations (14) to (18). A more accurate positioning of the small shaft gear when meshing-up to the interrupted gear may be necessary.

(19) Replace the cover on the r.f. unit.

(20) Refer to operations (2) and (3) in paragraphs 32 and re-connect the wires etc. to the component board.

REPAIR DATA

IMPORTANT NOTICE

1. When soldering certain types of coil assembly to the printed circuit board, the heat can cause serious distortion of the coil former. The types of coil most liable to this distortion are those wound on a "Neosid" former, and the following precautions must be observed with these particular coils:

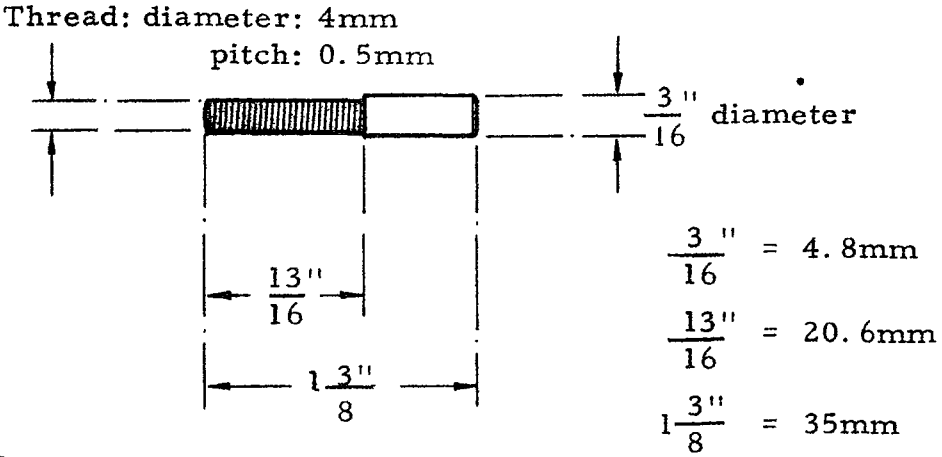
(1) Remove the adjustable core from the replacement coil assembly.

(2) Insert a brass 'dummy core' which acts as a heat shunt during the soldering operation.

(3) When soldering is completed, remove the brass heat shunt and insert the normal core.

HEAT SHUNT

2. The illustration below, shows the data required to make a suitable heat shunt for the above operation.



Material: Brass

CHAPTER 8

LIST OF COMPONENTS

CONTENTS

NOTE: Component values are quoted as follows:

Resistors	Capacitors
No suffix = ohms	No suffix = microfarads
Suffix 'k' = kilohms	Suffix 'p' = picofarads
Suffix 'M' = megohms	

Orders for Spare Parts

In order to expedite handling of spare part orders, please quote:-

(1) Type and serial number of equipment.

(2) Circuit reference, description and manufacturer of part required.

(3) Quantity required.

Joint-Service Numbers

(also known as CCA or NATO Stock Numbers)

Commercial and private users will note that the above numbers have been included in this section; these are for assisting Service users in the provision of spare components.

NOTES ON COMPONENT CHANGES AND ADDITIONS

Cct. Ref.	Value	Description	Rat.	Tol. %	N.A.T.O. No.	Manufacturer

REPLACEMENT MODULES AND SUB-ASSEMBLIES

To order a replacement module assembly complete with sub-circuit boards, quote the module identification and the corresponding Racal Part Number according to Table 1, below. To order a replacement printed-circuit board refer to Table 2.

TABLE 1

Module Assemblies

Name	Part Number
R.F. Unit	CA.28140
1st Mixer and 40 Mc/s Filter	BA.28211
2nd. Mixer	CA.30959
3rd. Mixer	CA.35970
1st. VFO	CA.28120
2nd. VFO	CA.28101
37.5 Mc/s Generator with 1 Mc/s Amp and Calibrator	CA.28276
37.5 Mc/s Band-Pass Filter Unit	BA.28192
1.F. Unit (455 kc/s i.f. output)	DA.28250/A
1.F. Unit (100 kc/s i.f. output)	DA.28250/B
BFO Assembly	CA.28259
13 kc/s Filter (McCoy)	

Power Unit: various types of power unit module are available for the RA.217, according to the loading of ancillary units etc. The standard power units for the RA.217A are the PU.408A for operation from an a.c. supply of 100-125v or 200-250v, or alternatively the PU.408B for operation from 200-250 a.c. or 21-27v d.c. (positive earth). If ancillary units such as an I.S.B. Adaptor or Panoramic Adaptors are to be connected, the above power units are not suitable and the Racal Service Department should be asked to recommend the most suitable power unit for the particular purpose.

TABLE 2

Sub-Circuit Assemblies

R.F. Unit	Part No.
0-30 Mc/s Filter	AA.28188
Coil & Switch Assy	CA.34082
R.F. Amp Board	BA.28155
Filter Board	AA.28179

1st.Mixer	Part No.
Mixer Board	BA.28215
40 Mc/s Filter	AA.28197

2nd. Mixer	
Mixer Board	BA.28177

3rd. Mixer	
Mixer Board	BA.35966

1st. VFO	
Oscillator Board	BA.35195
Amplifier Board	BA.32535
Amplifier Board	BA.28128

2nd. VFO	
Oscillator Board	BA.35808
Amplifier Board	BA.35807

37.5 Mc/s Generator	
Harmonic Gen. Board	BA.32854
Harmonic Filter Assembly	BA.35836
Harm. Mixer Board	BA.37894
37.5 Mc/s Amp. Board	BA.32850

1 Mc/s Amp and Calibrator	
1 Mc/s Amplifiers	BA.32858
OSC & Calibrator	BA.32860

BFO (600 kc/s)	
Oscillator Board	BA.30540
Amplifier Board	BA.30542

Power Unit Type 408A (AC)	
Circuit Board	BA.28297

I.F. Unit	
1st. I.F. Amp Board	BA.31474
Main 1.F. Amp Board	BA.30533
Audio Amp Board	BA.31462
Detector Board	BA.28236
AGC Board	BA.31466
Band with Switch (Mounting Plate)	BA.28252

455 kc/s Converter	BA.28258/A
OSC Board	BA.34766/A
Amp Board	BA.34783/A
100 kc/s Converter	BA.28258/B
OSC Board	BA.34766/B
Amp Board	BA.34783/B

MAIN CHASSIS ITEMS

Note 1: The circuit function of each component listed under "Main Chassis Items" is shown in Fig.15. These components are located in various parts of the receiver assembly but are not in any module.

Resistors

Cct Ref.	Value	Description	Rat. watts	Tol. %	Racal Part No.	Manufacturer
R1	3.9k	Metal Oxide		5	906029	Electrosil TR5
R2	22k	Metal Oxide		5	906553	Electrosil TR5
R3	5.6k	Metal Oxide		5	906032	Electrosil TR5
R4	68	Metal Oxide		5	908278	Electrosil TR4
R5	68	Metal Oxide		5	908278	Electrosil TR4
R6	82	Metal Oxide		5	908290	Electrosil TR4
R7	1k	Metal Oxide		5	906031	Electrosil TR5
R8	1.5k	Metal Oxide		5	908296	Electrosil TR4
R9	1.5k	Metal Oxide		5	908296	Electrosil TR4
R10	390	Metal Oxide		5	908472	Electrosil TR4
R11	180	Metal Oxide		5	909125	Electrosil TR4
R12	10k	Carbon	0.1	5	905313	Erie 15
R13	10k	Carbon	0.1	5	905313	Erie 15
R14	680	Metal Oxide			910113	Electrosil TR4

Potentiometers

RV1	10k	linear: Line Level (pre-set)	908635	Plessey MP
RV2	1k	linear: Dimmer (pre-set)		Racal ASW 35811
RV3	500	CALIBRATE (variable)	908596	General Controls CPL15/16X
RV4	47k	linear: 'S' Meter Zero (pre-set)	900615	Plessey MP
RV5		RF/IF GAIN (variable)		Racal BA 33809
RV6		AF GAIN (variable)		Racal BA 33809

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
		Capacitors				
			volts	%		
C1	.001	Ceramic	350	20	902122	Lemco 310K or
C2	.001	Ceramic	350	20	902122	Erie K350081 AD/PL107
C3	0.1	Polyester	250	20	909428	Mullard C280 AE/P100K
C4	0.1	Polyester	250	20	909428	Mullard C280 AE/P100K
C5	0.1	Polyester	250	20	909428	Mullard C280 AE/P100K
C6	0.22	Polyester	250	20	910486	Mullard C280 AE/P220K
C7	0.1	Polyester	250	20	909428	Mullard C280 AE/P100K
C8	0.1	Polyester	250	20	909428	Mullard C280 AE/P100K
C9	0.1	Polyester	250	20	909428	Mullard C280 AE/P100K
C10	0.1	Polyester	250	20	909428	Mullard C280 AE/P100K
C11	0.1	Polyester	250	20	909428	Mullard C280 AE/P100K
		Switches				
SA		Microswitch:			901943	Honeywell 11SM1-T
SB		Microswitch			901943	Honeywell 11SM1-T
SC/1		Microswitch power ON/OFF			901943	Honeywell 11SM1-T
SC/2		Microswitch power ON/OFF			901943	Honeywell 11SM1-T
SD		2nd V.F.O. IN/OUT			900777	Plessey S5. Black
SE		System switch				Racal CSW 28302
SF		Meter switch RF/AF			900777	Plessey S5. Black
		Diodes				
D1 to D4		Meter rectifiers			900071	Mullard OA91
		Plugs				
XPL1		Free Antenna plug: coaxial			900038	UG88/U
PL1		See Note 2 below				
PL2		Chassis plug to Power Module			908598	Cannon DAM15P
PL3		Free plug to I.F. unit input				Racal AA 33091/6

Note 2: Double-ended (bulkhead type) adaptors connect the following modules (see Fig.15).

RF Unit to 1st Mixer.....SKT1 with PL1 and PL1 Racal 908405
1st VFO to 1st Mixer.....SKT2 with PL1 and PL3 Racal 908405
1st VFO to 37.5 Mc/s Gen..SKT3 with PL1 and PL2 Racal 908405

Cct Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
		Sockets SKT1, SKT2 and SKT3 are Belling Lee Type L 1403/BS/Ag. The associated free plugs are detailed under the heading of the appropriate module.				
Terminating Plug						
PL4	75Ω	Termination for SKT 16 (LF) when LF Adaptor unit is not connected				Racal AA.28254
		Sockets				
SKT1		See Note 2 (Above)			908405	Belling Lee L1403/BS/Ag
SKT2		See Note 2 (Above)			908405	Belling Lee L1403/BS/Ag
SKT3		See Note 2 (Above)			908405	Belling Lee L1403/BS/Ag
SKT4		1st.Mixer to 2nd.Mixer, connector contact			908600	Cannon DM 53743-5001
SKT5		HT to 1st.Mixer			908604	Sealectro 5BC
SKT6		37.5 Mc/s Filter to 2nd.Mixer (contact)			908600	Cannon DM 53743-5001
SKT7		Chassis to 2nd.Mixer(multi-way)			908602	Cannon DBM9W4S
Note 3: Coaxial inserts for SKT 7, SKT 8 and SKT 9 are part number 908600.						Cannon DM 53743-5001,
SKT8		Chassis to 3rd.Mixer(multi-way)			908602	Cannon DBM9W4S
SKT9		Chassis to 37.5 Mc/s Generator			908602	Cannon DBM9W4S
SKT10		Chassis to 2nd.V.F.O(multi-way)			908599	Cannon DBM13W3S
Coaxial insert to SKT 10					907076	Cannon DM 53743-5001
SKT11		Chassis to IF Unit 37 way			908603	Cannon DCM 37.S
Note 4: SKT 12 to SKT 19 are on the receiver rear panel.						
SKT12		Coaxial: 2nd.V.F.O. OUT			906878	Belling Lee L1403/CS/Ag
SKT13		Coaxial: 2nd.V.F.O. IN LOW			906878	Belling Lee L1403/CS/Ag
SKT14		Coaxial: 1 Mc/s OUT			906878	Belling Lee L1403/CS/Ag
SKT15		Coaxial: 1 Mc/s IN LOW			906878	Belling Lee L1403/CS/Ag
SKT16		Coaxial: LF			906878	Belling Lee L1403/CS/Ag
SKT17		Coaxial: 2nd.V.F.O. IN HIGH			906878	Belling Lee L1403/CS/Ag
SKT18		Coaxial: 1 Mc/s IN HIGH			906878	Belling Lee L1403/CS/Ag
SKT19		Coaxial: PAN			906878	Belling Lee L1403/CS/Ag
JK1		Phones Jack Socket			901509	Igranic P71
		Free plug to fit JK1			901557	Igranic P50

Cct Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
		Terminal Strip				
TB2	(Fig.15)					Racal AD 37652
		Dial Lamps				
ILP1					908605	Vitality Type 690/14V
ILP2					908605	Vitality Type 690/14V
		Dial Lamps Holders				
ILP1 and ILP2					909586	Bulgin Lilliput
		Filter Unit				
13 kc/s Band-Pass Filter					909025	McCoy 164B5
		Counter Assembly				
Veeder Root Counter					CA.28274	
		Meter				
M1						Racal BD 35519

Cct Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer

R. F. UNIT

Resistors

Ae. Attenuator and Coil and Switch Assembly

	ohms		Watts	%		
2R1	56	Carbon Hi. Stb.		5	906559	Erie N6
2R2	15	Carbon Hi. Stb.		5	908300	Erie N6
2R3	56	Carbon Hi. Stb.		5	906559	Erie N6
2R4	33	Carbon Hi. Stb.		5	908301	Erie N6
2R5	47	Carbon Hi. Stb.		5	906435	Erie N6
2R6	33	Carbon Hi. Stb.		5	908301	Erie N6
2R7	15	Carbon Hi. Stb.		5	908300	Erie N6
2R8	56	Carbon Hi. Stb.		5	906559	Erie N6
2R9	56	Carbon Hi. Stb.		5	906559	Erie N6
2R10	82	Metal Oxide		5	908290	Electrosil TR4

R.F. Amplifier Board (BC.28155)

3R1	8.2k	Metal Oxide		5	908275	Electrosil TR4
3R2	820	Metal Oxide		5		Electrosil TR4
3R3	560	Metal Oxide		5	909841	Electrosil TR4
3R4	3.3k	Metal Oxide		5	900991	Electrosil TR4
3R5	18k	Metal Oxide		5	908272	Electrosil TR4
3R6	18k	Metal Oxide		5	908272	Electrosil TR4
3R7	10k	Metal Oxide		5	900986	Electrosil TR4
3R8	390	Metal Oxide		5	908472	Electrosil TR4
3R9	3.3k	Metal Oxide		5	900991	Electrosil TR4
3R10	33	Metal Oxide		5	908690	Welwyn F25
3R11	Not used					
3R12	Not used					
3R13	33	Carbon	0.25	10	902490	Erie16
3R14	18k	Metal Oxide		5	908272	Electrosil TR4
3R15	10k	Metal Oxide		5	900986	Electrosil TR4
3R16	390	Metal Oxide		5	908472	Electrosil TR4
3R17	3.3k	Metal Oxide		5	900991	Electrosil TR4
3R18	33	Metal Oxide		5	908690	Welwyn F25
3R19	82	Metal Oxide		5	908290	Electrosil TR4

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer.
		Thermistor				
3TH1					909839	Mullard VA1038
Sub-Component Board (A.C28179)						
4R1	68	Metal Oxide		5	907494	Electrosil TR5
		Potentiometer				
4RV1	2.2k	(on sub-component board)			909836	Plessey MP Linear
		Capacitors				
0 - 30 Mc/s Filter (AC.28188)						
			volts	%		
1C1	68p	Polystyrene	30	2½	908321	Suflex HS 7/A
1C2	82p	Polystyrene	30	2½	908322	Suflex HS 7/A
1C3	18p	Polystyrene	30	2½	908323	Suflex HS 7/A
1C4	68p	Polystyrene	30	2½	908322	Suflex HS 7/A
1C5	68p	Polystyrene	30	2½	908321	Suflex HS 7/A
Ac. Attenuator and Coil and Switch Assembly						
2C1	6p	trimmer: tubular			901987	Mullard C004EA/6E
2C2	6p	trimmer: tubular			901987	Mullard C004EA/6E
2C3	6p	trimmer: tubular			901987	Mullard C004EA/6E
2C4	6p	trimmer: tubular			901987	Mullard C004EA/6E
2C5	6p	trimmer: tubular			901987	Mullard C004EA/6E
2C6a	(Variable: R.F. TUNE. Minimum 8.5 pF.				909024	Wingrove & RogersC78-22
2C6b	(range 157 pF. each section				909024	Wingrove & RogersC78-22
2C7	10p	Ceramic	750	½p	902011	Lemco 310P100
R.F. Amplifier Board (BC.28155)						
3C1	0.1	Ceramic	30	-25+50	906675	Erie 811T/30
3C2	0.1	Ceramic	30	-25+50	906675	Erie 811T/30
3C3	0.1	Ceramic	30	-25+50	906675	Erie 811T/30
3C4	0.1	Ceramic	30	-25+50	906675	Erie 811T/30
3C5	0.1	Ceramic	30	-25+50	906675	Erie 811T/30

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
3C6	0.1	Ceramic	30	-25+50	906675	Erie 811T/30
3C7	68p	Polystyrene	30	2½	908321	Suflex HS 7/A
3C8	100p	Polystyrene	30	2½	908241	Suflex HS 7/A
3C9	27p	Polystyrene	30	±1p	908325	Suflex HS 7/A
3C10	220p	Polystyrene	30	2½	908320	Suflex HS 7/A
3C11	33p	Polystyrene	30	±1p	906497	Suflex HS 7/A
3C12	150p	Polystyrene	30	2½	908331	Suflex HS 7/A
3C13	0.1	Ceramic	30	-25+50	906675	Erie 811T/30
3C14	0.1	Ceramic	30	-25+50	906675	Erie 811T/30
3C15	100p	Polystyrene	30	2½	908241	Suflex HS 7/A
3C16	18p	Polystyrene	30	±1p	907171	Suflex HS 7/A
3C17	220p	Polystyrene	30	2½	908320	Suflex HS 7/A
3C18	33p	Polystyrene	30	±1p	906497	Suflex HS 7/A
3C19	82p	Polystyrene	30	2½	908322	Suflex HS 7/A
3C20	0.1	Ceramic	30	-25+50	906675	Erie 811T/30
3C21	68p	Polystyrene	30	2½	908321	Suflex HS 7/A

Sub-Component Board (AC.28179)

4C1	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
4C2		Not used				
4C3	50	Electrolytic	25		908798	Mullard C426 AR/F50
4C4	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K

Inductors and Transformers

0 - 30 Mc/s Filter

1L1	Aerial Filter coil	Racal CT 32963
1L2	Aerial Filter coil	Racal CT 32964
1L3	Aerial Filter coil	Racal CT 32963

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer.
Ae. Attenuator and Coil and Switch Assembly						
2L1		Coil assembly				Racal CT 32934
2L2		Coil assembly				Racal CT 32933
2L3		Coil assembly				Racal CT 32932
2L4		Coil assembly				Racal CT 32931
2L5		Coil assembly				Racal CT 32930
2T1		Transformer (wideband reception)				Racal CT 28156
R.F. Amplifier Board						
3L1		Coil assembly: L.P. Filter				Racal CT 28154
3L2		Coil assembly: L.P. Filter				Racal CT 28152
3L3		Coil assembly: L.P. Filter				Racal CT 28154
3L4		Coil assembly: L.P. Filter				Racal CT 28152
3T1		Transformer assembly				Racal CT 28149
3T2		Transformer assembly				Racal CT 28149
		Switches				
2SA		Aerial Attenuator NSF Type A.				Racal BSW 28141
2SB		R.F.Range-switching NSF Type A.				Racal BSW 28142
2SC		Microswitch (WB)			901943	Honeywell 11SM1-T
2SD		Microswitch (WB)			901943	Honeywell 11SM1-T
		Transistors				
R.F. Amplifier Board						
3VT1					900618	Texas 2S303
3VT2					909111	RCA 2N3478
3VT3					909111	RCA 2N3478
		Diodes				
0 - 30 Mc/s Filter						
1D1		Limiter			909837	Hughes HS9003
1D2		Limiter			909837	Hughes HS9003

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer.
R.F. Amplifier Board						
3D1, 3D2, 3D3, 3D4					907818 or 909843	(Hughes HPS1672 or Hughes HP1670
3D5					908343	Texas 1S920
3D6					908343	Texas 1S920
		Plugs and Sockets				
XSKT1		Antenna: socket 50Ω UG477/U			908387	Transradio BN/5A
PL1		R.F. Output plug (free)			906391	Belling Lee L1403/FP/Ag
		Fuse				
1FS1		500 mA Aerial protection			906850	Belling Lee L562
Fuseholder for LFS1					908352	Belling Lee L1383
X1		Ferrite Bead			900461	Mullard FX115

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer.

FIRST MIXER AND 40 Mc/s FILTER
(BC.28211)

NOTE: The following list refers to the later 1st mixer circuit fitted to production receivers.

Resistors

1st.Mixer Board (BC.28215)

	ohms					
R1	56	Metal Oxide		5	908289	Electrosil TR4
R2	15k	Metal Oxide		5	908280	Electrosil TR4
R3	12k	Metal Oxide		5	908274	Electrosil TR4
R4	2.7k	Metal Oxide		5	908294	Electrosil TR4
R5	2.7k	Metal Oxide		5	908294	Electrosil TR4

40 Mc/s Filter (AC.28197)

R1	1k	Metal Oxide		5	908267	Electrosil TR4

Potentiometers

1st.Mixer Board

RV1	2.2k				909838	Ancillary Dev.Type T.0.5.

Capacitors

1st.Mixer Board (BC.28215)

C1	0.1	Ceramic	30	-25+50	906675	Erie 811T/30
C2	0.1	Ceramic	30	-25+50	906675	Erie 811T/30
C3	0.1	Ceramic	30	-25+50	906675	Erie 811T/30
C4	0.1	Ceramic	30	-25+50	906675	Erie 811T/30
C5	39p	Polystyrene	30	1p	905374	Suflex HS 7/A
C6	39p	Polystyrene	30	1p	905374	Suflex HS 7/A

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer.
40 Mc/s Filter (AC.28197)						
C1	47p	Polystyrene	30	2½	908318	Suflex HS 7/A
C2	47p	Polystyrene	30	2½	908318	Suflex HS 7/A
C3	47p	Polystyrene	30	2½	908318	Suflex HS 7/A
C4	47p	Polystyrene	30	2½	908318	Suflex HS 7/A
C5	47p	Polystyrene	30	2½	908318	Suflex HS 7/A
C6	47p	Polystyrene	30	2½	908318	Suflex HS 7/A
C7	56p	Polystyrene	30	2½	908319	Suflex HS 7/A
C8	470p	Polystyrene	30	2½	908317	Suflex·HS 7/A
		Inductors				
1st. Mixer Board.						
T1		Transformer				Racal CT 28212
40 Mc/s Filter						
L1		Coil assembly				Racal CT 31031
L2		Coil assembly				Racal CT 31030
L3		Coil assembly				Racal CT 31030
L4		Coil assembly				Racal CT 31030
L5		Coil assembly				Racal CT 31030
L6		Coil assembly				Racal CT 31030
L7		Coil assembly				Racal CT 31030
L8		Coil assembly				Racal CT 31030
		Transistors				
VT1					906517	Texas 2N918
VT2					906517	Texas 2N918
		Plugs and Sockets				
PL1		From R.F. Unit			906391	Belling Lee L1403/FP/Ag
P12		-16V supply			908340	Sealectro FT-M-4
PL3		Connects to bulkhead adaptor SKT2			908370	Belling Lee L1403 RFP/Ag
PL4		To 2nd. mixer			908341	Cannon insert DM 53740-5001

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer.

SECOND MIXER

(BC.30959)

Resistors

Module Chassis

	ohms					
1R1	270	Metal Oxide			908284	Electrosil TR4
1R2 + 1R3		deleted				
1R4	180	Metal Oxide		5	909125	Electrosil TR4

Circuit Board (BC.28177)

R1	47k	Metal Oxide		5	908391	Electrosil TR4
R2	4.7k	Metal Oxide		5	900989	Electrosil TR4
R3	12k	Metal Oxide		5	908274	Electroiil TR4
R4	680	Metal Oxide		5	908390	Electrosil TR4
R5	8.2k	Metal Oxide		5	908275	Electrosil TR4
R6	2.2k	Metal Oxide		5	908270	Electrosil TR4
R7	3.3k	Metal Oxide		5	900991	Electrosil TR4
R8	10k	Metal Oxide		5	900986	Electrosil TR4
R9	3.9k	Metal Oxide		5	900990	Electrosil TR4
R10	470	Metal Oxide		5	900992	Electrosil TR4
R11		deleted				
R12	56	Metal Oxide		5	908289	Electrosil TR4

Capacitors

			volts			
C1	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C2	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C3	68p	Polystyrene	30	2½	908321	Suflex HS7/A
C4	0.1	Polyester	250	20	909428	Mullard C280 AE/P100K
C5	0.1	Polyester	250	20	909428	Mullard C280 AE/P100K

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
C6	.01	Polyester	250	20	910485	Mullard C280 AE/P10K
C7	.01	Polyester	250	20	910485	Mullard C280 AE/P10K
C8	150p	Polystyrene	30	2½	908331	Suflex HS7/A
C9	.01	Polyester	250	20	910485	Mullard C280 AE/P10K
C10	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C11	47p	Polystyrene	30	2½	908318	Suflex HS7/A
C12	0.1	Polyester	250	20	909428	Mullard C280 AE/P100K
C13	100p	Polystyrene	30	2½	908241	Suflex HS7/A
C14	300p	Polystyrene	30	2½	908335	Suflex HS7/A
C15	0.1	Polyester	250	20	909428	Mullard C280 AE/P100K
C16	15p	Polystyrene	30	1p	908336	Suflex HS7/A
C17	56p	Polystyrene	30	2½	908319	Suflex HS7/A
C18	150p	Polystyrene	30	2½	908331	Suflex HS7/A
C19	15p	Ceramic	750	5	902047	Lemco 310NP0
		Transformers and Inductors				
T1		37.5 Mc/s coupling				Racal CT 28317
T2		2-3 Mc/s output				Racal CT 28316
L1		Mixer load				Racal CT 28310
L2		Filter coil assembly				Racal CT 28311
L3		Filter coil assembly				Racal CT 28312
L4		Filter coil assembly				Racal CT 28313
L5		Filter coil assembly				Racal CT 28314
L6		Filter coil assembly				Racal CT 28315
		Transistors				
VT1					909414	Mullard 2N3323
VT2					909414	Mullard 2N3323
VT3					910866	Texas GM290A
		Plugs and Sockets				
PL1		9 - way			908388	Cannon DM9W4P
		Coaxial inserts A 1 to A 4			908341	Cannon DM53740-5001

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer.

THIRD MIXER
(BC.35970)

Resistors

Module Chassis

	ohms		watts	%		
1R1	39	Carbon		10	902491	Erie 15

Circuit Board (BC.35966)

R1	18k	Metal Oxide		5	908272	Electrosil TR4
R2	82k	Metal Oxide		5	908691	Electrosil TR4
R3	3.9k	Metal Oxide		5	900990	Electrosil TR4
R4	2.2k	Metal Oxide		5	908270	Electrosil TR4
R5	470	Metal Oxide		5	900992	Electrosil TR4
R6	33	Metal Oxide		5	908690	Welwyn F25
R7	82	Metal Oxide		5	908290	Electrosil TR4
R8	680	Metal Oxide		5	908390	Electrosil TR4
R9	33	Metal Oxide		5	908690	Welwyn F25
R10	5.6k	Metal Oxide		5	908273	Electrosil TR4
R11	18k	Metal Oxide		5	908272	Electrosil TR4
R12	1k	Metal Oxide		5	908267	Electrosil TR4
R13	22	Carbon	0.1	10	902488	Erie 15
R14	1k	Metal Oxide		5	908267	Electrosil TR4
R15	330	Metal Oxide		5	908268	Electrosil TR4
R16	68	Metal Oxide		5	910487	Welwyn F25

Capacitors

Module Chassis

			volts			
1C1	820p	Polystyrene	30	2½	908389	Suflex HS 7/A
1C2	820p	Polystyrene	30	2½	908389	Suflex HS 7/A
1C3	.0033	Silvered Mica	200	2	902204	JMC CX22S/200
1C4	50	Electrolytic	25	-10+50	908798	Mullard C426/AR/F50
1C5	0.1	Polyester	250	20	909428	Mullard C280 AE/P100K
1C6	470p	Polystyrene	30	2½	908317	Suflex HS 7/A

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer.
Circuit Board (BC.35966)			volts			
C1	0.1	Polyester	250	10	909428	Mullard C280 AE/P100K
C2	0.1	Polyester	250	10	909428	Mullard C280 AE/P100K
C3	680p	Silver Mica	300	2	902254	J.M.C. C12S
C4	150p	Polystyrene	30	2	908331	Suflex HS7/A
C5	.015	Silver Mica	125	1	910928	S.T.C.454-LWA-75
C6	680p	Silver Mica	300	2	902254	J.M.C. C12S
C7	39p	Polyestyrene	30	1p	905374	Suflex HS7/A
C8	0.1	Polyester	250	20	909428	Mullard C280 AE/P100K
C9	0.1	Polyester	250	20	909428	Mullard C280 AE/P100K
C10	68p	Polystyrene	30	2½	908321	Suflex HS7/A
C11	150p	Polystyrene	30	2½	908331	Suflex HS7/A
C12	0.1	Polyester	250	20	909428	Mullard C280 AE/P100K
C13	0.1	Polyester	250	20	909428	Mullard C280 AE/P100K
		Transformers and Inductors				
Module Chassis						
1L1		Coil assembly				Racal CT 31026
1L2		Bead Assembly				Racal AA 38847
Circuit Board						
T1		Transformer				Racal CT 35968
T2		Transformer				Racal CT 35968
T3		Transformer				Racal CT 35968
L1		Coil assembly				Racal CT 35969
L2		Coil assembly				Racal CT 31023
L3		Coil assembly				Racal CT 35971
L4		Coil assembly				Racal CT 31022
L5		Coil assembly				Racal CT 34745
L6		Coil assembly				Racal CT 31021
L7		Coil assembly				Racal CT 31020
		Transistors				
VT1					900893	STC BSY 27
VT2					900893	STC BSY 27
VT3					909111	Texas 2N3478

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer.
		Diodes				
1D1		(mounted on the module)			908349	Hughes HD1871
D1-D4		Diode Quad on circuit board			909846	Cosem A502GE
		Plugs and Sockets				
PL1		(Plug Shell			908388	Cannon DBM9W4P
		(Plug coaxial inserts (4)			908341	Cannon DM53740-5001

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer.

FIRST V.F.O.

(BC.28120)

Resistors

Oscillator Board (1st.V.F.O.) (AC.35195)

	ohms					
R1	100	Metal Oxide		5	908276	Electrosil TR4
R2	10	Carbon	0.1	10	902484	Morganite XL
R3	4.7k	Metal Oxide		5	900989	Electrosil TR4
R4	6.8k	Metal Oxide		5	900987	Electrosil TR4
R5	68	Metal Oxide		5	908278	Electrosil TR4
R6	10k	Metal Oxide		5	900986	Electrosil TR4

Amplifier Board (1st V.F.O.) (AC.32535)

R1	68	Metal Oxide		5	908278	Electrosil TR4
R2	1.5k	Metal Oxide		5	908296	Electrosil TR4
R3	8.2k	Metal Oxide		5	908275	Electrosil TR4
R4	5.6k	Metal Oxide		5	908273	Electrosil TR4
R5	10k	Metal Oxide		5	900986	Electrosil TR4
R6	4.7k	Metal Oxide		5	900989	Electrosil TR4
R7	56	Metal Oxide		5	908289	Electrosil TR4
R8	330	Metal Oxide		5	908268	Electrosil TR4
R9	220	Metal Oxide		5	900988	Electrosil TR4
R10	680	Metal Oxide		5	908390	Electrosil TR4

Amplifier Board (1st.V.F.O.) (AC.28128)

R1	68	Metal Oxide		5	908278	Electrosil TR4
R2	1.5k	Metal Oxide		5	908296	Electrosil TR4
R3	8.2k	Metal Oxide		5	908275	Electrosil TR4
R4	5.6k	Metal Oxide		5	908273	Electrosil TR4
R5	10k	Metal Oxide		5	900986	Electrosil TR4

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer.
R6	4.7k	Metal Oxide		5	900989	Electrosil TR4
R7	56	Metal Oxide		5	908289	Electrosil TR4
R8	330	Metal Oxide		5	908268	Electrosil TR4
R9	68	Metal Oxide		5	908278	Electrosil TR4
R10	680	Metal Oxide		5	908390	Electrosil TR4
		Capacitors				
Module Assembly						
			volts	%		
1C1		Megacycle tuning				Racal CA.27752
1C2	.047	Ceramic	200		908722	Erie Filtercon 1201-051
Oscillator Board (AC.35195)						
C1		deleted				
C2	8.5p	Trimmer			908732	Erie 562-013
C3	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C4	390p	Polystyrene	30	5	906710	Suflex HS 7/A
C5	.047	Polyester	250	20	909227	Mullard CC280 AE/P47K
C6	.0015	Ceramic	350	20	902124	Lemco 310K
Amplifier Board (AC.32535)						
C1	.047	Polyester		20	909227	Mullard C280 AE/P47K
C2	470p	Ceramic Hi k	350	20	902118	Lemco 310K
C3	.0033	Ceramic Hi k	350	20	902128	Lemco 310K
C4	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C5	6.8p	Ceramic	750	$\frac{1}{2}$p	902075	Lemco 310N750
C6	47p	Polystyrene	30	$2\frac{1}{2}$	908318	Suflex HS 7/A
C7	.001	Disc Ceramicon	500	-20+80	908832	Erie K7004/861
C8	.001	Disc Ceramicon	500	-20+80	908832	Erie K7004/861
C9	82p	Polystyrene	30	$2\frac{1}{2}$	908322	Suflex HS 7/A
C10	.001	Disc Ceramicon	500	-20+80	908832	Erie K7004/861

Amplifier Board (AC.28128)

NOTE: Capacitor details are identical to the Amplifier board AC.32535 above.

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer.
		Transformers and Inductors				
L1		Oscillator coil assembly				Racal CT 28220
		Transistors				
Oscillator Board						
VT1					910866	Texas GM 290A
Amplifier Boards						
VT1					910866	Texas GM 290A
VT2					910866	Texas GM 290A
		Plugs and Sockets				
PL1		Cable and connector assembly				Racal AA 33091/9
PL2		Cable and connector assembly				Racal AA 33091/6

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer.

SECOND V.F.O. (CC.28101)

RESISTORS

Oscillator Board (BA.35808)

	ohms		watts	%		
R1	100	Metal Oxide		5	908276	Electrosil TR4
R2	390	Metal Oxide		5	908472	Electrosil TR4
R3	2.2k	Metal Oxide		5	908270	Electrosil TR4
R4	27k	Metal Oxide		5	908295	Electrosil TR4
R5	390	Metal Oxide		5	908472	Electrosil TR4
R6	270	Metal Oxide		5	908284	Electrosil TR4
R7	390	Metal Oxide		5	908472	Electrosil TR4
R8	150	Metal Oxide		5	909121	Electrosil TR4

Amplifier Board (BA.35807)

R1	150k	Metal Oxide		5	908277	Electrosil TR4
R2	1.8k	Metal Oxide		5	908283	Electrosil TR4
R3		Not used				
R4	1.8k	Metal Oxide		5	908283	Electrosil TR4
R5	150k	Metal Oxide		5	908277	Electrosil TR4
R6	75	Metal Oxide		5	908288	Electrosil TR4
R7	6.8k	Metal Oxide		5	900987	Electrosil TR4
R8	1k	Metal Oxide		5	908267	Electrosil TR4
R9	1k	Metal Oxide		5	908267	Electrosil TR4
R10	470	Metal Oxide		5	900992	Electrosil TR4
R11	82	Metal Oxide		5	908290	Electrosil TR4
R12	18	Carbon	0.1	10	902487	Erie 15
R13	68	Metal Oxide		5	908278	Electrosil TR4
R14	10k	Metal Oxide			900986	Electrosil TR4
R15	27k	Metal Oxide			908295	Electrosil TR4
R16	220	Metal Oxide			900988	Electrosil TR4
R17	22	Carbon	0.1	10	902488	Erie 15
R18	1k	Metal Oxide		5	908267	Electrosil TR4
R19	4.7k	Metal Oxide		5	900989	Electrosil TR4
R20	27k	Metal Oxide		5	908295	Electrosil TR4
R21	100	Metal Oxide		5	908276	Electrosil TR4
R22	75	Metal Oxide		5	908288	Electrosil TR4

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
		Capacitors				
Module Assembly						
			volts	%		
C1		kc/s tuning				Racal CA 30948
C2	8.5p	kc/s tuning trimmer			908732	Erie 562-013
Oscillator Board (BA.35808)						
C1	.01	Ceramicon	100	-20+80	900067	Erie K800011/CD801
C2	.01	Ceramicon	100	-20+80	900067	Erie K800011/CD801
C3	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C4	56p	Silvered Mica	300	2	902228	J.M.C.12S
C5	18p	Ceramic	750	5	902083	Lemco 310N750
Amplifier Board (BA.35807)						
C1	1	Tantalum	35	20	909123	U.Carbide KIJ35S
C2	.01	Polyester	250	20	910485	Mullard C280 AE/P10K
C3	1	Tantalum	35	20	909123	U.Carbide KIJ35S
C4	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C5	.01	Polyester	250	20	910485	Mullard C280 AE/P10K
C6	.01	Polyester	250	20	910485	Mullard C280 AE/P10K
C7	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C8	.01	Polyester	250	20	910485	Mullard C280 AE/P10K
C9	.01	Polyester	250	20	910485	Mullard C280 AE/P10K
C10	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
		Inductors				
NOTE: L1 and L2 are not mounted on a board.						
L1		Increductor				Racal CT 35810
L2		Oscillator coil				Racal CT 35809
		Transistors				
Oscillator						
VT1				or	909113 or 906517	Semi-Conductors ST70 or Texas 2N918

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer.
Amplifier Board						
VT1 VT2 VT3				(ST70 - 909113 (or (2N918 - 906517		Semi-Conductors ST70 or Texas 2N918
		Diodes				
Oscillator Board						
D1		Zener			900897	Mullard OAZ245
D2		Zener			900897	Mullard OAZ245
D3		Zener			905395	Mullard OAZ243
D4		Zener			905395	Mullard OAZ243
Amplifier Board						
D1		Zener			909118	Texas 1S2068A
D2 and D3					906673	Texas 1S920
		Plugs and Sockets				
PL1		Multi-way connector			908716	Cannon DBM13W3P
		Coaxial inserts for PL1(3 off)			908341	Cannon DM53740-5001

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer.

37.5 Mc/s GENERATOR

(BC.28284)

Resistors

Harmonic Generator (AC.32854)

	ohms				
R1	1.8k	Metal Oxide	5	908283	Electrosil TR4
R2	1.2k	Metal Oxide	5	908285	Electrosil TR4
R3	820	Metal Oxide	5	908282	Electrosil TR4
R4	390	Metal Oxide	5	908472	Electrosil TR4
R5	390	Metal Oxide	5	908472	Electrosil TR4

Harmonic Mixer (AC.37894)

R1	270	Metal Oxide	5	908284	Electrosil TR4
R2	56	Metal Oxide	5	908289	Electrosil TR4
R3	15k	Metal Oxide	5	908280	Electrosil TR4
R4	5.6k	Metal Oxide	5	908273	Electrosil TR4
R5	120	Metal Oxide	5	908286	Electrosil TR4
R6	1.8k	Metal Oxide	5	908283	Electrosil TR4
R7	5.6k	Metal Oxide	5	908273	Electrosil TR4
R8	15k	Metal Oxide	5	908280	Electrosil TR4
R9	120	Metal Oxide	5	908286	Electrosil TR4
R10	820	Metal Oxide	5	908282	Electrosil TR4

37.5 Mc/s Amplifier (AC.32850)

R1	4.7k	Metal Oxide	5	900989	Electrosil TR4
R2	4.7k	Metal Oxide	5	900989	Electrosil TR4
R3	47k	Metal Oxide	5	908391	Electrosil TR4
R4	680	Metal Oxide	5	908390	Electrosil TR4
R5	12k	Metal Oxide	5	908274	Electrosil TR4
R6	8.2k	Metal Oxide	5	908275	Electrosil TR4

Potentiometer

RV1	2.2k	Mixer Balance adjustment		909838	Ancillary Developments Type T05

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer.
			CAPACITORS			
IC1	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
IC2	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
IC3	150p	Polystyrene	30	2½	908331	Suflex HS7/A
Harmonic Generator						
			volts			
C1		Trimmer 4.5/15p			908796	Steatite N750 Type 7S Triko 02
C2	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C3	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C4	.01	Polyester	250	20	910485	Mullard C280 AE/P10K
C5	100p	Polystyrene	30	2½	908797	Suflex HS7/A
Harmonic Filter (AC.32862 and AC.32548)						
C1	22p	Polystyrene		±1p	906703	
C2	2.5-6p	Pre-set Ceramic sub-micro			907886	Steatite Triko 7S02N033
C3	27p	Polystyrene		±1p	908325	
C4	7-35p	Pre-set Ceramic sub-micro			908806	Steatite Triko 7S02N1500
C5	27p	Polystyrene		±1p	908325	
C6	2.5-6p	Pre-set Ceramic sub-micro			907886	Steatite Triko 7S02N033
C7	27p	Polystyrene		±1p	908325	
C8	7-35p	Pre-set Ceramic sub-micro			908806	Steatite Triko 7S02N1500
C9	18p	Polystyrene		±1p	907171	
Harmonic Mixer (AC.37894)						
C1	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
C2	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
C3	.01	Ceramic	100	-20+80	909102	Erie K800011 CD801
C4	.01	Ceramic	100	-20+80	909102	Erie K800011 CD801
C5	.01	Ceramic	100	-20+80	909102	Erie K800011 CD801
C6	.01	Ceramic	100	-20+80	909102	Erie K800011 CD801

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer.
37.5 Mc/s Amplifier						
C1	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
C2	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
C3	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C4	68	Polystyrene	30	$2\frac{1}{2}$	908321	Suflex HS7/A
C5	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
C6	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C7	15p	Ceramic	750	5	902047	Lemco 310NP0
		Transformers and Inductors				
Harmonic Filter						
L1		Coil assembly			32956	Racal CT 32956
L2		Coil assembly			32954	Racal CT 32954
L3		Coil assembly			32956	Racal CT 32956
L4		Coil assembly			32954	Racal CT 32954
Harmonic Mixer						
L1		Coil assembly			32957	Racal CT 32957
37.5 Mc/s Amplifier						
T1		Coil assembly inc. capacitor C4			28317	Racal CT 28317
		Transistors				
Harmonic Generator						
VT1					910866	Texas GM290A
Harmonic Mixer						
VT1 and VT2					910866	Texas GM290A
37.5 Mc/s Amplifier						
VT1					910866	Texas GM290A
VT2					910866	Texas GM290A

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer.
		Diodes				
Harmonic Generator						
D1					908347	Hughes HG 5085
D2					908347	Highes HG 5085
Harmonic Mixer						
D1					908347	Hughes HG 5085
35.7 Mc/s Amplifier						
D1					908347	Hughes HG 5085
		Plugs and Sockets				
PL1		Connects to bulkhead adaptor			908370	Belling Lee L1403/RFP/Ag
SKT1		Connects to PL1 on 37.5 Mc/s Filter Unit			907076	Cannon insert DM53742-5001
		Ferrite Beads				
FB1		On H.T. Filter			900461	Mullard FX 1115
		37.5 Mc/s FILTER				

NOTE: If this unit is faulty a replacement should be obtained from the Racal Service Department quoting Part number BA.28192.

		Plugs (fixed)				
PL1		Co-axial insert			908341	Cannon DM 53740-5001
PL2		Co-axial insert			908341	Cannon DM 53740-5001

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer

1 Mc/s AMP. OSC. & CALIBRATOR

(CC 28285)

NOTE: This assembly is contained in the 37.5 Mc/s Generator Module).

Resistors

	ohms				
1R1	56	Metal Oxide	5	910545	Welwyn F25

1 Mc/s Amplifiers Board (BC 32858)

	ohms		Watts	%		
R1	22k	Metal Oxide		5	908269	Electrosil TR4
R2	6.8k	Metal Oxide		5	900987	Electrosil TR4
R3	1k	Metal Oxide		5	908267	Electrosil TR4
R4	820	Metal Oxide		5	908282	Electrosil TR4
R5	18	Metal Oxide		5	902487	Welwyin F25
R6	1k	Metal Oxide		5	908267	Electrosil TR4
R7	22k	Metal Oxide		5	908269	Electrosil TR4
R8	6.8k	Metal Oxide		5	900987	Electrosil TR4
R9	82	Metal Oxide		5	908290	Electrosil TR4
R10	560	Metal Oxide		5	909841	Electrosil TR4
R11	33	Metal Oxide		5	908690	Selwyn F25
R12	1k	Metal Oxide		5	908267	Electrosil TR4
R13	18k	Metal Oxide		5	900994	Electrosil TR4
R14	5.6k	Metal Oxide		5	908273	Electrosil TR4
R15	1.5k	Metal Oxide		5	908296	Electrosil TR4
R16	1.2k	Metal Oxide		5	908285	Electrosil TR4
R17	39k	Metal Oxide		5	908292	Electrosil TR4
R18	82	Metal Oxide		5	908290	Electrosil TR4
R19	68	Metal Oxide		5	908278	Electrosil TR4

1 Mc/s Oscillator and Calibrator Board (BC 32860)

R1	39k	Metal Oxide	5	908292	Electrosil TR4
R2	10k	Metal Oxide	5	900986	Electrosil TR4
R3	10k	Metal Oxide	5	900986	Electrosil TR4
R4	100	Metal Oxide	5	908276	Electrosil TR4
R5	6.8k	Metal Oxide	5	900987	Electrosil TR4

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
R6	2.2k	Metal Oxide		5	908270	Electrosil TR4
R7	68	Metal Oxide		5	908278	Electrosil TR4
R8	4.7k	Metal Oxide		5	900989	Electrosil TR5
R9	2.2K	Metal Oxide		5	906020	Electrosil TR5
R10	10k	Metal Oxide		5	906023	Electrosil TR5
R11	4.7k	Metal Oxide		5	900989	Electrosil TR5
R12	47	Composition	0.1	10	902492	Morganite XL
R13	4.7k	Metal Oxide		5	900989	Electrosil TR5
R14	39k	Metal Oxide		5	910107	Electrosil TR5
R15	150k	Metal Oxide		5	908470	Electrosil TR5
		Capacitors				
1C1	0.22				908338	TCC CML10
1 Mc/s Amplifier Board						
			volts	%		
C1	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C2	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C3	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C4	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C5	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C6	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
C7	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C8	.001	Ceramic Hi-K	350	20	902122	Lemco 310K
C9	.047	Polyester	250	20	909227	Mullard C280 AE/P47k
C10	680p	Polystyrene	30	$2\frac{1}{2}$	908455	Suflex HS7/A
C11	150p	Polystyrene	30	$2\frac{1}{2}$	908331	Suflex HS7/A
C12	.0015	Ceramic Hi-K	350	20	902124	Lemco 310K
C13	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C14	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
1 Mc/s Oscillator and Calibrator Board						
C1	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C2	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C3	220p	Polystyrene	30	$2\frac{1}{2}$	908320	Suflex HS7/A
C4	470p	Polystyrene	30	$2\frac{1}{2}$	908317	Suflex HS7/A
C5	.001	Polystyrene	30	$2\frac{1}{2}$	908583	Suflex HS7/A

Cct. Ref.	Value	Description	Volt.	Tol.	Racal Part No.	Manufacturer.
C6	22p	Polystyrene	30	1p	906703	Suflex HS 7/A
C7	7-35p	Pre-set: Steatite Ceramic Sub-micro 75			908806	Triko 02 N1500
C8	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
C9	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
C10	560	Polystyrene	30	2½		Suflex HS 7/B
C11	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
C12	1200	Polystyrene	30	2½	910645	Suflex HS 7/B
C13	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
C14	560	Polystyrene	30	20	908452	Suflex HS 7/A
C15	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
C16	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K

Transformers and Inductors

1 Mc/s Amplifier Board

L1	Coil Assembly		Racal CT 32955

1 Mc/s Osc. and Calibrator Board

L1	Coil Assembly		Racal CT 31443
L2	Coil Assembly		Racal CT 31442
L3	Coil Assembly		Racal CT 31444

Transistors

1 Mc/s Amplifier Board

VT1	909414	Motorola 2N3323
VT2	909414	Motorola 2N3323
VT3	909414	Motorola 2N3323

1 Mc/s Osc. and Calibrator Board

VT1	909414	Motorola 2N3323
VT2	909414	Motorola 2N3323
VT3	909414	Motorola 2N3323

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer.
		Diodes				
1 Mc/s Osc. and Calibrator Board						
D1 to D4					900620	Mullard OA200
D5					900620	Mullard OA200
D6					900652 908349	Mullard AAZ13 or Hughes HD1871
		Plugs and Sockets				
PL1		(Plug shell (Plug inserts (4)			908388 907080	Cannon DBM9W4P Cannon DM53741-5001
		Crystals				
XL1		1 Mc/s crystal Style D Crystal Holder			 900397	Racal CD 38871/A X2/UG

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer.

B.F.O.

(BC 28259)

Resistors

Oscillator Board (BC 30540)

	ohms				
R1	470	Metal Oxide	5	900992	Electrosil TR4
R2	5.6k	Metal Oxide	5	908273	Electrosil TR4
R3	5.6k	Metal Oxide	5	908273	Electrosil TR4
R4	5.6k	Metal Oxide	5	908273	Electrosil TR4
R5	10k	Metal Oxide	5	900986	Electrosil TR4

Amplifier Board (BC 30542)

R1	5.6k	Metal Oxide	5	908273	Electrosil TR4
R2	15k	Metal Oxide	5	908280	Electrosil TR4
R3	1k	Metal Oxide	5	908267	Electrosil TR4
R4	180	Metal Oxide	5	909125	Electrosil TR4
R5	4.7k	(part of CT 35217)	10	908246	Nutec RKL10

Capacitors

B.F.O. Assembly

			volts			
C1	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
C4	4-20p	B.F.O. Variable tuning				

Oscillator Board (BC 30540)

C1	0.1	Polyester	250	10	909428	Mullard C280 AE/P100K
C2	7-35p	pre-set			908806	Steatite 7S Triko 02/N150
C3	7-35p	pre-set			908806	Steatite 7S Triko 02/N150
C4		(see B.F.O. Assembly)				
C5	7-35p	pre-set			908806	Steatite 7S Triko 02/N150

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer.
C7	390p	Polystyrene	30	2½	908243	Suflex HS 7/A
C8	82p	Ceramic	750	2	902099	Erie N750B
C9	0.1	Polyester	250	10	909428	Mullard C280 AE/P100K
C10	.01	Polyester	250	20	910485	Mullard C280 AE/P10K
C11	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
Amplifier Board (BC30						
			volts			
C1	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C2*	180p	Polystyrene	30	2½	907884	Suflex HS 7/A
C3	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K

* C2 is part of CT 35216

Transformers and Inductors

Oscillator Board		
L1	Oscillator coil	Racal CT 35217
Amplifier Board		
T1	600 kc/s output transformer	Racal CT 35216

Switches

SA	B.F.O. kc/s switch	N.S.F./Racal BSW 28266

Transistors

Oscillator Board			
VT1		906433	S.T.C. BSY95A
Amplifier Board			
VT1		906433	S.T.C. BSY95A

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer

I.F. UNIT

(DC.28250)

NOTE: Components prefixed '2' are not mounted on a printed circuit board.

Main Assembly Components

Main Assembly Components

Resistors

	ohms		Watts	%		
2R1	120	Metal Oxide		5	908286	Electrosil TR4
2R2	10k	Carbon		10	905313	Erie 15

Capacitors

	uF		volts	%		
2C1		Not used				
2C2		Not used				
2C3	0.1	Ceramic	30	-25+50	906675	Erie 811T/30
2C4	50	Electrolytic	25		908798	Mullard C426AR/F50

Socket

SKT1	Input from 3rd. mixer	906878	Belling Lee L1403/CS/Ag
Free plug PL3 (Fig. 15) to mate with SKT1			Racal AA2825A

I.F. Unit Board Components

Resistors

H.T. Supply Filter (AC 30535)

	ohms		%		
R1	100		5	908276	Electrosil TR4

Resistors

1st. I.F. Amplifier (1) (BC.31474)

	ohms		%		
R1	18k	Metal Oxide	5	908272	Electrosil TR4
R2	100	Metal Oxide	5	908276	Electrosil TR4
R3	4.7k	Metal Oxide	5	900989	Electrosil TR4
R4	3.9k	Metal Oxide	5	900990	Electrosil TR4

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
R5	1k	Metal Oxide		5	908267	Electrosil TR4
R6	470	Metal Oxide		5	900992	Electrosil TR4
Bandwidth Switch Assembly (2) (BC.28252)						
R1	680	Metal Oxide		5	908390	Electrosil TR4
R2		deleted				
R3	27	Metal Oxide		5	908297	Welwyn F25
R4	100	Metal Oxide		5	908276	Electrosil TR4
R5	68	Metal Oxide		5	908278	Electrosil TR4
Main I.F. Amplifier (3) (BC.30533)						
R1	18k	Metal Oxide		5	908272	Electrosil TR4
R2	3.9k	Metal Oxide		5	900990	Electrosil TR4
R3	330	Metal Oxide		5	908268	Electrosil TR4
R4	4.7k	Carbon Film		10	908246	Nutec RKL10
R5	33	Metal Oxide		5	908690	Welwyn F25
R6	1k	Metal Oxide		5	908267	Electrosil TR4
R7	22k	Metal Oxide		5	908269	Electrosil TR4
R8	4.7k	Metal Oxide		5	900989	Electrosil TR4
R9	2.2k	Metal Oxide		5	908270	Electrosil TR4
R10	5.6k	Metal Oxide		5	908273	Electrosil TR4
R11	4.7k	Metal Oxide		5	900989	Electrosil TR4
R12	3.9k	Metal Oxide		5	900990	Electrosil TR4
R13	10k	Metal Oxide		5	900986	Electrosil TR4
R14	220	Metal Oxide		5	900988	Electrosil TR4
R15	8.2k	Metal Oxide		5	908275	Electrosil TR4
R16	4.7k	Carbon film		10	908246	Nutec RKL10
R17	3.9k	Metal Oxide		5	900990	Electrosil TR4
R18	12k	Metal Oxide		5	908274	Electrosil TR4
R19	330	Metal Oxide		5	908268	Electrosil TR4
R20	4.7k	Carbon film		5	908246	Nutec RKL10
R21	47	Metal Oxide		5	908298	Welwyn F25
R22	1k	Metal Oxide		5	908267	Electrosil TR4

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer.
Audio Amplifier (4) (BC.31462)						
R1	5.6k	Metal Oxide		5	908273	Electrosil TR4
R2	2.2k	Metal Oxide		5	908270	Electrosil TR4
R3	5.6k	Metal Oxide		5	908273	Electrosil TR4
R4	330	Metal Oxide		5	908268	Electrosil TR4
R5	2.2k	Metal Oxide		5	908270	Electrosil TR4
R6	15k	Metal Oxide		5	908280	Electrosil TR4
R7	5.6k	Metal Oxide		5	908273	Electrosil TR4
R8	22k	Metal Oxide		5	908269	Electrosil TR4
R9	150k	Metal Oxide		5	908277	Electrosil TR4
R10	150k	Metal Oxide		5	908277	Electrosil TR4
R11	470	Metal Oxide		5	900992	Electrosil TR4
R12	470	Metal Oxide		5	900992	Electrosil TR4
R13	1k	Metal Oxide		5	908267	Electrosil TR4
R14	150k	Metal Oxide		5	908277	Electrosil TR4
R15	10k	Metal Oxide		5	900986	Electrosil TR4
R16	68k	Metal Oxide		5	908279	Electrosil TR4
R17	2.2k	Metal Oxide		5	908270	Electrosil TR4
R18	68	Metal Oxide		5	908278	Electrosil TR4
Detector Board (5) (CC.28236)						
R1	3.9k	Metal Oxide		5	900990	Electrosil TR4
R2	33k	Metal Oxide		5	908291	Electrosil TR4
R3	39k	Metal Oxide		5	908292	Electrosil TR4
R4	5.6k	Metal Oxide		5	908273	Electrosil TR4
R5	56	Metal Oxide		5	908289	Electrosil TR4
R6	100	Metal Oxide		5	908276	Electrosil TR4
R7	2.2k	Metal Oxide		5	908270	Electrosil TR4
R8	330	Metal Oxide		5	908268	Electrosil TR4
R9	10k	Metal Oxide		5	900986	Electrosil TR4
R10		Not used				
R11	4.7k	Metal Oxide		5	900989	Electrosil TR4
R12	820	Metal Oxide		5	908282	Electrosil TR4
R13	100k	Metal Oxide		5	908293	Electrosil TR4
R14	4.7k	Metal Oxide		5	900989	Electrosil TR4
R15	1k	Metal Oxide		5	908267	Electrosil TR4

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
R16	22	Carbon	0.1	10	902488	Erie 15
R17	6.8k	Carbon film		10	908247	Nutec RKL10
R18	2.7k	Metal Oxide		5	908294	Electrosil TR4
R19	15k	Metal Oxide		5	908280	Electrosil TR4
R20	100	Metal Oxide		5	908276	Electrosil TR4
R21	2.2k	Metal Oxide		5	908270	Electrosil TR4
R22	5.6k	Metal Oxide		5	908273	Electrosil TR4
R23	33k	Metal Oxide		5	908291	Electrosil TR4
R24	3.9k	Metal Oxide		5	900990	Electrosil TR4
R25	8.2k	Metal Oxide		5	908275	Electrosil TR4
R26	1.2k	Metal Oxide		5	908285	Electrosil TR4
R27	6.8k	Metal Oxide		5	900987	Electrosil TR4
R28	22k	Metal Oxide		5	908269	Electrosil TR4
R29		Not used				
R30		Not used				
R31	82	Metal Oxide		5	908290	Electrosil TR4
R32	5.6k	Metal Oxide		5	908273	Electrosil TR4
R33	5.6k	Metal Oxide		5	908273	Electrosil TR4
AGC Board (7)		(BC.31466)				
R1	15k	Metal Oxide		5	908280	Electrosil TR4
R2	3.9k	Metal Oxide		5	900990	Electrosil TR4
R3	330	Metal Oxide		5	908268	Electrosil TR4
R4	5.6k	Carbon film		10		Nutec RKL10
R5	22	Carbon	0.1	10	902488	Erie 15
R6	1k	Metal Oxide		5	908267	Electrosil TR4
R7	18k	Metal Oxide		5	908272	Electrosil TR4
R8	12k	Metal Oxide		5	908274	Electrosil TR4
R9	1k	Metal Oxide		5	908267	Electrosil TR4
R10	18	Carbon	0.1	10	902487	Erie 15
R11	10k	Carbon film		10	908249	Nutec RKL10
R12	150k	Metal Oxide		5	908277	Electrosil TR4
R13	120k	Metal Oxide		5	908281	Electrosil TR4
R14	10k	Metal Oxide		5	900986	Electrosil TR4
R15	10k	Metal Oxide		5	900986	Electrosil TR4
R16	120k	Metal Oxide		5	908281	Electrosil TR4
R17	68k	Metal Oxide		5	908279	Electrosil TR4
R18	820k	Carbon	0.1	10	902543	Erie 15
R19	1k	Metal Oxide		5	908267	Electrosil TR4
R20	2.2k	Metal Oxide		5	908270	Electrosil TR4

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
R21	6.8k	Metal Oxide		5	900987	Electrosil TR4
R22	15k	Metal Oxide		5	908280	Electrosil TR4
R23	820	Metal Oxide		5	908282	Electrosil TR4
R24	3.3k	Metal Oxide		5	900991	Electrosil TR4
Converter Amplifier Board (6) (BC.34783/A or B)						
R1	6.8k	Metal Oxide		5	900987	Electrosil TR4
R2	1.8k	Metal Oxide		5	908283	Electrosil TR4
R3	100	Metal Oxide		5	908276	Electrosil TR4
R4	270	Metal Oxide		5	908284	Electrosil TR4
R5	1k	Metal Oxide		5	908267	Electrosil TR4
R6	100	Metal Oxide		5	908276	Electrosil TR4
R7	15k	Metal Oxide		5	908280	Electrosil TR4
R8	100	Metal Oxide		5	908276	Electrosil TR4
R9	1.2k	Metal Oxide		5	908285	Electrosil TR4
R10*	56k	Metal Oxide		5	908287	Electrosil TR4
R11	120	Metal Oxide		5	908286	Electrosil TR4

* R10 is fitted only to the 100 kc/s board 34783/B

Converter Assembly

3R5	1k	Metal Oxide		5	908267	Electrosil TR4

NOTE: On the converter output panel a 10 kΩ resistor is wired between each socket contact and chassis. These resistors provide mechanical security and have no circuit function.

Converter Oscillator Board (8) (34766A or B)

NOTE: Except for R12, resistor details are identical in the 100 kc/s(B) and 455 kc/s(A) versions.

	ohms					
R1	100	Metal Oxide		5	908276	Electrosil TR4
R2	68k	Metal Oxide		5	908279	Electrosil TR4
R3	390	Metal Oxide		5	908472	Electrosil TR4
R4	4.7k	Metal Oxide		5	900989	Electrosil TR4
R5	22k	Metal Oxide		5	908269	Electrosil TR4

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
R6	1k	Metal Oxide		5	908267	Electrosil TR4
R7	3.3k	Metal Oxide		5	900991	Electrosil TR4
R8	18k	Metal Oxide		5	908272	Electrosil TR4
R9	100	Metal Oxide		5	908276	Electrosil TR4
R10	1k	Metal Oxide		5	908267	Electrosil TR4
R11	33	Metal Oxide		5	908690	Welwyn F25
R12	39k	(100 kc/s only)		5	908292	Electrosil TR4
R12	82k	(455 kc/s only)		5	908691	Electrosil TR4
		Potentiometer				
AGC Board						
RV1	2.2M				908365	Plessey Type MP
		Capacitors				
1st. I.F. Amplifier (1)						
			volts			
C1	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
C2	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C3*	180p	Polyestyrene	30	2½	907884	Suflex HS7/A
C4	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C5*	.01	Silver Mica	500	20	908245	Erie Microcap
C6*	.01	Silver Mica	500	20	908245	Erie Microcap
* Contained in L1 assembly.						
H.T. Supply Filter (AC.30535)						
C1	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C2	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
Main I.F. Amplifier (3)						
			volts			
C1	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
C2	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C3	10	Electrolytic	16V	-10+50	900068	Mullard C426 AR/E10
C4	180 p	Polystyrene	30	2½	907884	Suflex HS7/A
C5	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
C6	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C7	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
C8	180p	Polystyrene	30	2½	907884	Suflex HS 7/A
C9	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
C10	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
C11	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C12	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
C13	180p	Polystyrene	30	2½	907884	Suflex HS 7/A
C14	50	Electrolytic	16	-10+50	908798	Mullard C426 ARF50
C15	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C16	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C17	100p	Polystyrene	30	2½	908241	Suflex.HS 7/A
Audio Amplifier Board (4)						
C1	80	Electrolytic	16	-10+50	908810	Mullard C426 AR/E80
C2	.022	Polyester	250	20	900082	Mullard C280 AE/P22K
C3	2.5	Electrolytic	16	-10+50	908808	Mullard C426 AS/E2.5
C4	80	Electrolytic	16	-10+50	908810	Mullard C426 AR/E80
C5	2.2	Tantalum	20	20	908316	U.Carbide K2R2J20S
C6	80	Electrolytic	80	-10+50	908810	Mullard C426 AR/E80
C7	80	Electrolytic	80	-10+50	908810	Mullard C426 AR/E80
C8	.001	Silver Mica	500	20	908315	Erie Microcap
C9	80	Electrolytic	16	-10+50	908810	Mullard C426 AR/E80
C10	10	Electrolytic	16	-10+50	900068	Mullard C426 AR/E10
C11	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
C12	50	Electrolytic	25	-10+50	908798	Mullard C426 AR/F50
Detector Board (5)			volts			
C1	180p	Polyestyrene	30	2½%	907884	Suflex HS 7/A
C2	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C3	10	Electrolytic	16	-10+50	900068	Mullard C426 AR/E10
C4	120p	Polystyrene	30	2½	908332	Suflex HS 7/A
C5	10	Electrolytic	16	-10+50	900068	Mullard C426 AR/E10
C6	120p	Polystyrene	30	2½	908332	Suflex HS 7/A
C7	10	Electrolytic	16	-10+50	900068	Mullard C426 AR/E10
C8	120p	Polystyrene	30	2½	908332	Suflex HS 7/A
C9	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C10	0.1	Ceramic	30	-25+50	906675	Erie 811T/30
C11	0.1	Ceramic	30	-25+50	906675	Erie 811T/30
C12	100p	Polystyrene	30	2½	908241	Suflex HS 7/A
C13	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C14	180p	Polystyrene	30	2½	907884	Suflex HS 7/A
C15	0.1	Ceramic	30	-25+50	906675	Erie 811T/30

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer.
C16	0.1	Ceramic	30	-25+50	906675	Erie 811T/30
C17	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C18	330p	Silver Mica	350	2	902173	J.M.C. CX22S/350
C19	.01	Ceramic	100		900067	Erie CD801
C20	.0022	Ceramic	350	20	902126	Lemco 310K
C21	7.35p	Variable			908806	Steatite Triko 02/N1500
C22	7.35p	Variable			908806	Steatite Triko 02/N1500
C23	0.1	Ceramic	30	-25+50	906675	Erie 811T/30
C24	0.1	Ceramic	30	-25+50	906675	Erie 811T/30
C25	10p	Polystyrene	30	$2\frac{1}{2}$	908324	Suflex HS 7/A
C26	10p	Polystyrene	30	$2\frac{1}{2}$	908324	Suflex HS 7/A
AGC Board (7)						
C1	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C2	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
C3	.0086	Silver Mica	125	2	908337	S.T.C. 454LWA-74
C4	330p	Polystyrene	330	$2\frac{1}{2}$	908242	Suflex HS 7/A
C5	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C6	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C7	33p	Polystyrene	30	1p	906497	Suflex HS 7/A
C8	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C9	180p	Polystyrene	30	$2\frac{1}{2}$	907884	Suflex HS 7/A
C10	390p	Polystyrene	30	$2\frac{1}{2}$	908243	Suflex HS 7/A
C11	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
C12	0.22	Ceramic	50	-10+50	908338	T.C.C. CML10
C13	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
C14	6.4	Electrolytic	25	-10+50	905371	Mullard C426 AR/F6.4
C15	0.64	Electrolytic	64	-10+50	909311	Mullard C426 AS/H0.64
C16	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
Converter Amplifier Board (6)						
C1	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
C2	.001	Ceramic	350	20	902122	Lemco 310K
C3	.001	Ceramic	350	20	908315	Erie Microcap
C4	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
C5	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer.
C6	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
C7	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
C8	470p	Polystyrene	30	2½	908317	Suflex HS 7/A
C9	2.2	Tantalum	20	20	908316	U.Carbide K2R2J20S
Converter Oscillator Board (8)						
NOTE:	Except for C9 the capacitor details are identical for the 100 kc/s + 455 kc/s versions.					
C1	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C2	6.8p	Ceramic	750	½p	902041	Lemco 310NP0
C3	150p	Polystyrene	30	2½	908331	Suflex HS 7/A
C4	7-35p	Variable			908806	Steatite 7S Triko 02
C5	470p	Polystyrene	30	2½		Suflex HS 7/A
C6	0.64	Electrolytic	64	-10+50	909311	Mullard C426 AS/H0.64
C7	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
C8	470p	Polystyrene	30	2½	908317	Suflex HS 7/A
C9	18p	(455 kc/s board)	30	1p	908323	Suflex HS 7/A
C9	100p	(100 kc/s board)	30	2½	908241	Suflex HS 7/A
C10	470p	Polystyrene	30	2½	908317	Suflex HS 7/A

Transformers, Inductors and Filters

1st. I.F. Amplifier (1)		
L1	Coil Assembly	Racal CT 31472
Bandwidth Switch Assembly (2)		
Filter	200 c/s Crystal unit	Racal BA 28240
Filter	1000 c/s Crystal unit	Racal BA 28241
Filter	3000 c/s Crystal unit	Racal BA 28242
Main I.F. Amplifier Board (3)		
L1	Coil Assembly	Racal CT 33004
L2	Coil Assembly	Racal CT 33005
L3	Coil Assembly	Racal CT 33006

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer.
Audio Amplifier Board (4)						
T1		Transformer assembly				Racal CT 31476
T2		Transformer assembly				Racal CT 31478
T3		Transformer assembly				Racal CT 31477
Detector Board (5)						
T1		Transformer assembly				Racal CT 32961
T2		Transformer assembly				Racal CT 33002
L1		Not used				
L2		Coil assembly				Racal CT 31473
L3		Coil assembly				Racal CT 32962
A.G.C. Board						
L1		Coil assembly				Racal CT 33008
L2		Coil assembly				Racal CT 33007
Converter Amplifier Board (6)						
L1		Coil assembly (455 kc/s)				Racal CT 32958
L1		Coil assembly (100 kc/s)				Racal CT 34763
Converter Oscillator Board (8)						
L1		Coil assembly (455 kc/s)				Racal CT 32959
L1		Coil assembly (100 kc/s)				Racal CT 34764
L2		Coil assembly (455 kc/s)				Racal CT 32960
L2		Coil assembly (100 kc/s)				Racal CT 34765
		Switches				
SA		Bandwidth switch:				Racal AD 28231
		Transistors				
1st I.F. Amplifier (1)						
VT1					909414	Motorola 2N3323

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer.
Main I.F. Amplifier Board (3)						
VT1					909414	Motorola 2N3323
VT2					906370	Texas 2N2412
VT3					909414	Motorola 2N3323
VT4					909414	Motorola 2N3323
Audio Amplifier (4)						
VT1					908364 909022	Texas 2G309 or Texas 2G309-D414
VT2					909017	Texas 2N929
VT3					909017	Texas 2N929
VT4						Texas 2N929
Detector Board (5)						
VT1					906433	S.T.C. BSY95A
VT2					900656	Texas 2S733
VT3					906433	S.T.C. BSY95A
VT4					906433	S.T.C. BSY95A
VT5					906433	S.T.C. BSY95A
VT6					906433	S.T.C. BSY95A
AGC Board (7)						
VT1					909414	Motorola 2N3323
VT2					906433	S.T.C. BSY95A
VT3					910839	Texas 2N3707
VT4					909413	S.T.C. 2N930
VT5					909414	Motorola 2N3323
VT6					908361	Texas 2N1304
Converter Amplifier Board (6)						
VT1					906433	S.T.C. BSY95A
VT2					906006	S.T.C. BFY19
VT3					906006	S.T.C. BFY19
Converter Oscillator Board (8)						
VT1					909414	Motorola 2N3323
VT2					906433	S.T.C. BSY95A

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer.
		Diodes				
Main I.F. Amplifier (3)						
D1					908343	Texas 1S920
Detector Board (5)						
D1					908343	Texas 1S920
D2					908343	Texas 1S920
D3		Not used				
D4					(900652 (908349	Mullard AAZ13 or Hughes HD1871
D5		Zener			908344	International MZ13T5
D6					908343	Texas 1S920
D7					908343	Texas 1S920
AGC Board (7)						
D1					906720	Texas 1S44
D2					908343	Texas 1S920
D3					908343	Texas 1S920
D4		Zener			908344	International MZ13T5
		Plugs and Sockets				
I.F. Unit Module Connectors						
SKT1		Co-ax connector assembly to 3rd.Mixer.			906878	Belling Lee L1403/CS/Ag
PL1		Main 37-way connector to SKT11				Cannon DCM37S
I.F. Converter Panel						
SKT1		Coaxial: fixed			906878	Belling Lee L1403CS/Ag
SKT2		Coaxial: fixed			906878	Belling Lee L1403CS/Ag
SKT3		Coaxial: fixed			906878	Belling Lee L1403CS/Ag
SKT4		Coaxial: fixed			906878	Belling Lee L1403CS/Ag
		Crystals				
Detector Board (5)						
XL1		1601.50 kc/s				Racal CD38871/B
XL2		1598.50 kc/s				Racal CD38871/C

Cct. Ref.	Value	Description	Rat.	Tol %	Racal Part No.	Manuafacturer.

Crystals (Cont)

Converter Oscillator Board (8)

XL1		1145 kc/s in 455 kc/s Converter	Racal CD38871/E
XL1		1500 kc/s in 100 kc/s Converter	Racal CD38871/F

Terminal Strip

TB1		8 way - rear panel.	908686 Carr. Fastener 44-79-593

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer.

POWER UNIT Type 408A (A.C. Supply)

(BC.28290)

Resistors

Module Chassis

	ohms					
1R1	100k	Metal Oxide		5	907866	Electrosil TR4

Circuit Board (BA.28297)

R1	1.8k	Metal Oxide		5	906026	Electrosil TR5
R2	68	Metal Oxide		5	907494	Electrosil TR5
R3	2.7k	Metal Oxide		5	906347	Electrosil TR5
R4	2.7k	Metal Oxide		5	906347	Electrosil TR5
R5	1.2k	Metal Oxide		5	906346	Electrosil TR5

Potentiometer

Module Chassis

1RV1	1.5k				908609	Colvern 1106/9S

Capacitors

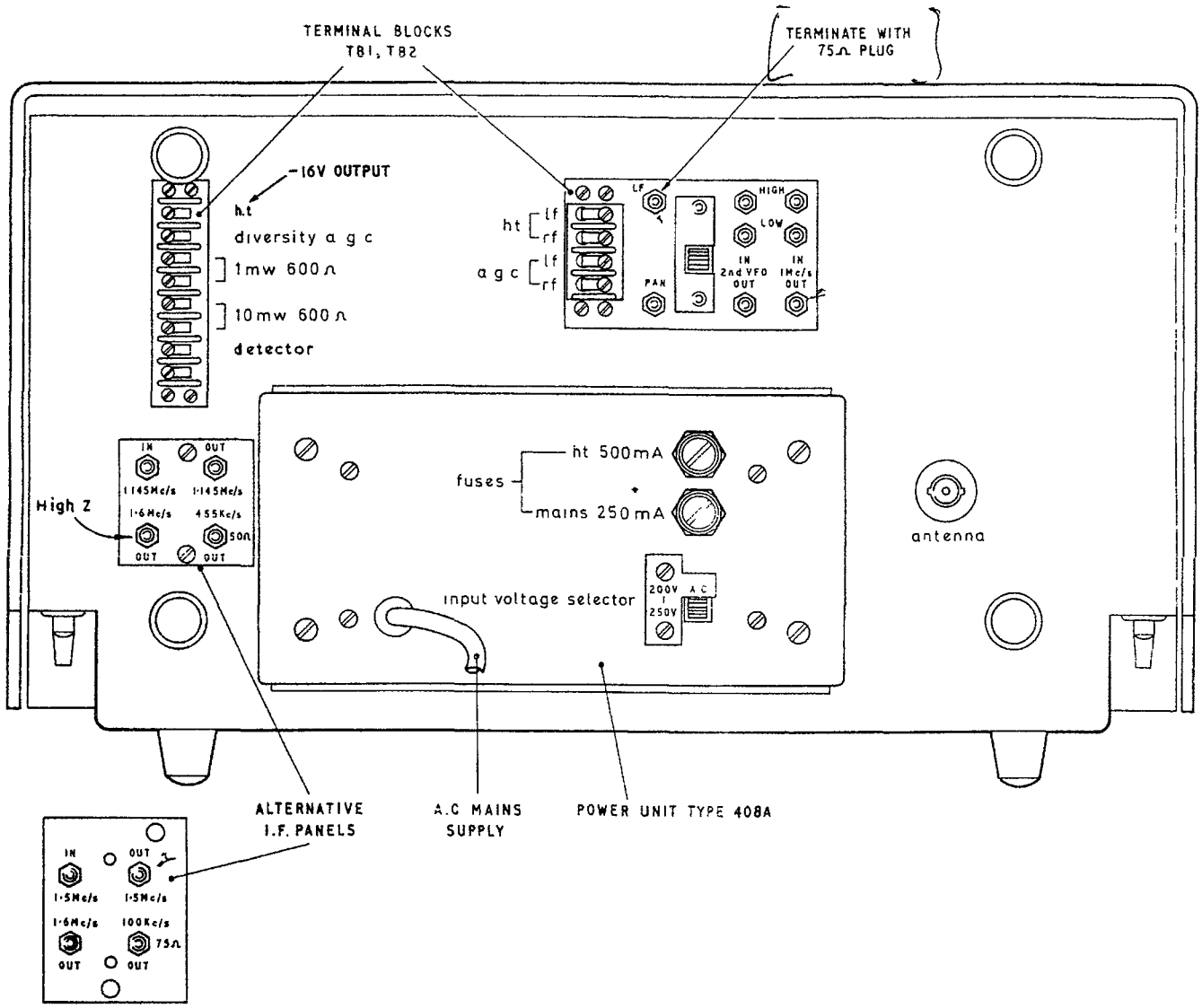
Module Chassis

	uF			volts		
C1	.02	Paper	350	20	902279	T.C.C. Metalmite CP33N
C2	.02	Paper	350	20	902279	T.C.C. Metalmite CP33N
C3	500	Electrolytic	64		906759	Mullard C431 BR/H500

Circuit Board (BA.28297)

C1	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
C2	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
C3	50	Electrolytic	25	-10+50	908798	Mullard C426 AR/F50
C4	50	Electrolytic	25	-10+50	908798	Mullard C426 AR/F50

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer.
		Transformer				
Module Chassis						
1T1		Power transformer				Racal CT 28300
		Transistors				
Module Chassis						
1VT1					900887	Mullard OC36
Accessory set for 1VT1						Racal 56201
Circuit Board						
VT1					908358	STC 2N706A
VT2					900888	Mullard ACY17
VT3					900888	Mullard ACY17
		Diodes				
Circuit Board						
D1-D4		Encapsulated bridge			909020	Motorola MDA920/3
D5-D7					905858	Texas 1S132
D8					908348	Hughes HS2068
		Fuses				
FS1	250mA	Mains input fuse (Size 00)			908681	Belling Lee L562
FS2	500mA	Transformer output fuse (Size 00)			908682	Belling Lee L562
		Fuseholders				
FS1 holder					900412	Belling Lee L575
FS2 holder					900412	Belling Lee L575
		Switch				
1SA		Mains Voltage Selector(Slider)			900777	Plessey S5
		Plugs and Sockets				
1SKT1		socket: sub-miniature			908683	Cannon DAMF15-S



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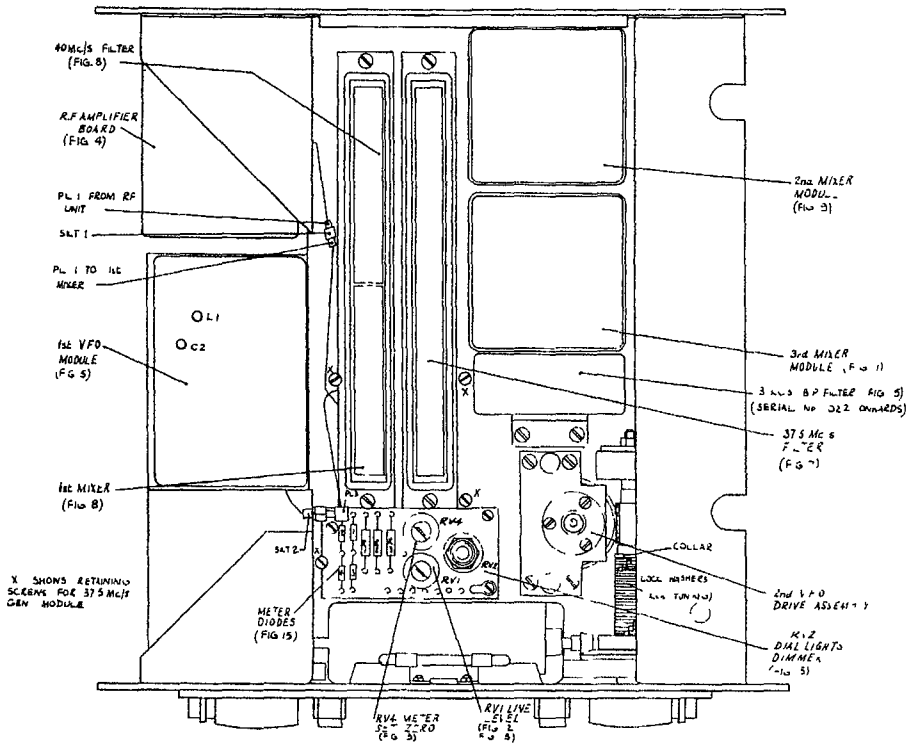
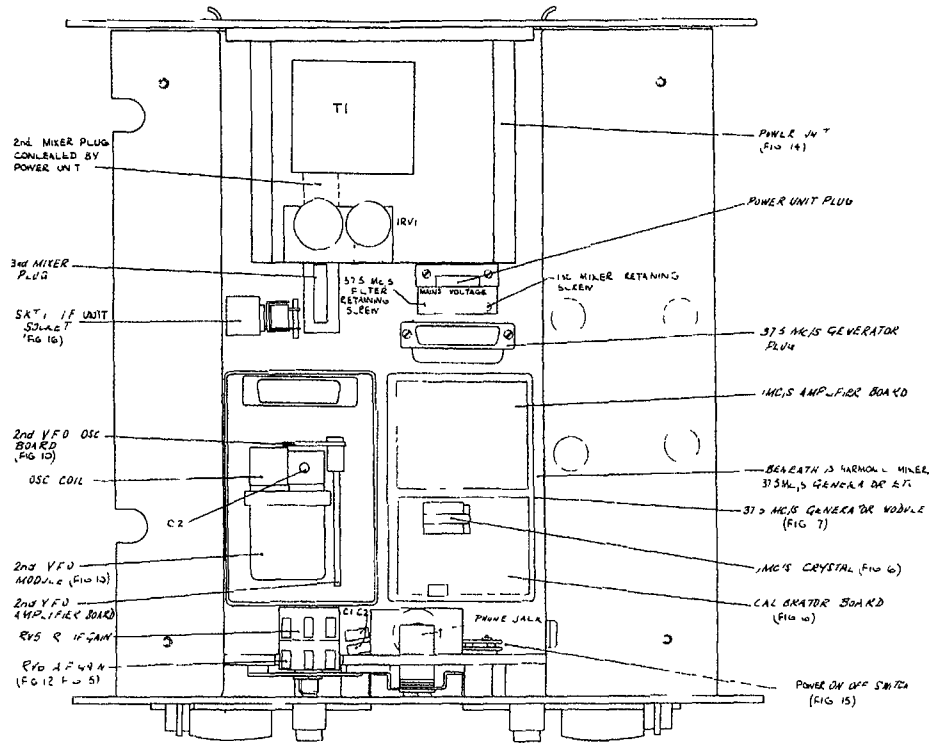
Rear panel : RA217

Fig.19

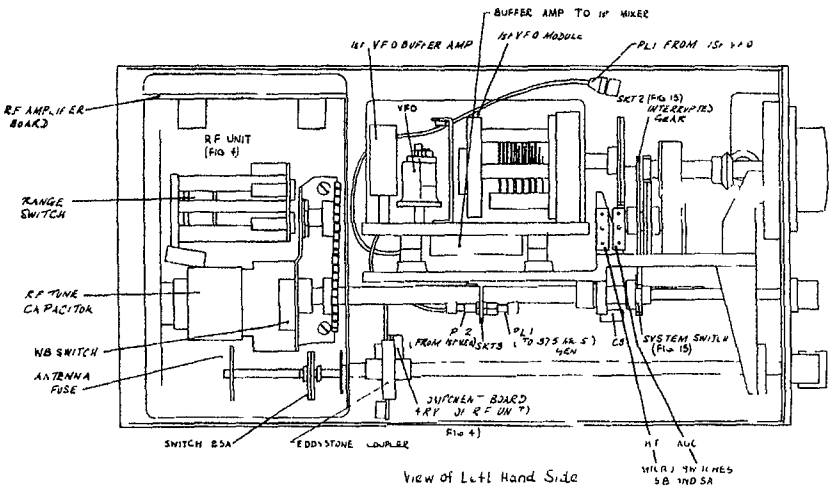


View on Chassis Top

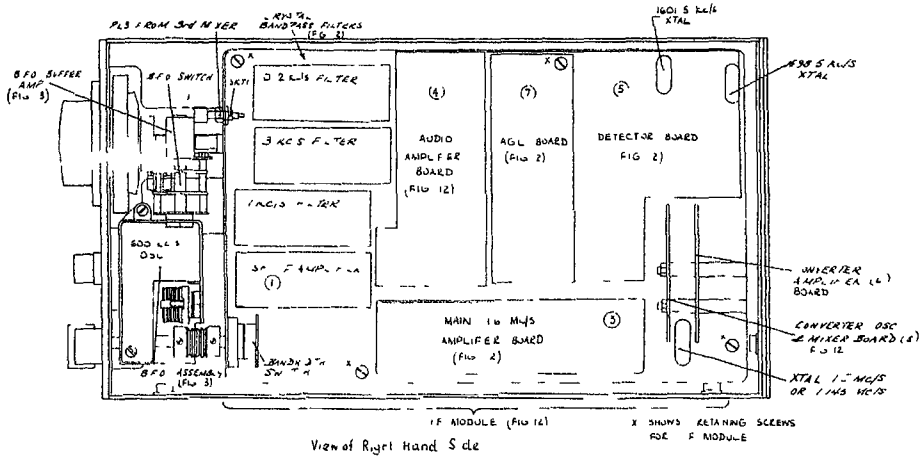


View on Chassis underside

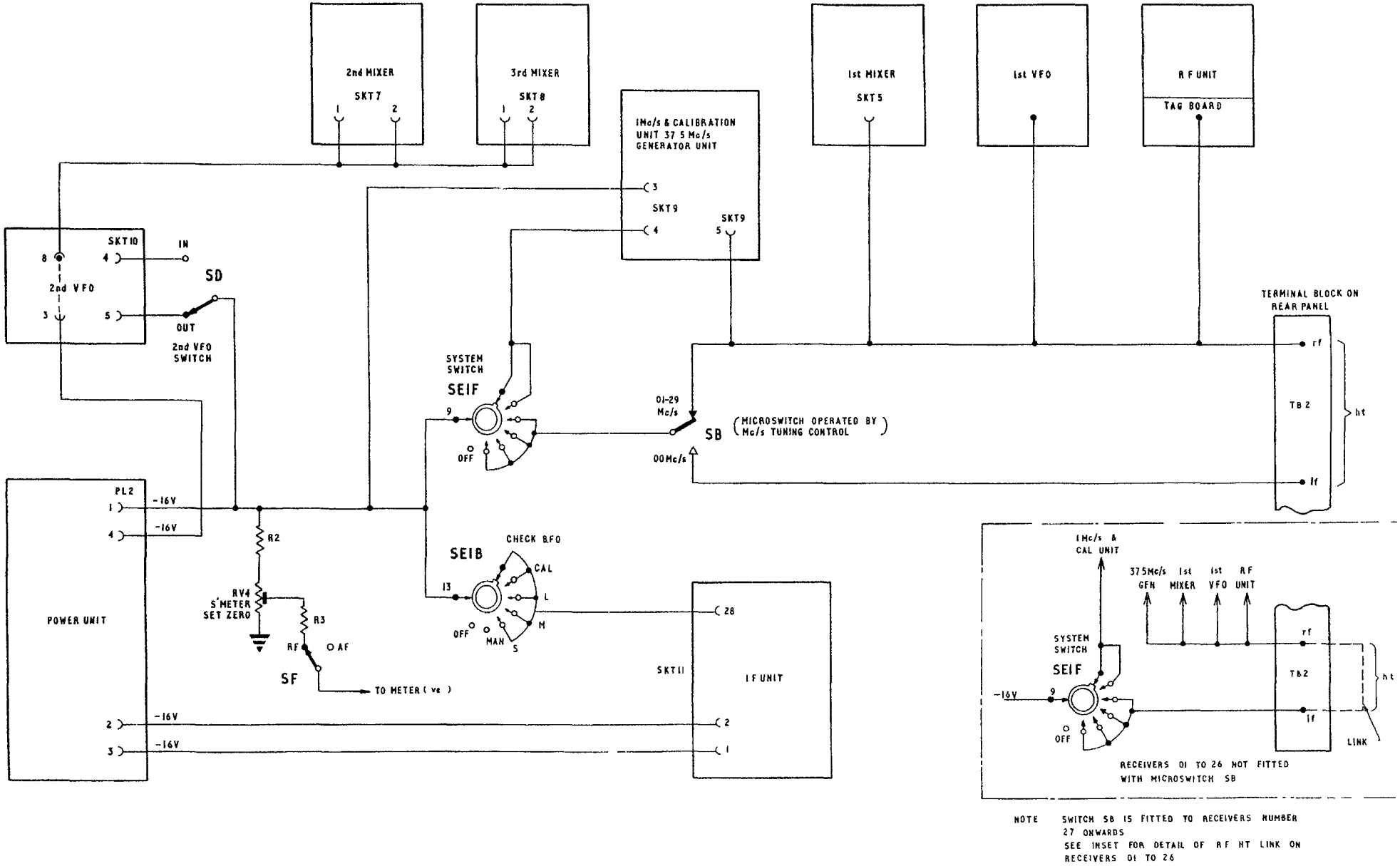
NOTE THIS ILLUSTRATION IDENTIFIES ONLY THE PRINCIPAL FEATURES OF THE RECEIVER FOR IDENTIFICATION OF COMPONENTS WITHIN THE MODULES REFER TO COMPONENT LAYOUT ILLUSTRATIONS IN THE MAINTENANCE HANDBOOK



View of Left Hand Side



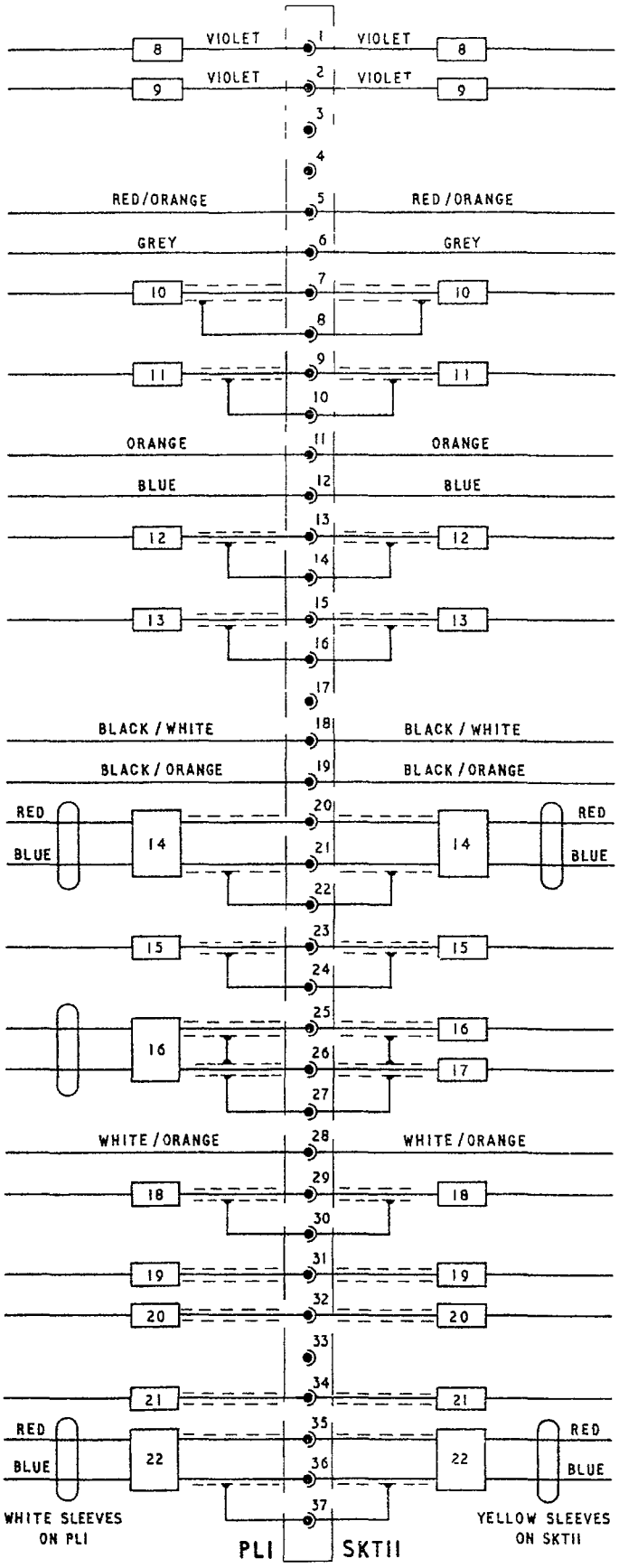
View of Right Hand Side

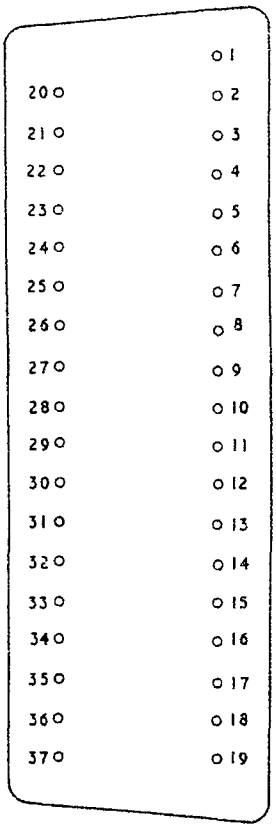


NOTE SWITCH SB IS FITTED TO RECEIVERS NUMBER 27 ONWARDS
SEE INSET FOR DETAIL OF R F HT LINK ON RECEIVERS 01 TO 26

Interconnecting Diagram : 16 Volt Supplies RA.217

Fig.17





PLI
CANNON PLUG TYPE DCM375
PIN IDENTIFICATION

NOTE:
CERTAIN LEADS CARRY NUMBERED SLEEVES AS SHOWN, TO ASSIST CIRCUIT TRACING

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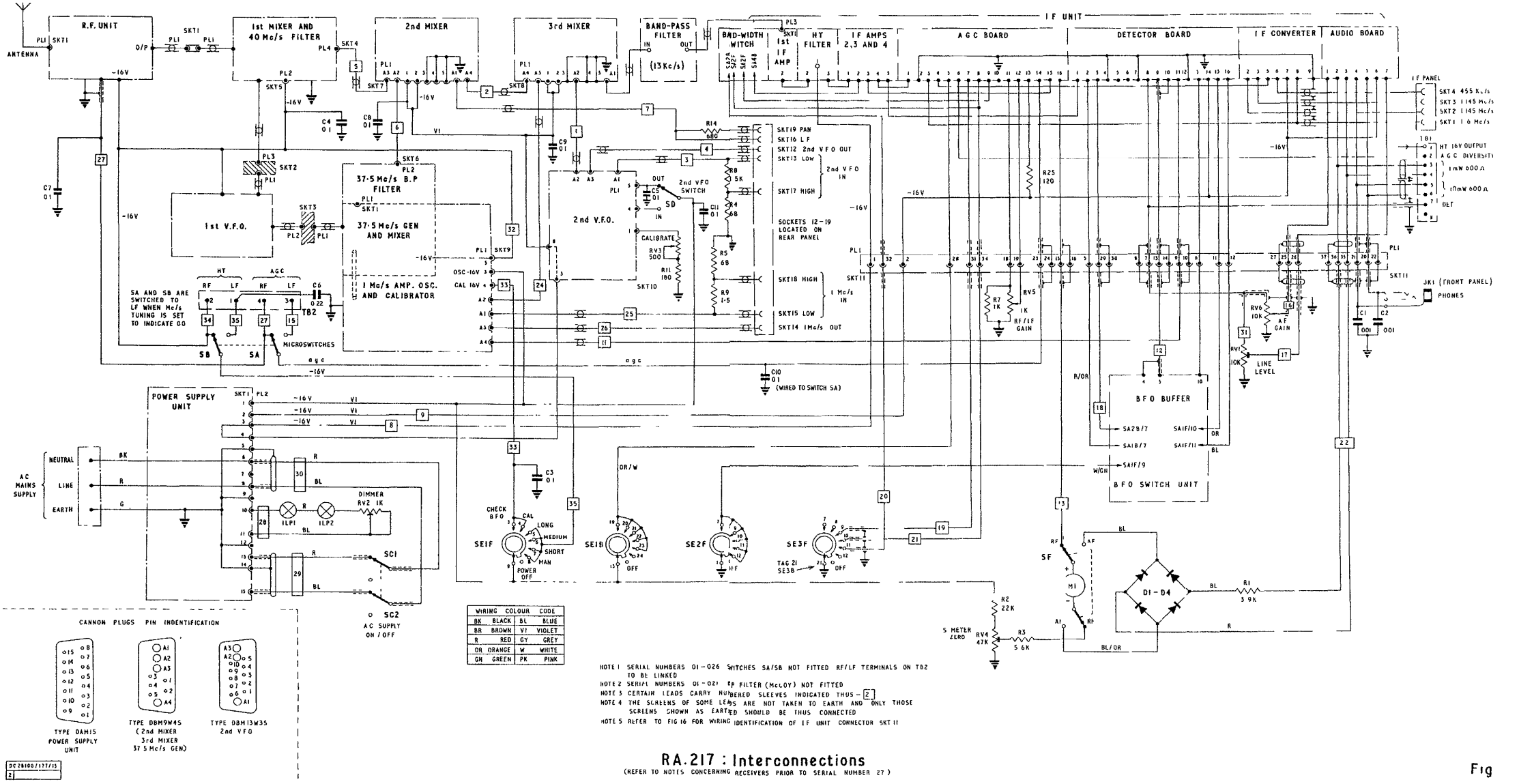
I.F. Unit Connector-RA.217

Fig.16



WIRING	COLOUR	CODE	
BK	BLACK	BL	BLUE
BR	BROWN	V	VIOLET
R	RED	GY	GREY
OR	ORANGE	W	WHITE
GN	GREEN	PK	PINK

CANNON PLUGS PIN INDENTIFICATION

TYPE DAM15 POWER SUPPLY UNIT

TYPE DBM9W4S (2nd MIXER 3rd MIXER 37·5 Mc/s GEN)

TYPE DBM13W3S 2nd V.F.O.

NOTE 1 SERIAL NUMBERS 01-026 SWITCHES SA/SB NOT FITTED RF/LF TERMINALS ON TB2 TO BE LINKED

NOTE 2 SERIAL NUMBERS 01-021 IF FILTER (McCOY) NOT FITTED

NOTE 3 CERTAIN LEADS CARRY NUMBERED SLEEVES INDICATED THUS - 2

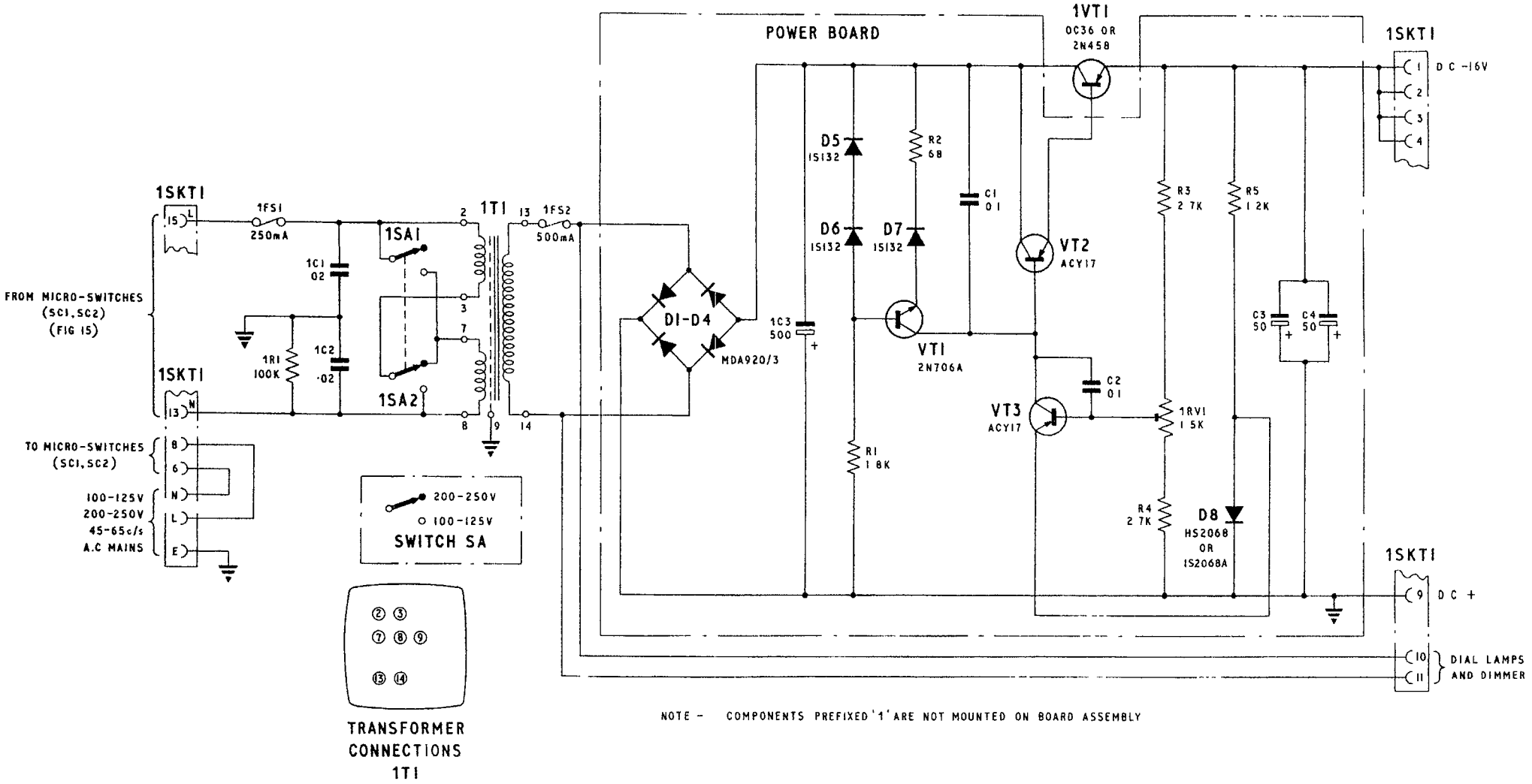
NOTE 4 THE SCREENS OF SOME LEADS ARE NOT TAKEN TO EARTH AND ONLY THOSE SCREENS SHOWN AS EARTHED SHOULD BE THUS CONNECTED

NOTE 5 REFER TO FIG 16 FOR WIRING IDENTIFICATION OF IF UNIT CONNECTOR SKT 11

RA.217 : Interconnections

(REFER TO NOTES CONCERNING RECEIVERS PRIOR TO SERIAL NUMBER 27)

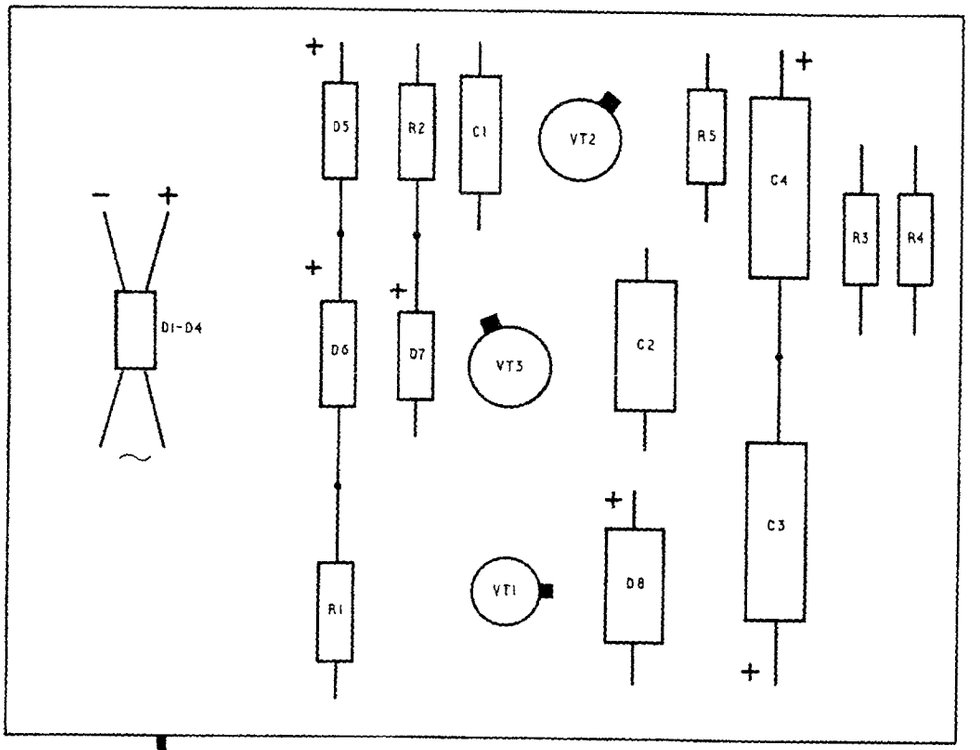
Fig



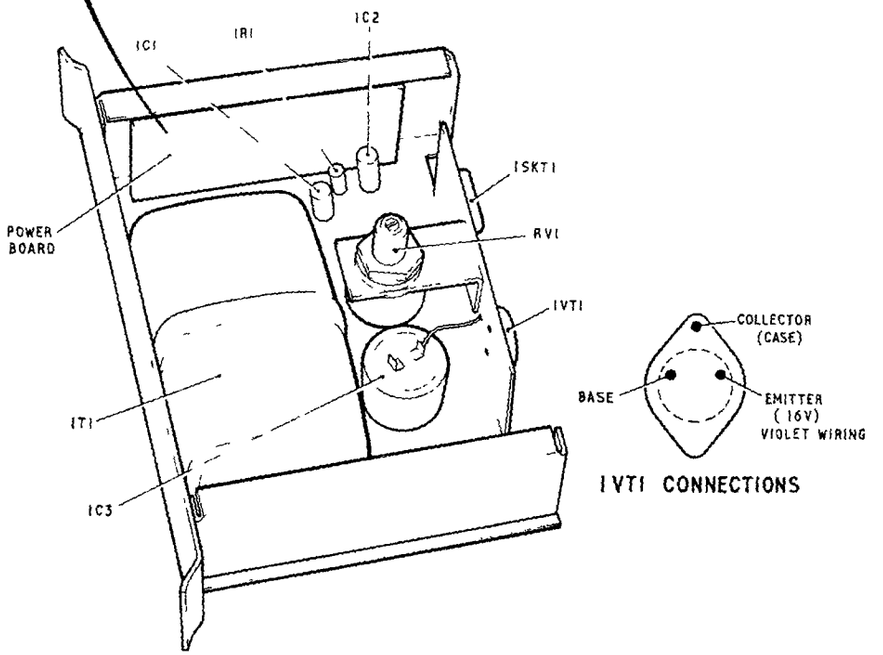
NOTE - COMPONENTS PREFIXED '1' ARE NOT MOUNTED ON BOARD ASSEMBLY

Circuit-Power Unit Type 408A

Fig.14



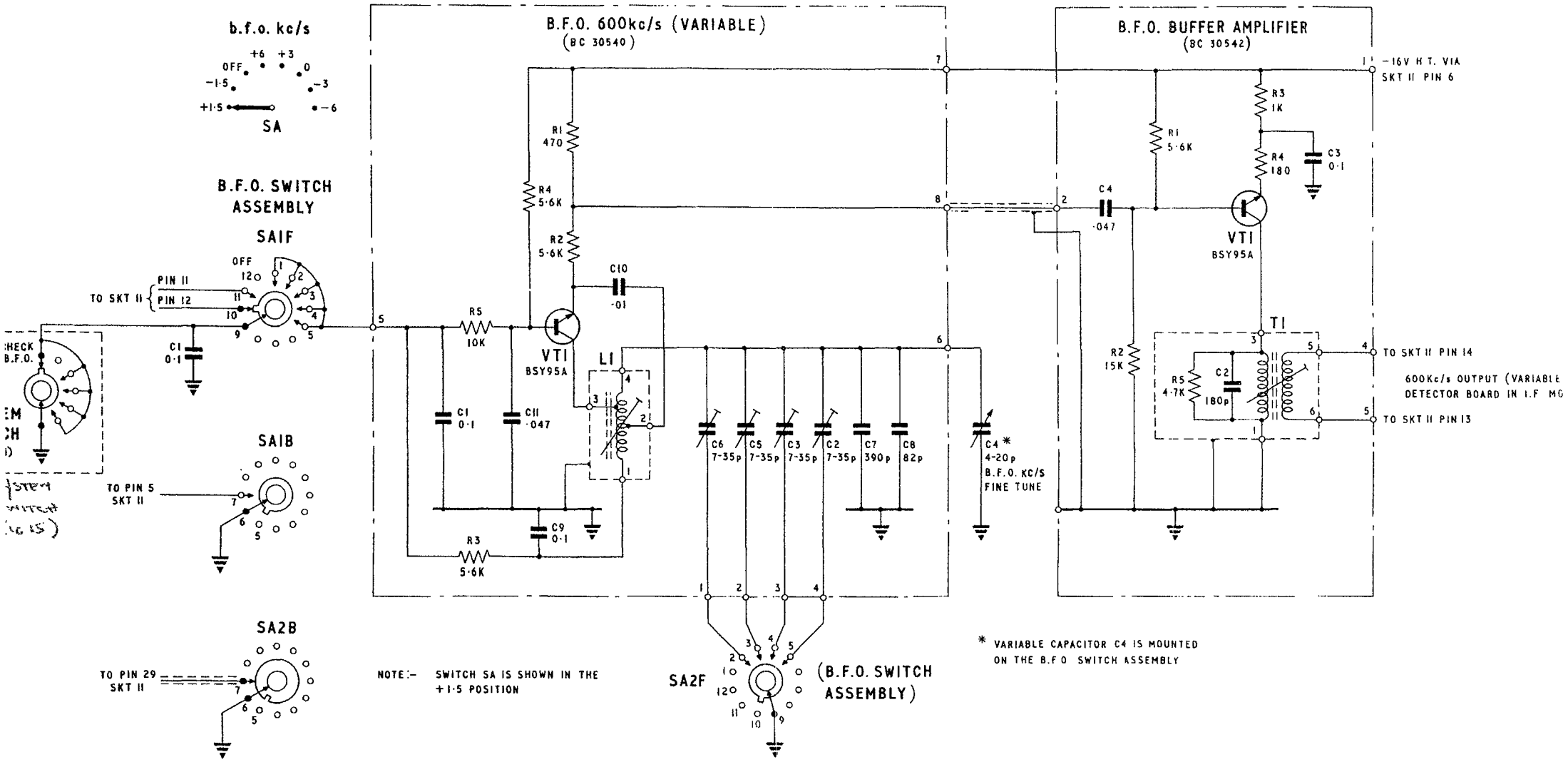
POWER COMPONENT BOARD



IVT1 CONNECTIONS

MODULE LAYOUT

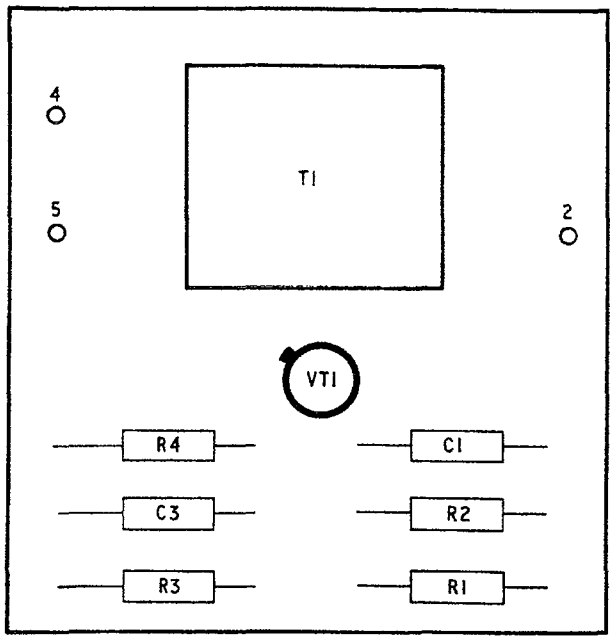
Layout: Power Unit Type 408A Fig.L-14



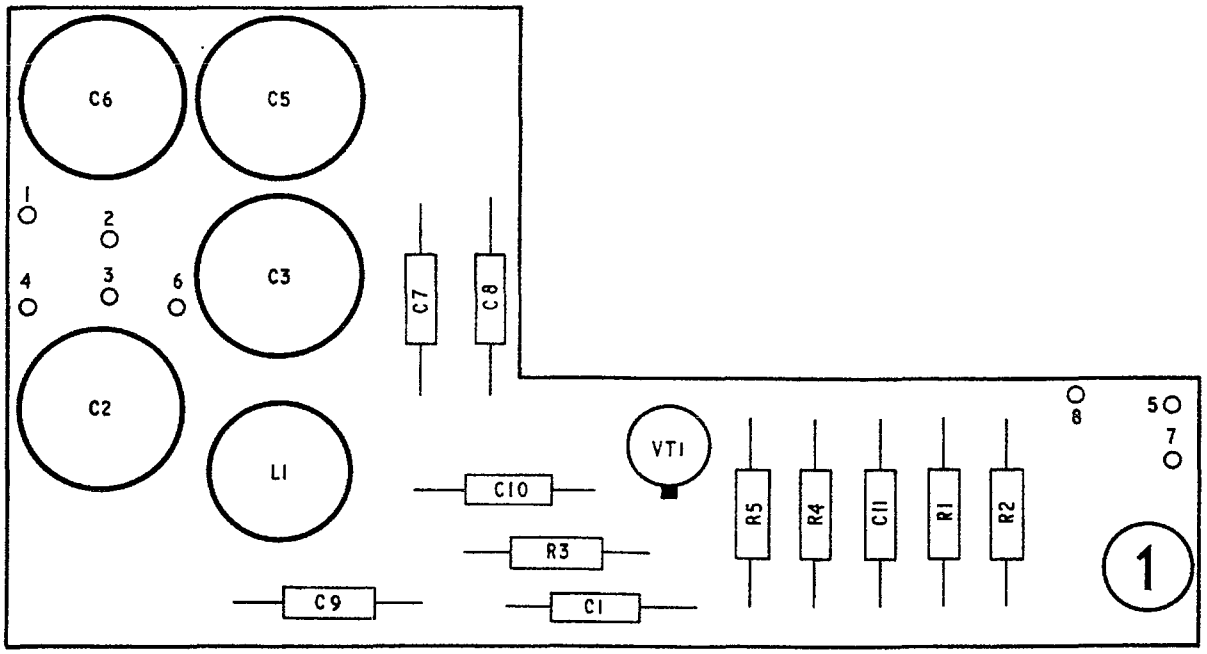
BC28259	177/13

Circuit : B.F.O. Unit

Fig



B.F.O. Amplifier
(B.C.30542)



600Kc/s Oscillator
(B.C.30540)

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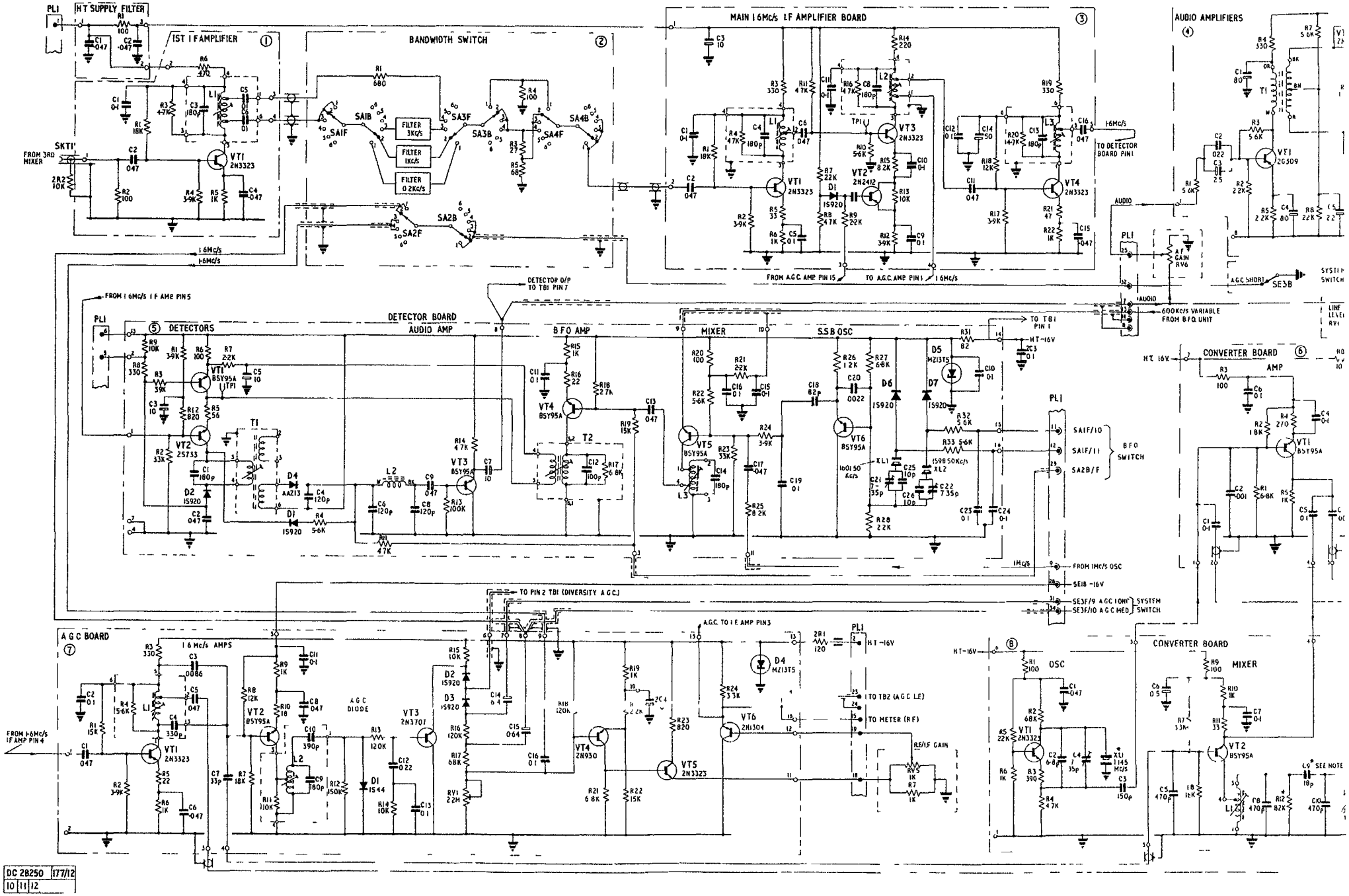
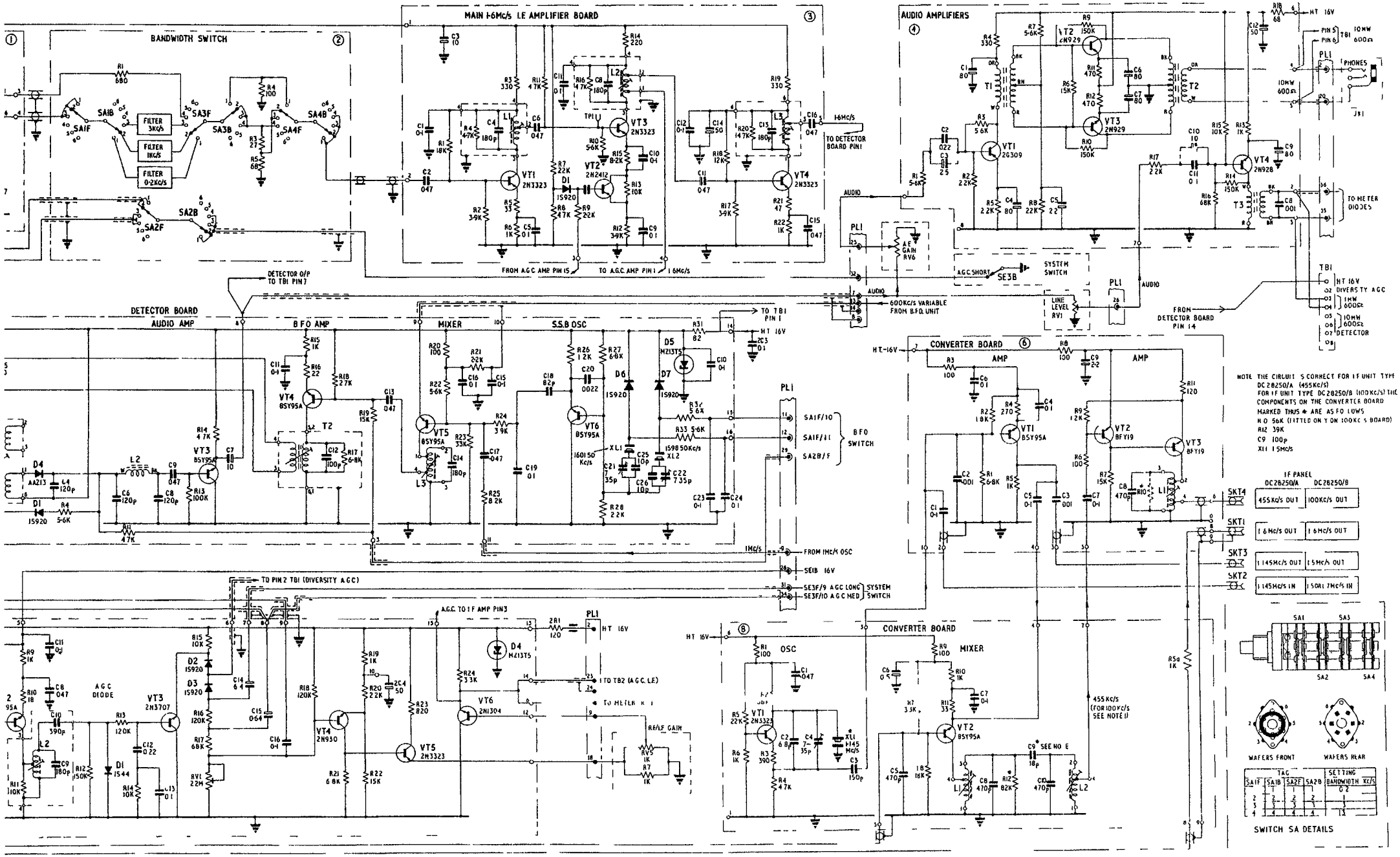
Component Layout B.F.O.

Fig.L-13



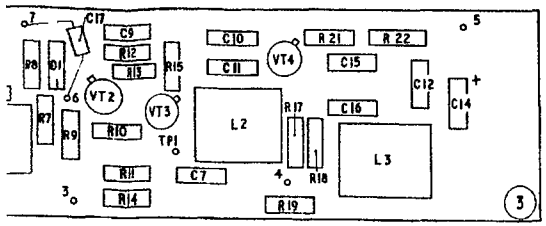
Circuit : I.F. Unit

Fig 12

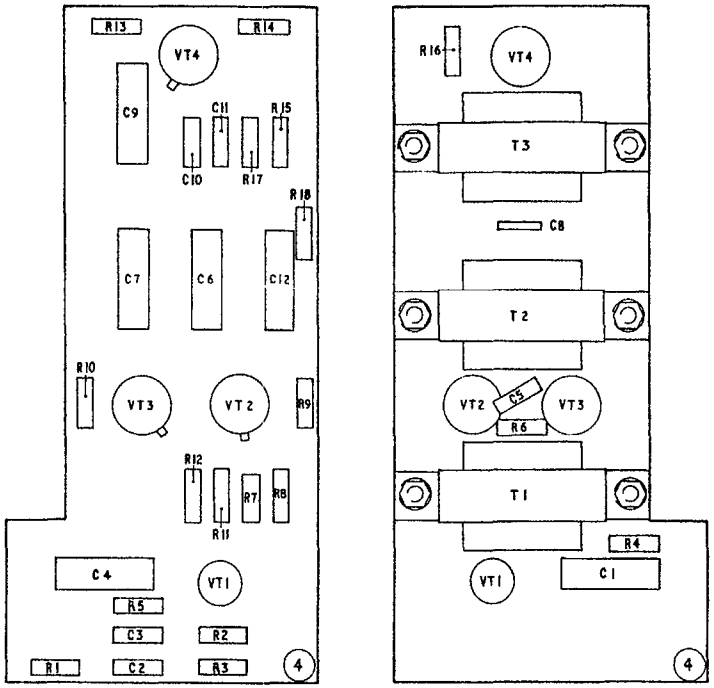


Circuit : I.F. Unit

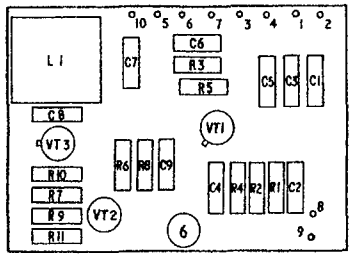
Fig.12



MAIN I.F. AMPLIFIER BOARD

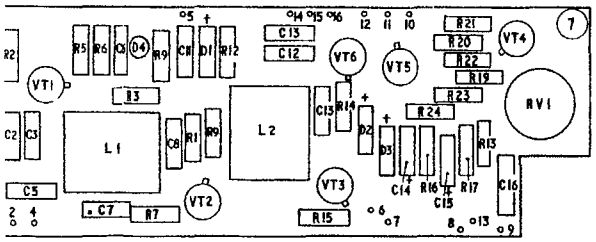


FRONT REAR



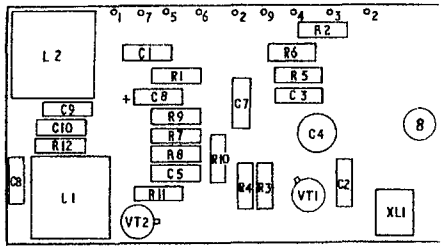
NOTE THE 455 KC/S BOARD IS IDENTICAL EXCEPT THAT R10 IS OMITTED

100 KC/S CONVERTER: AMPLIFIER



AG.C. BOARD

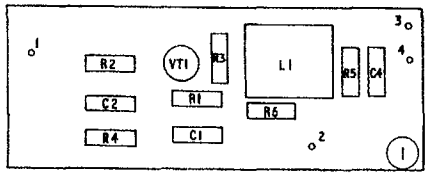
AUDIO AMPLIFIER BOARD



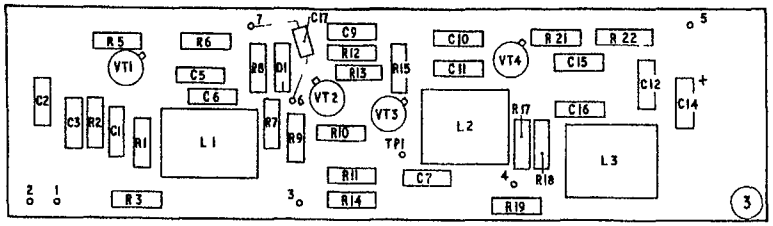
CONVERTER: OSCILLATOR AND MIXER

Component Layout: IF Unit
(D.C. 28250)

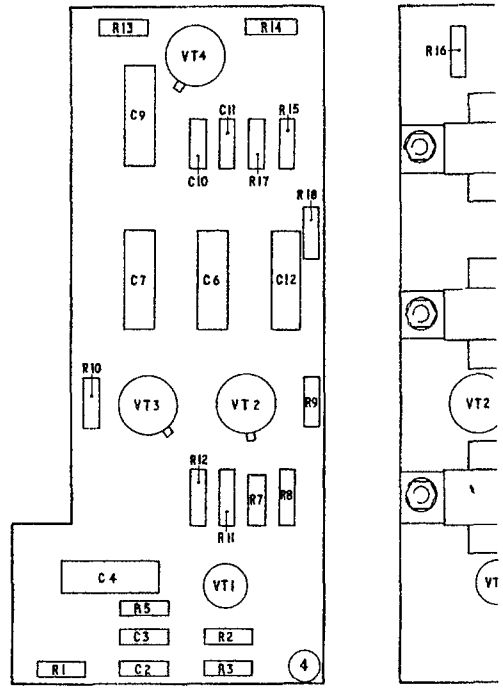
Fig. L-1.



1ST. I.F. AMPLIFIER BOARD

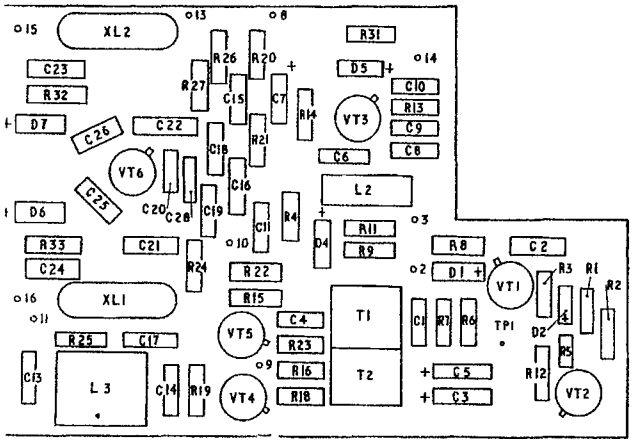


MAIN I.F. AMPLIFIER BOARD

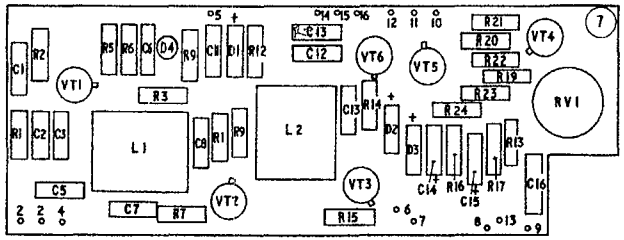


FRONT

AUDIO AMPLIFIER BOARD



DETECTOR BOARD



AGC. BOARD

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Component Layout: IF Unit
(D.C.28250)

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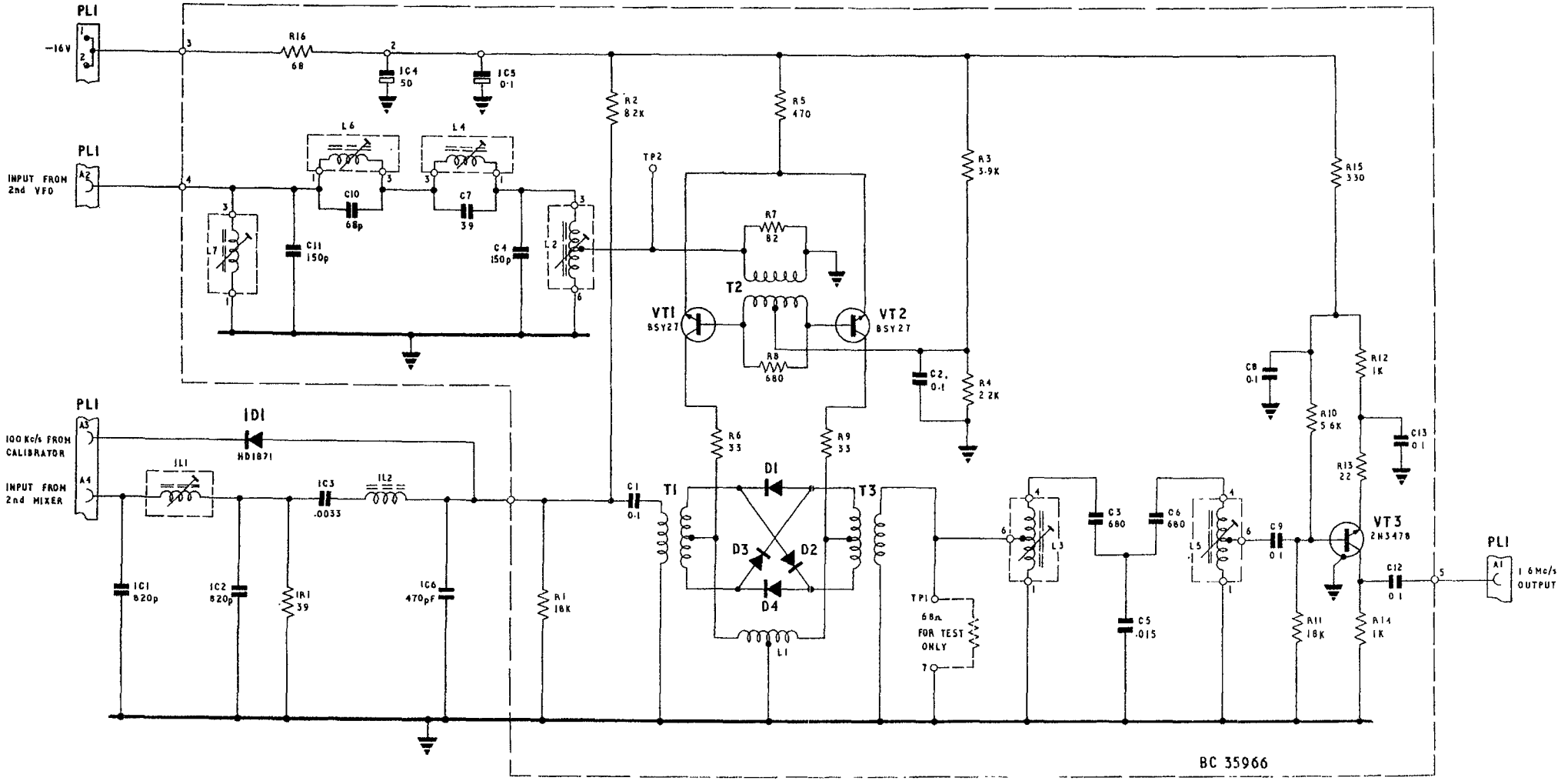
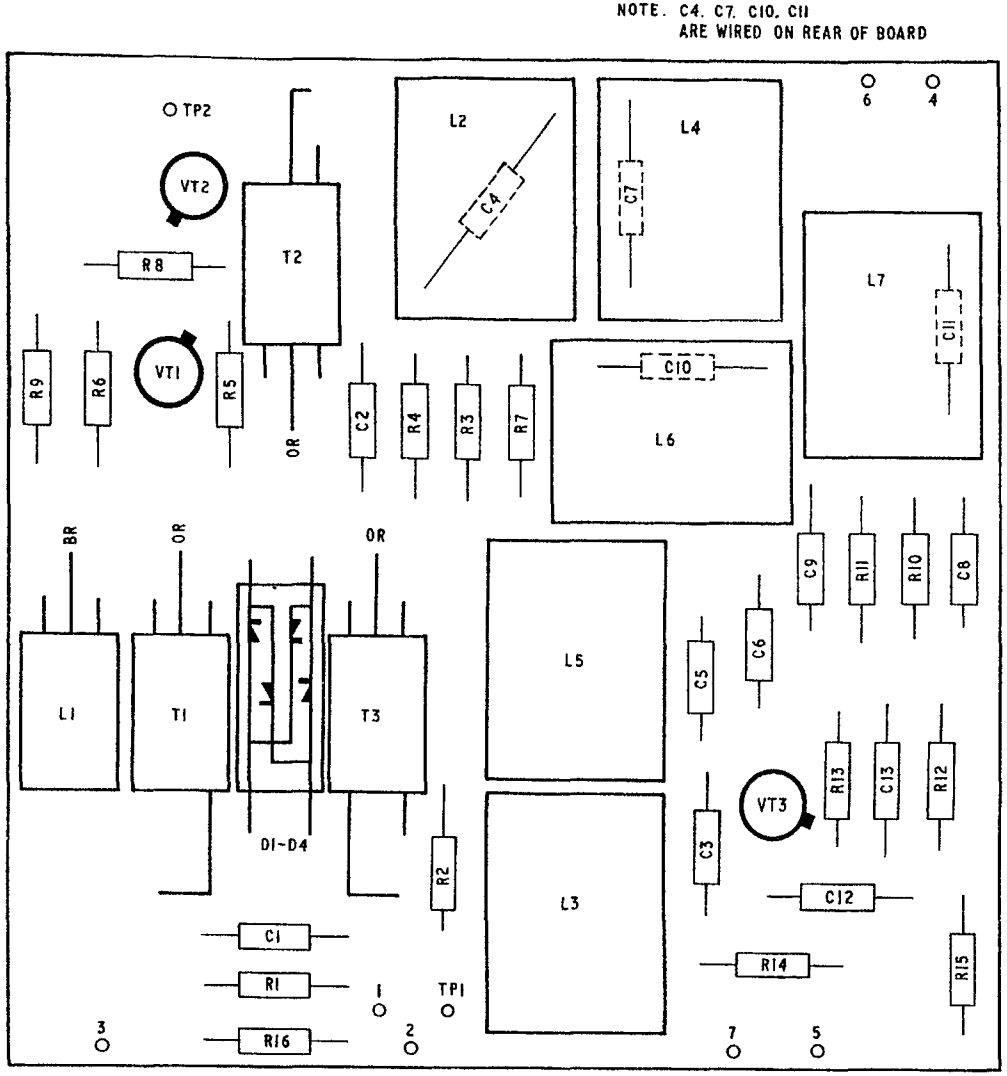


NOTE COMPONENTS PREFIXED 'I' ARE MOUNTED ON THE MODULE BUT NOT ON THE CIRCUIT BOARD

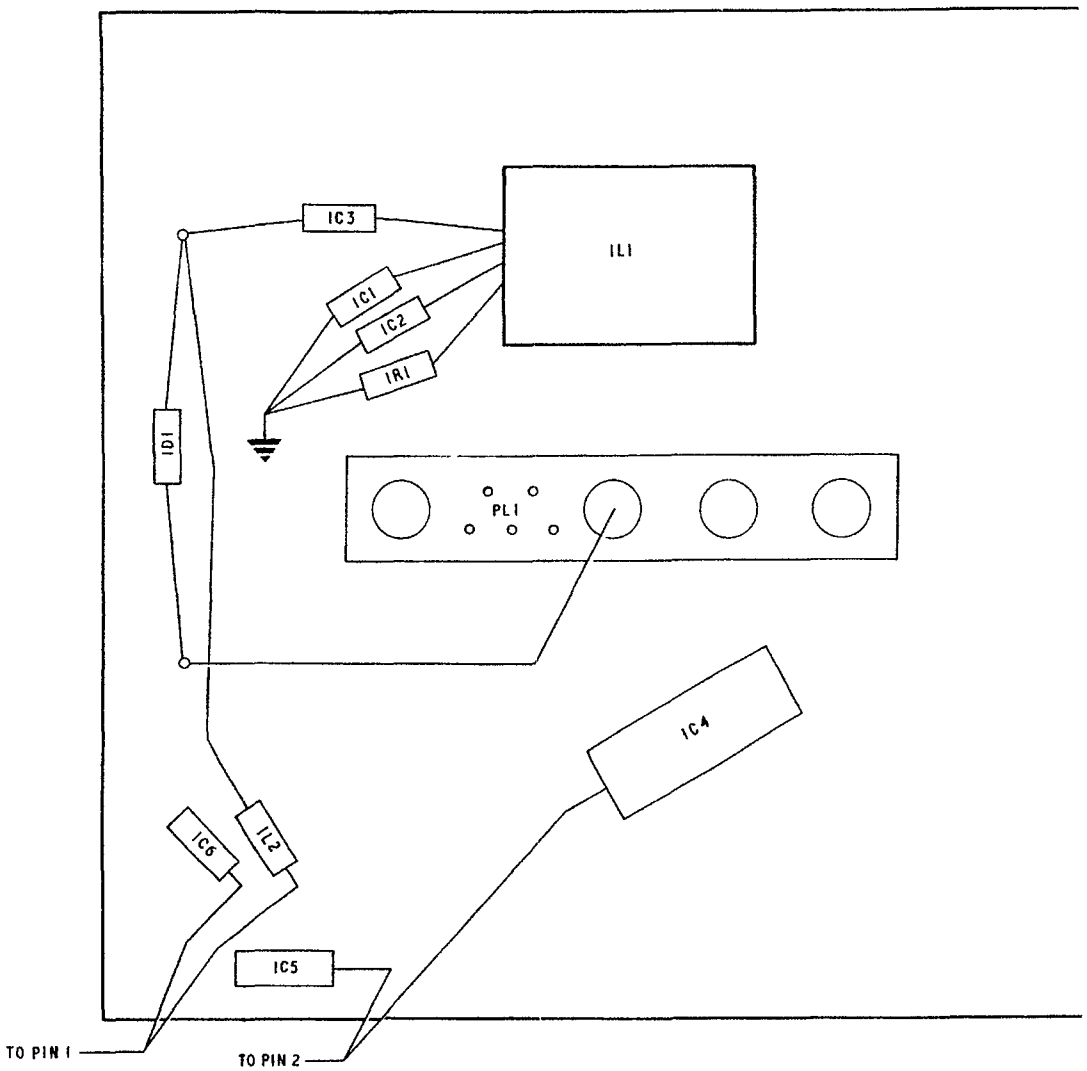
BC35970 | 177/11
1 | 5 | 6

Circuit : 3rd Mixer

Fig. 11



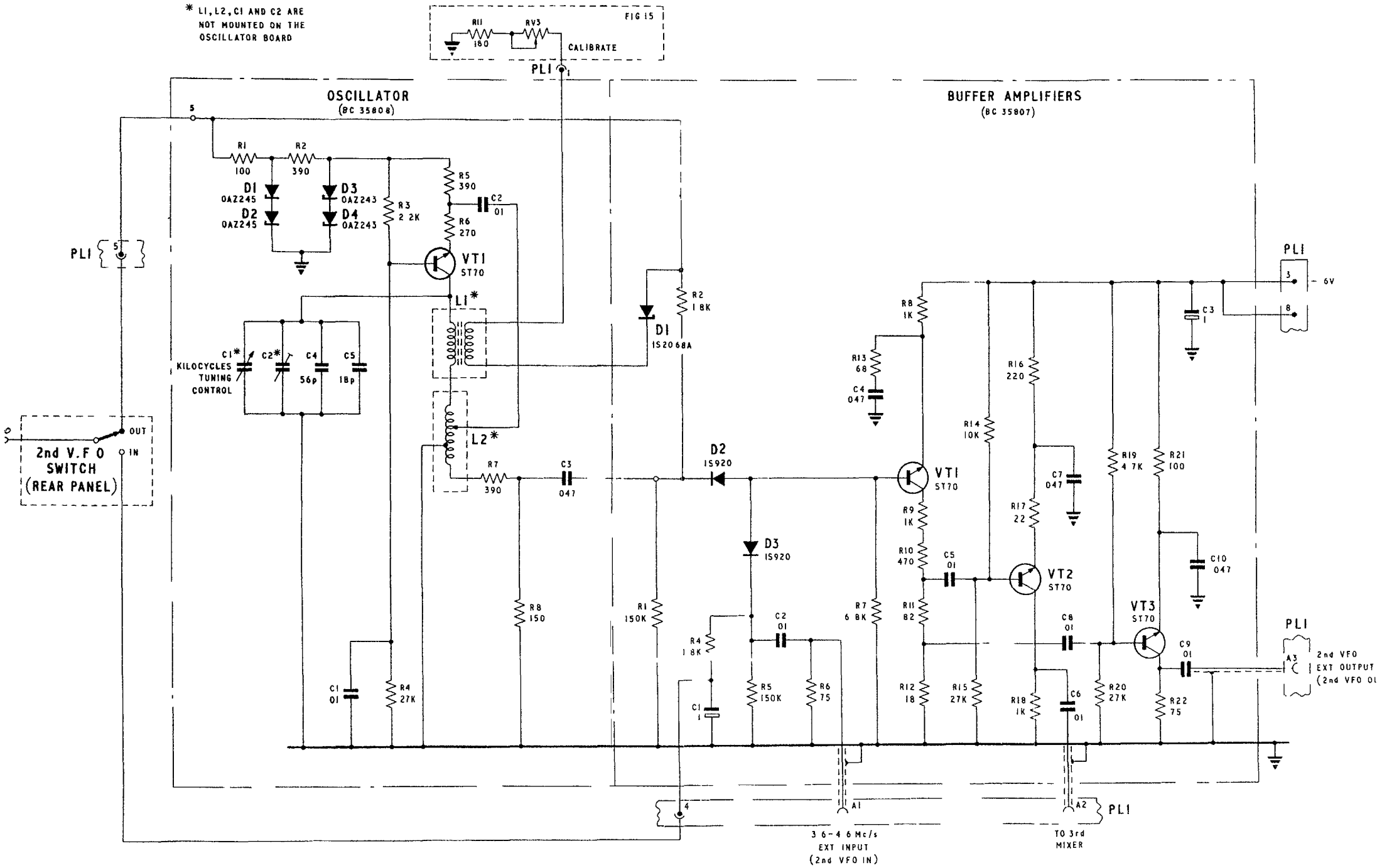
MIXER BOARD
(BC 35966)



MODULE COMPONENTS

Component Layout 3rd Mixer

Fig. L-1

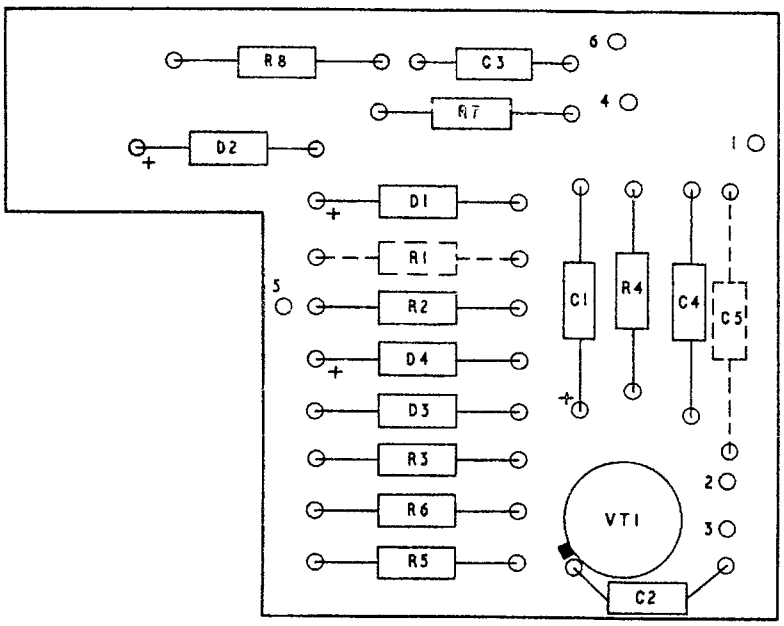


CC28101 177/10

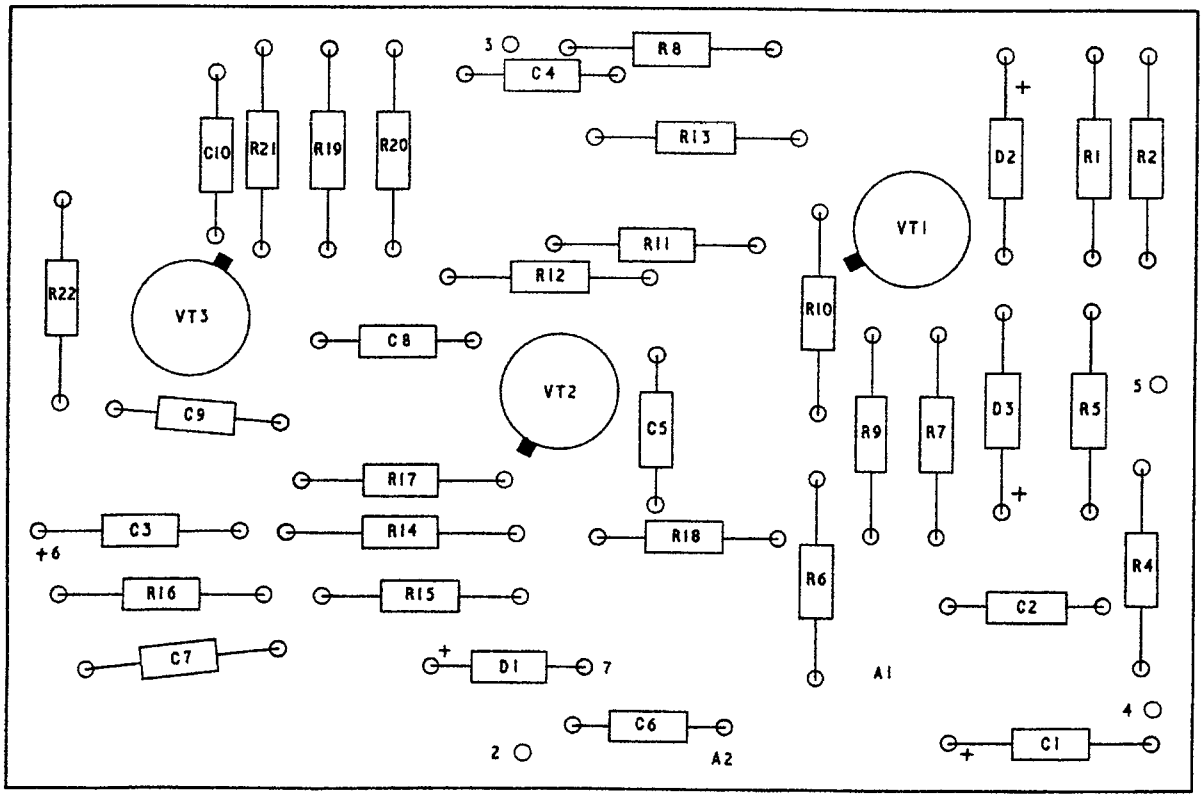
3 5

Circuit . 2nd V F.O.

Fig



OSCILLATOR BOARD
(BC.35808)



AMPLIFIER BOARD
(BC.35807)

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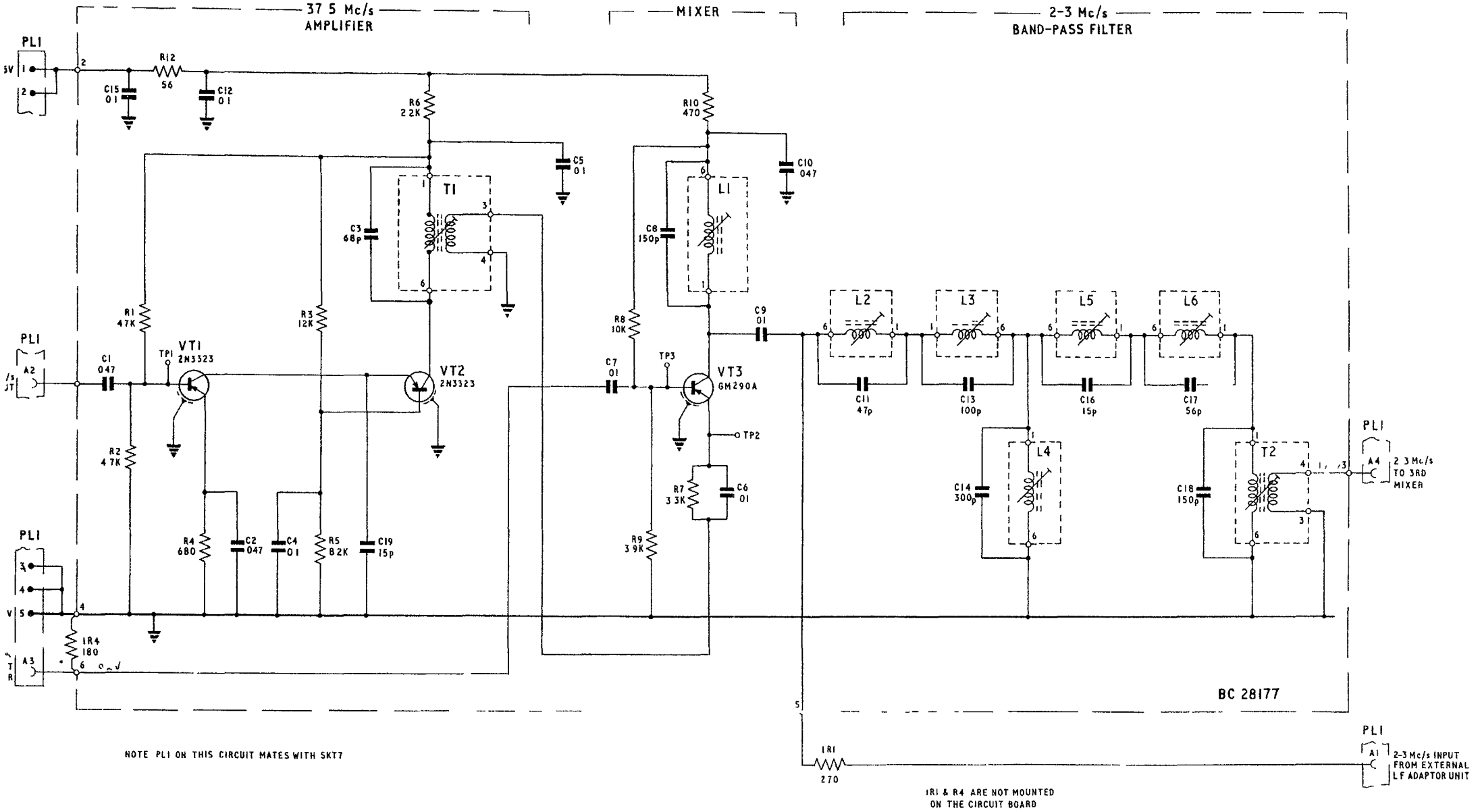
Component Layouts: 2nd V.F.O

Fig.L-10



NOTE PL1 ON THIS CIRCUIT MATES WITH SKT7

1R1 & R4 ARE NOT MOUNTED
ON THE CIRCUIT BOARD

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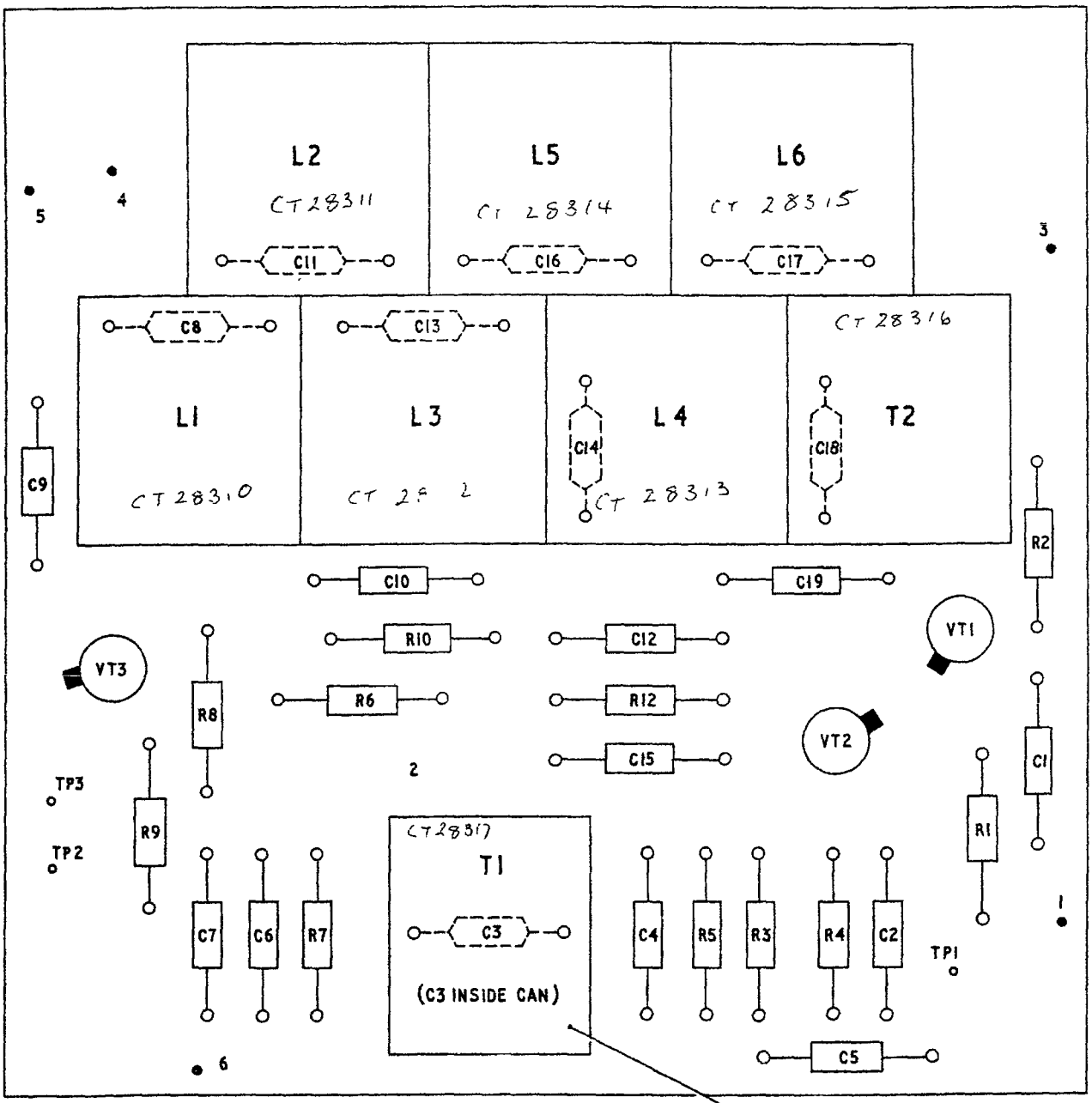
Circuit : 2nd Mixer

NOTE: CAPACITORS C8, C11, C13, C14, C14, C17 AND C18 ARE WIRED ON REAR OF BOARD



2nd. MIXER
BC. 28177

NOTE :
A BLUE SPOT ON T1 INDICATES THAT C3 IS WIRED ON THE TRACK SIDE OF THE BOARD.

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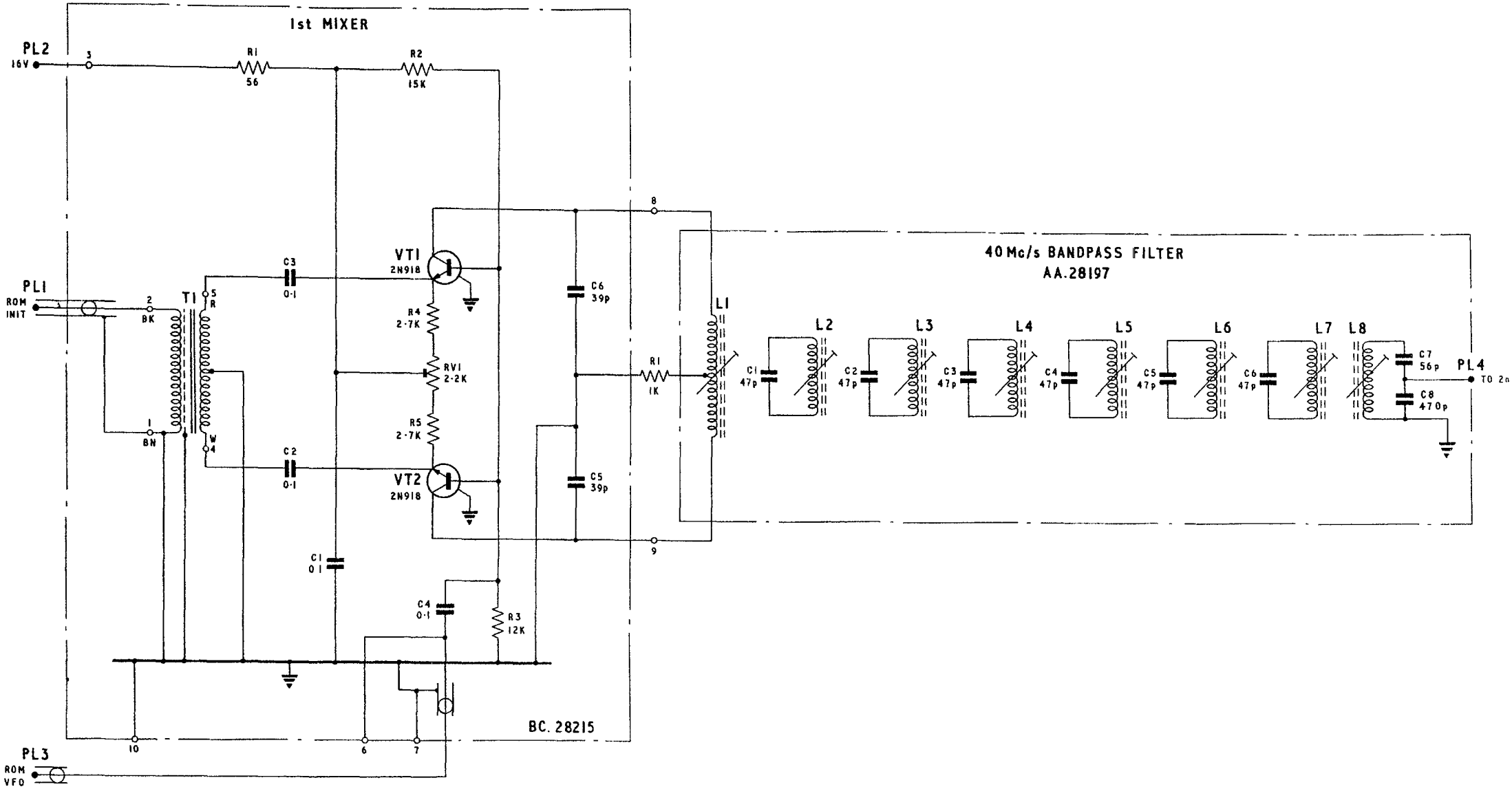
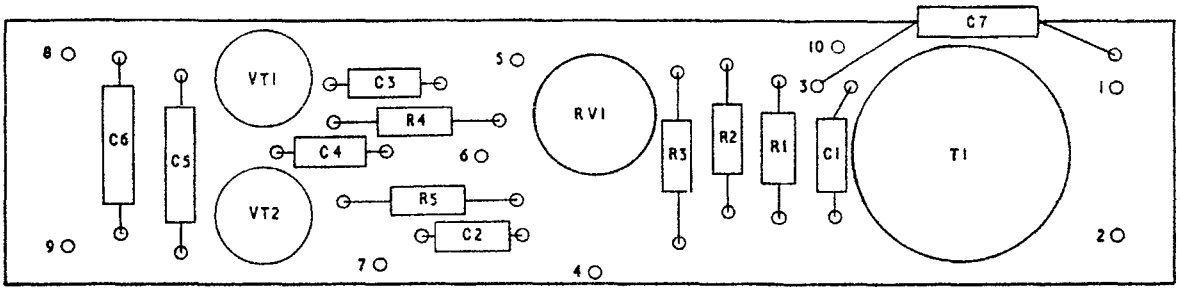
Component Layout : 2nd Mixer Fig.L-9



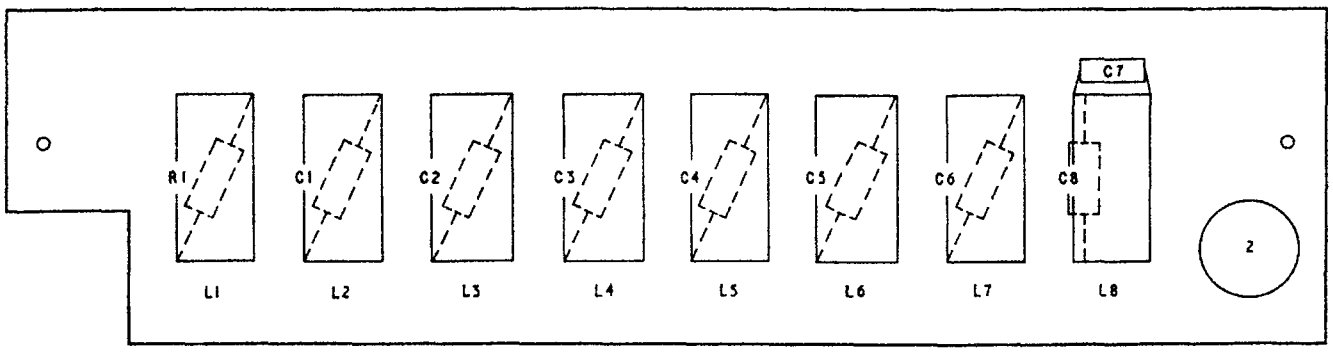
BC28211	177/3
2 4	

Circuit : 1st Mixer and 40Mc/s Filter

Fig.

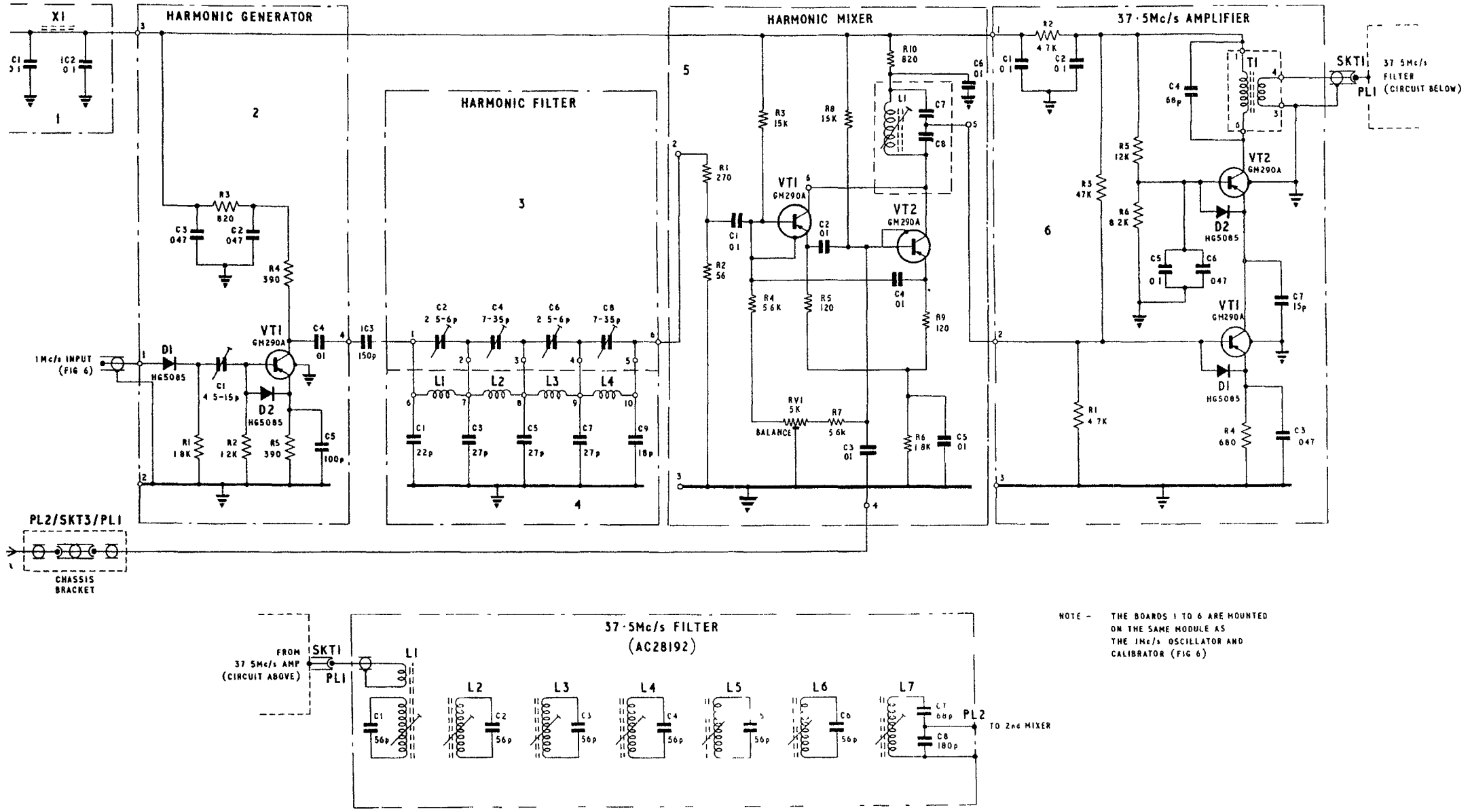


1st MIXER
(BC.28215)



40 Mc/s FILTER
(AC.28197)

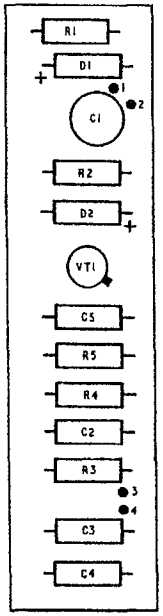
177/26 Component Layout : 1st Mixer and 40 Mc/s Filter Fig.L-8



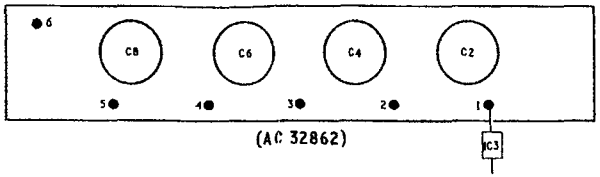
NOTE – THE BOARDS 1 TO 6 ARE MOUNTED ON THE SAME MODULE AS THE 1Mc/s OSCILLATOR AND CALIBRATOR (FIG 6)

Circuits: Harmonic Generator Mixer and 37·5Mc/s Filter (37·5Mc/s Generator)

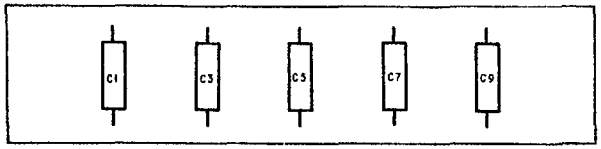
Fig. 7

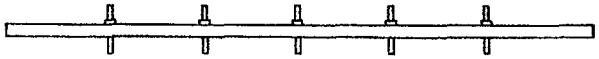


HARMONIC GENERATOR
(AC 32854)

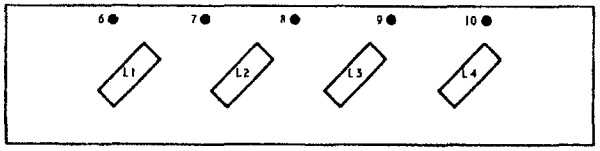


(AC 32862)

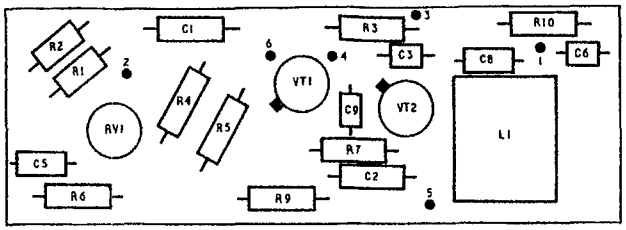




(AC 35836)

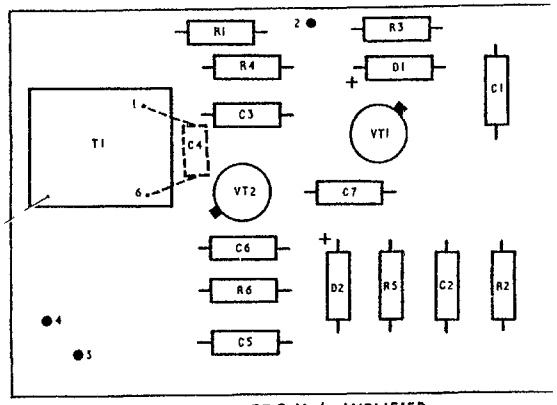


HARMONIC FILTER
ASSEMBLY (BA 35836)

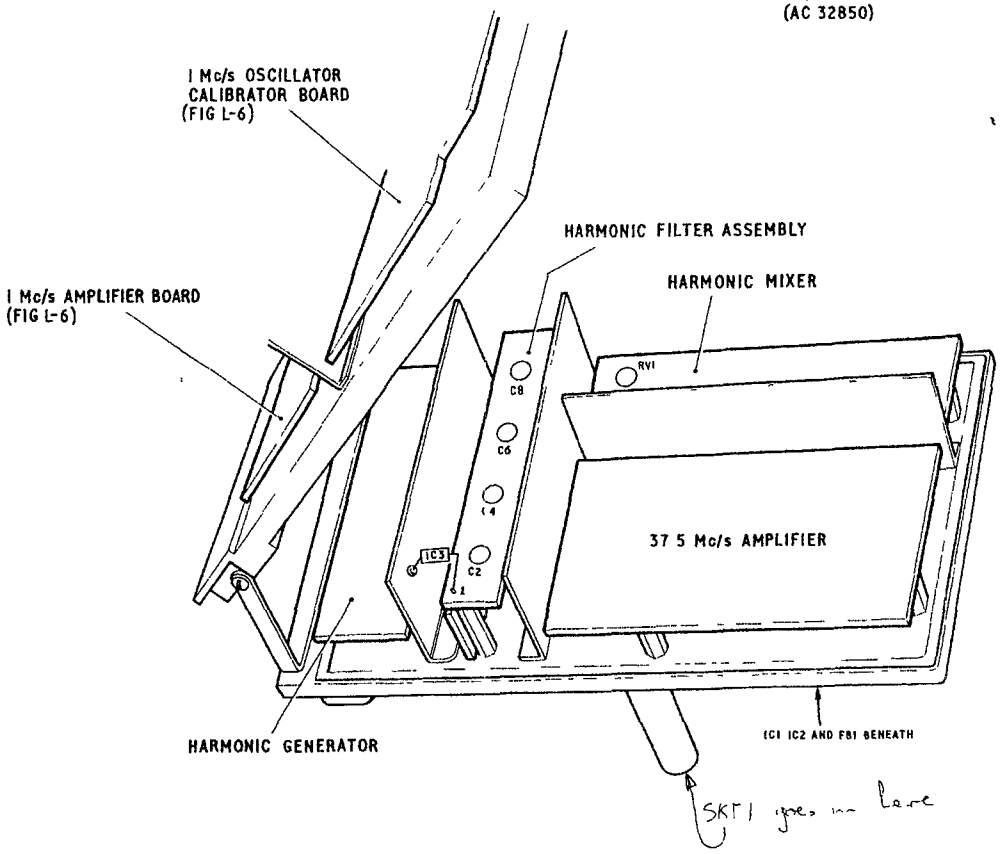


HARMONIC MIXER
(AC 37894)

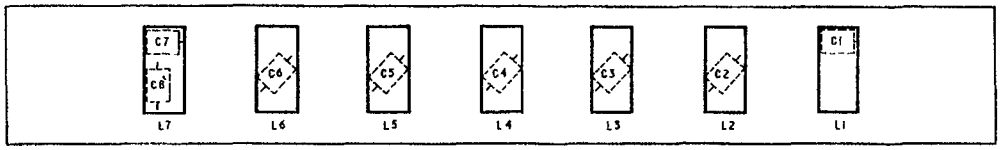
A BLUE SPOT ON T1
INDICATES C4 WIRED
ON TRACK SIDE
OF BOARD



37 5 Mc/s AMPLIFIER
(AC 32850)



NOTE CAPACITORS C1 TO C8 ARE MOUNTED ON THE REAR OF THE BOARD



37 5 Mc/s FILTER UNIT
(AC.28192)

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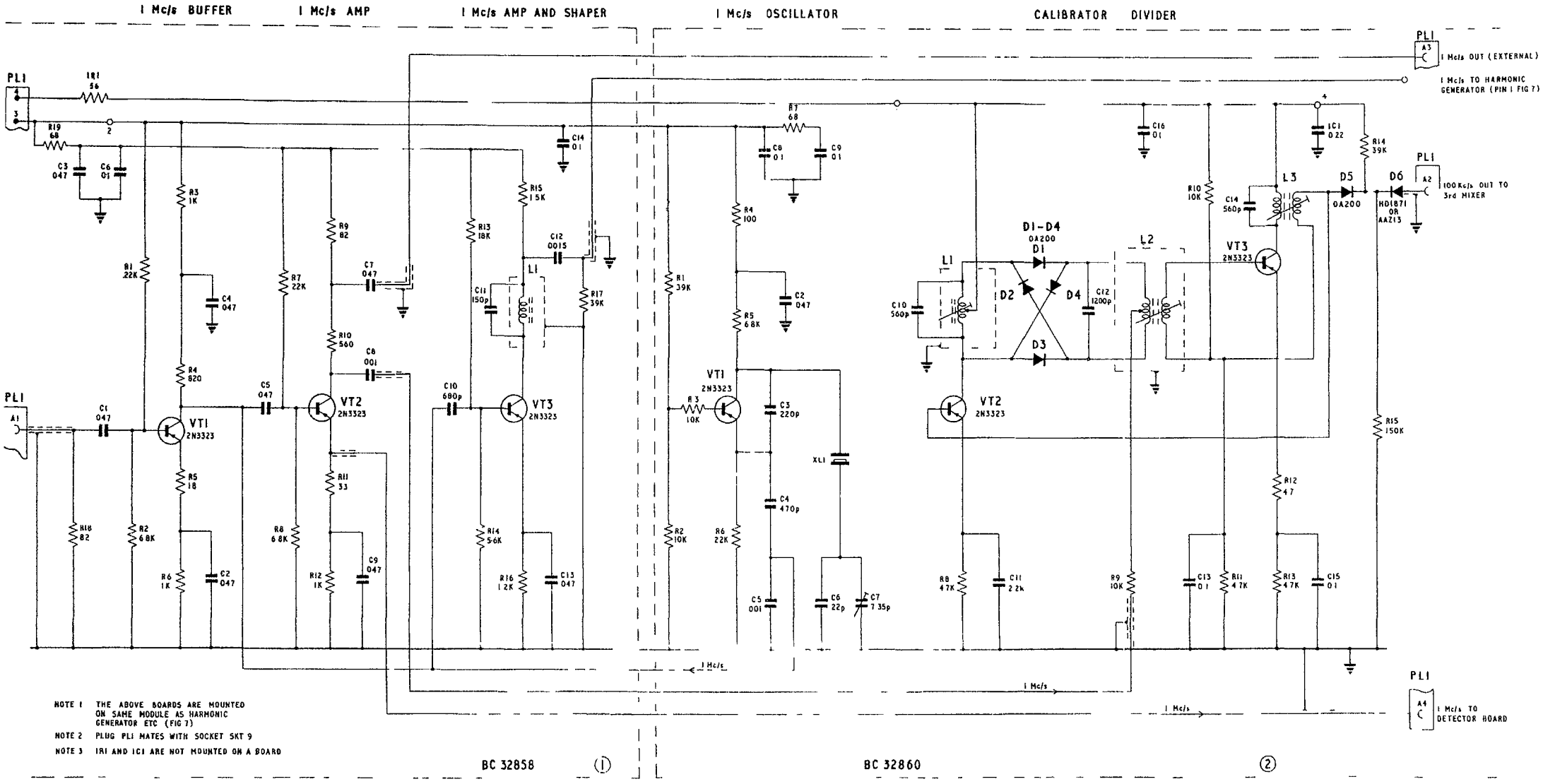
Component Layouts: 37·5 Mc/s Generator and 37·5 Mc/s Filter Unit

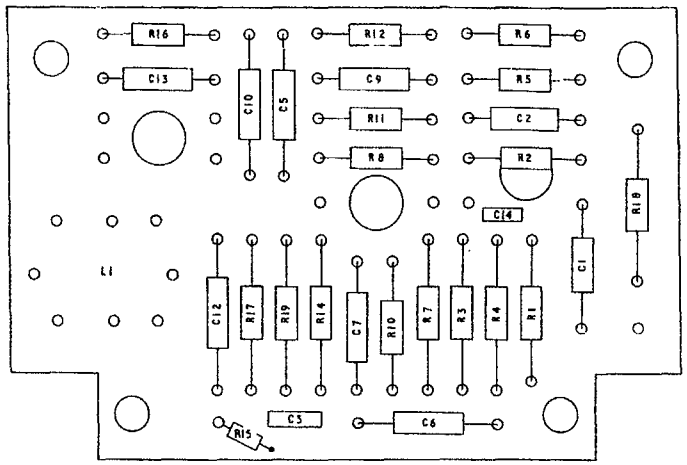
Fig. L



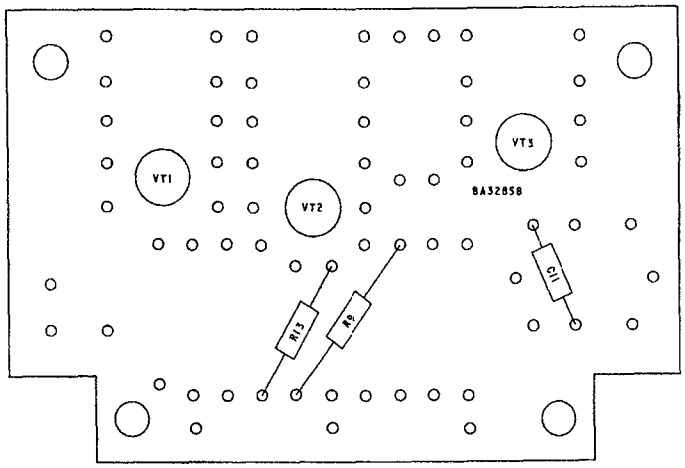
CC20285	177/6
9 | 11 | 12	

Circuit 1Mc/s Amplifiers, Oscillator and Calibrator

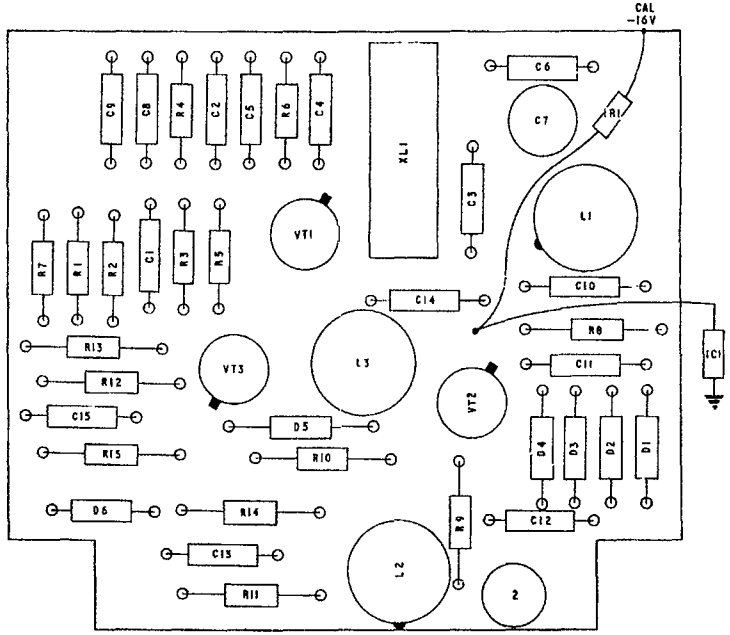
Fig 6



(Rear of Board)
1 Mc/s AMPLIFIERS
(BC32828)



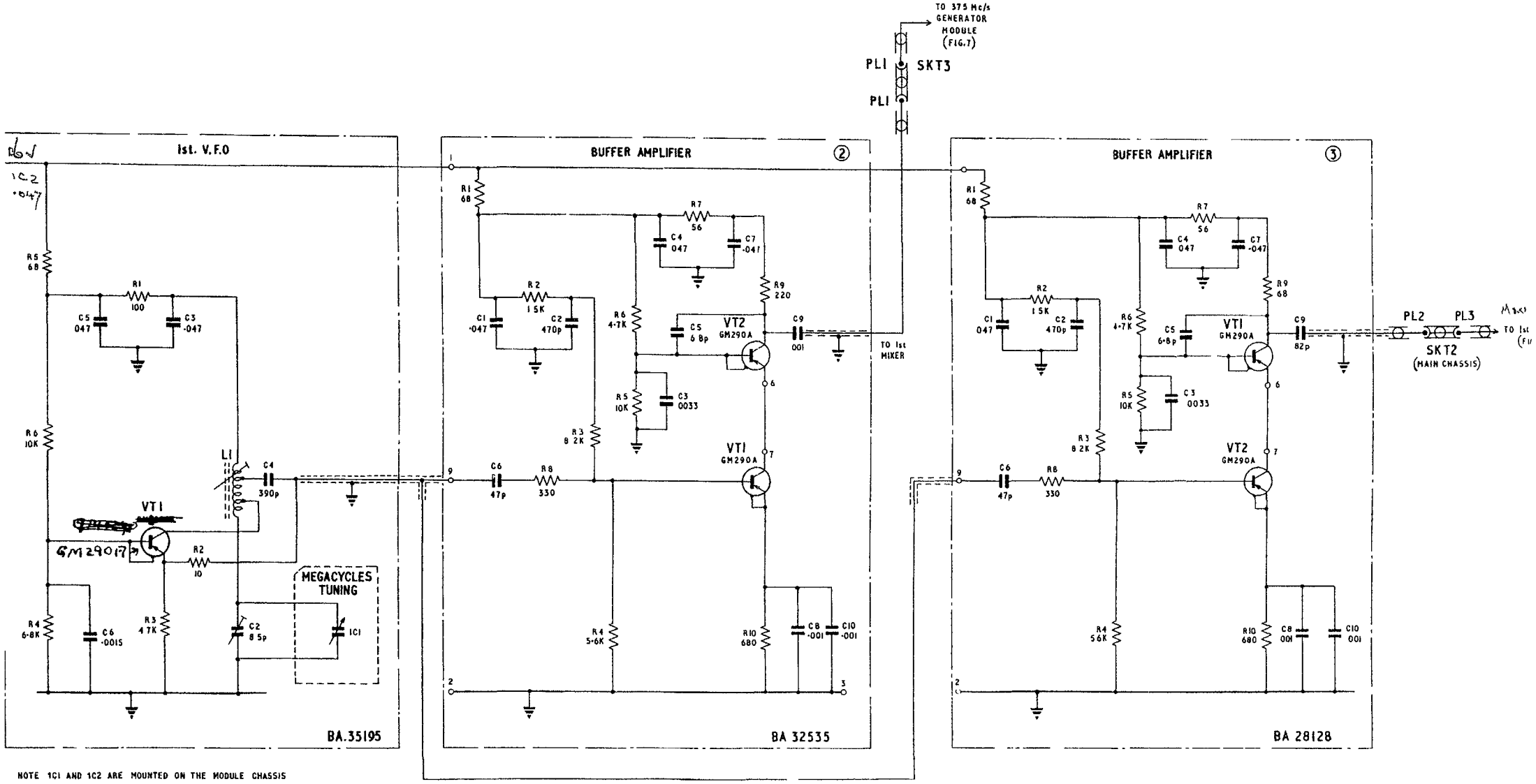
(Front of Board)
1 Mc/s AMPLIFIERS
(BC32858)



1 Mc/s OSCILLATOR AND CALIBRATOR
(BC32860)

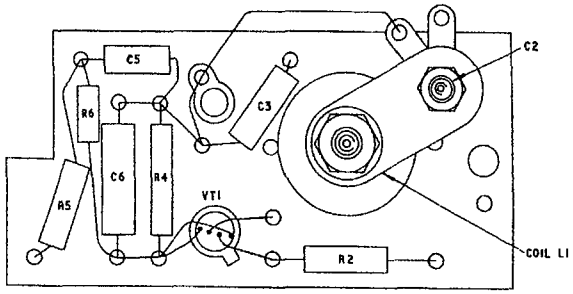
Layout: 1 Mc/s Amp. Oscillator and Calibrator

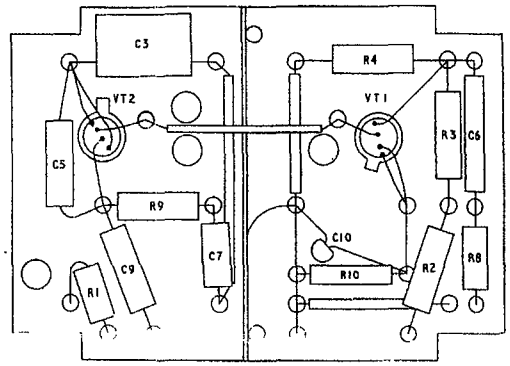
Fig.L-6



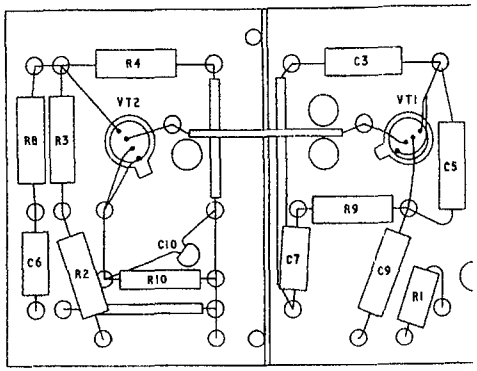
Circuit: 1st. V. F. O

Fig

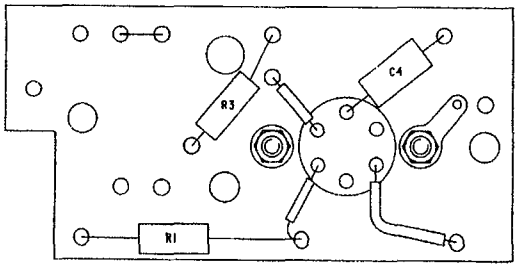




NOTE THIS BOARD IS CONTAINED IN THE RECTANGULAR BOX

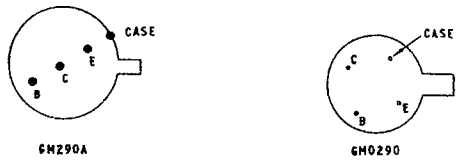


NOTE THIS BOARD IS ATTACHED TO THE UNDERSIDE OF THE 1st VFO CHASSIS

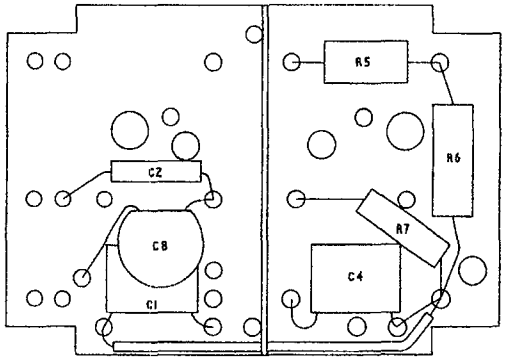


OSCILLATOR
(B.A. 35195)

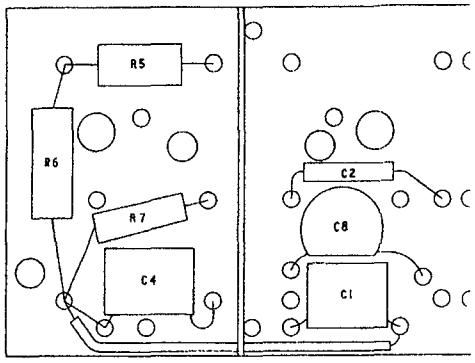
NOTE. A FEW EARLY PRODUCTION BOARDS ARE FITTED WITH GMO 290 TRANSISTORS THE MAIN PRODUCTION USES TYPE GM 290A



TRANSISTOR CONNECTIONS



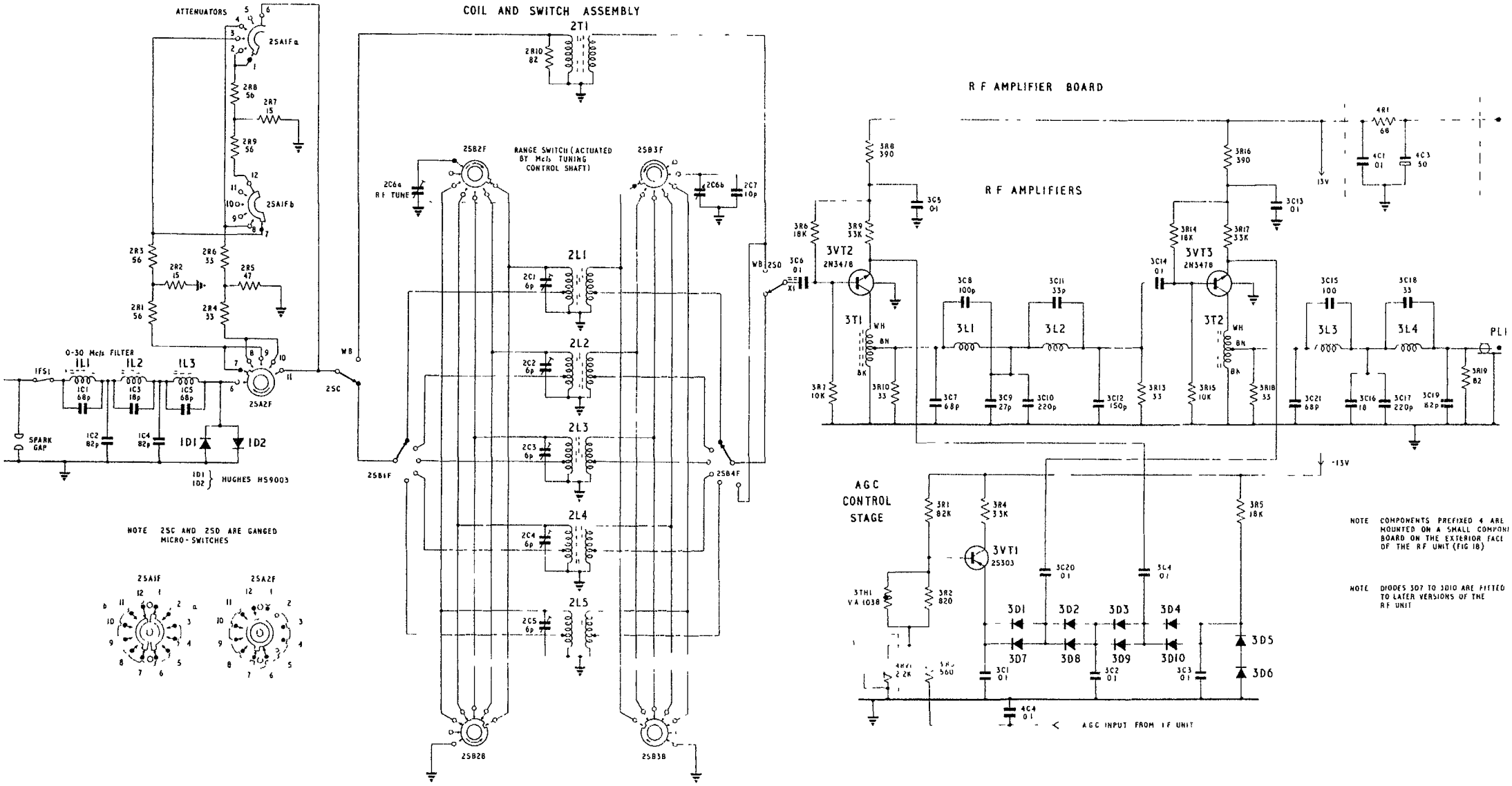
BUFFER AMPLIFIER
(B.C. 32535)



BUFFER AMPLIFIER
(B.C. 28128)

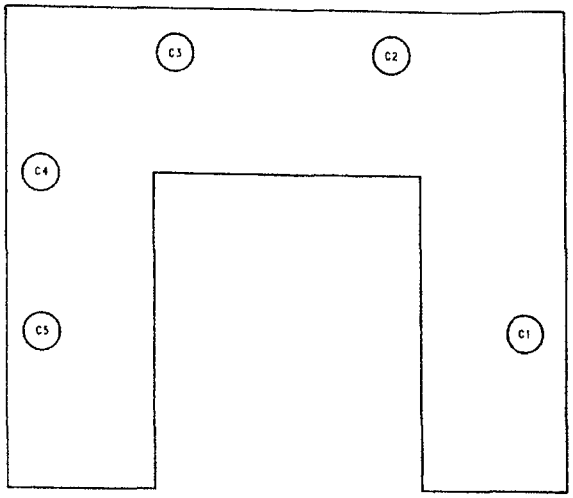
Component Layouts 1st. V.F.O.

Fig. 1

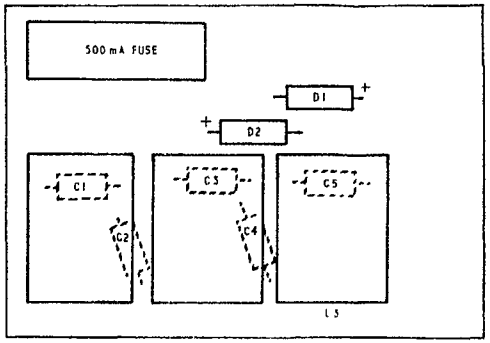


Circuit : R.F. unit

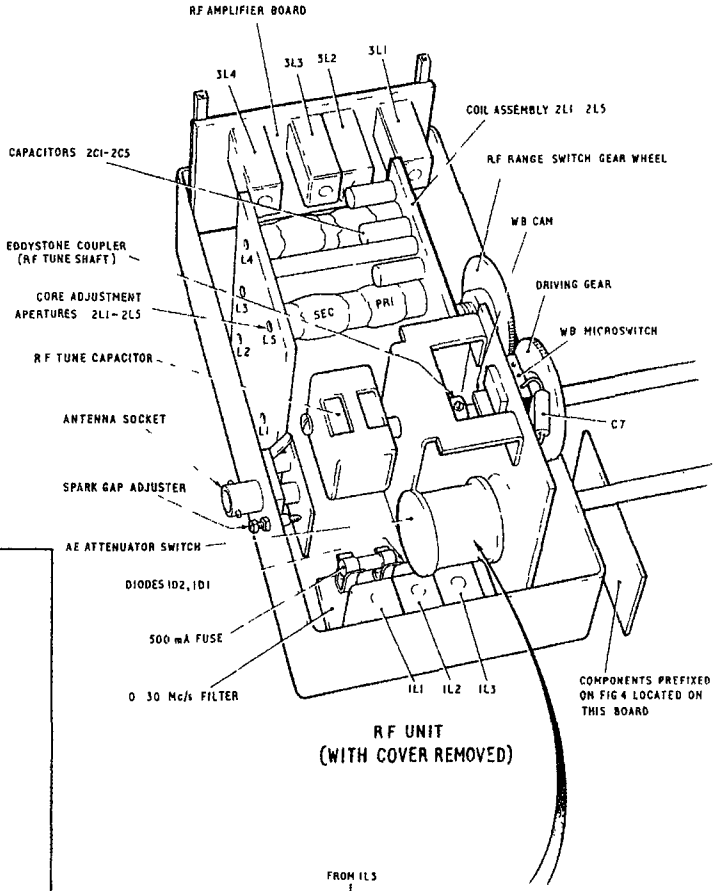
Fi
4



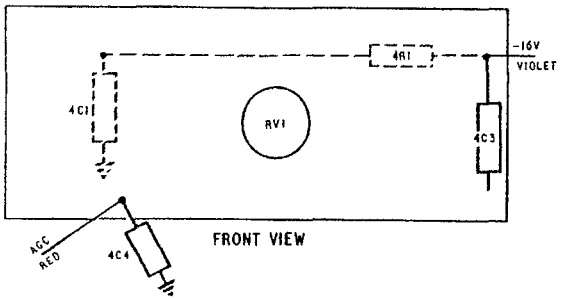
COIL ASSEMBLY
(PREFIX 2)



0-30 Mc/s FILTER
(PREFIX 1)



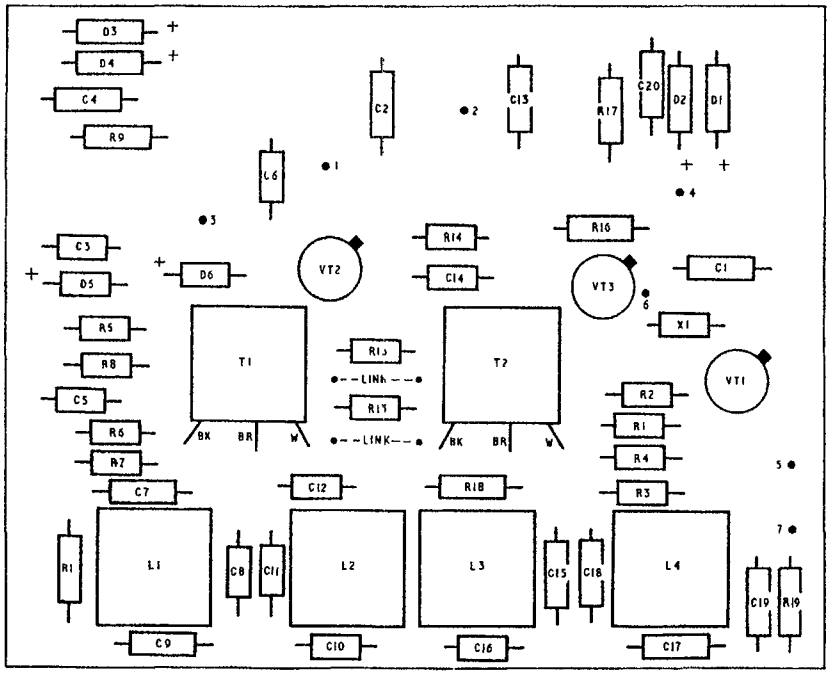
RF UNIT
(WITH COVER REMOVED)



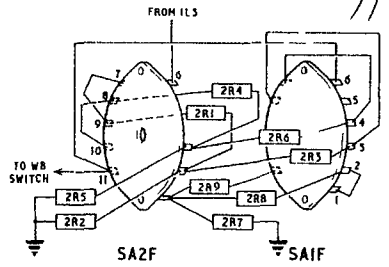
FRONT VIEW

EXTERNAL COMPONENT BOARD
(COMPONENTS PREFIXED 4 ON CIRCUIT)

NOTE DIODES IN PARALLEL WITH D1 D2 D3 AND D4 ARE ON REAR OF BOARD



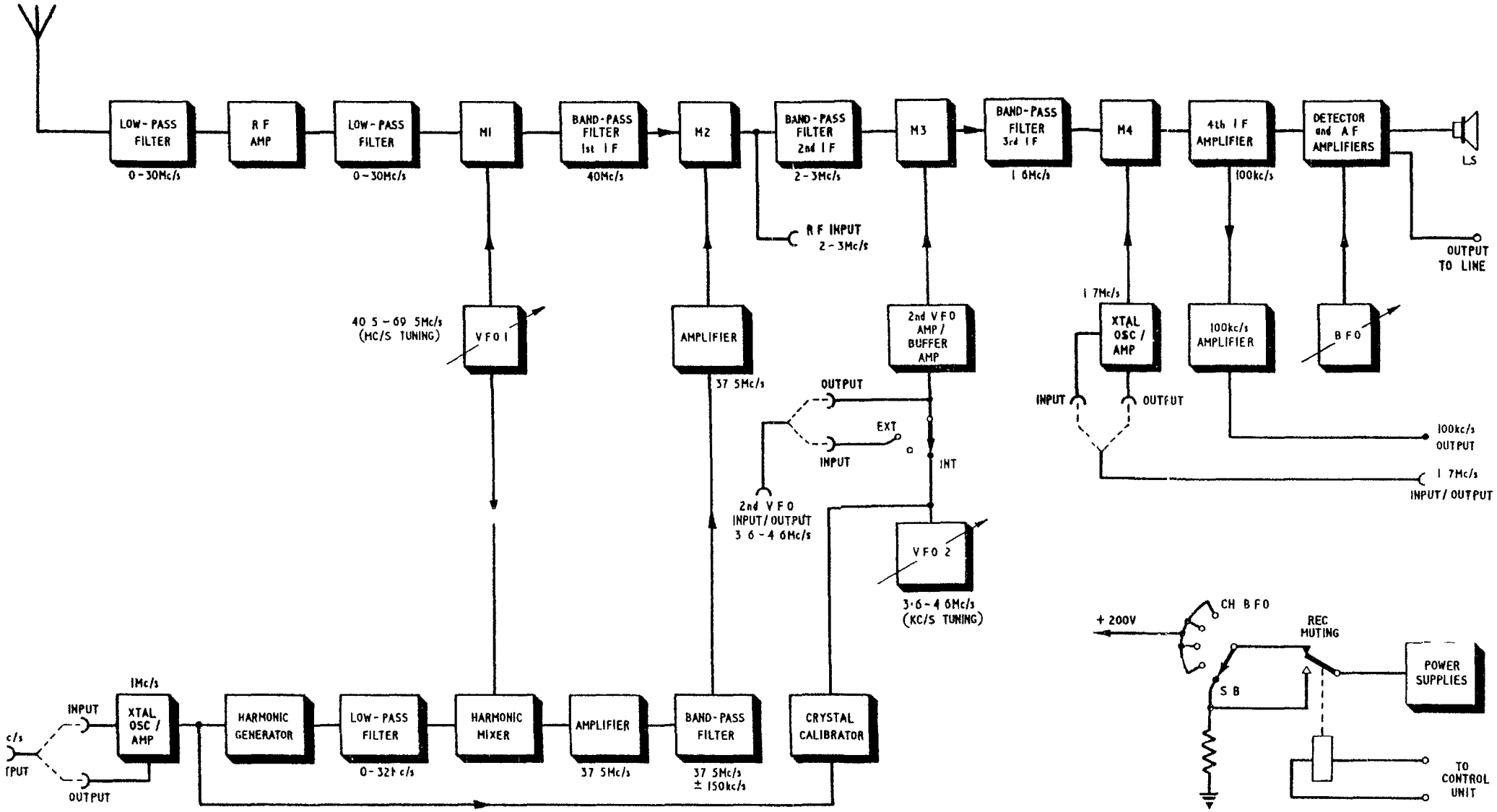
RF AMPLIFIER (BC 28155)
(COMPONENTS PREFIXED 3 ON CIRCUIT)



ATTENUATOR SWITCH 2SA

Component Layout: R.F. Unit

Fig.L-4



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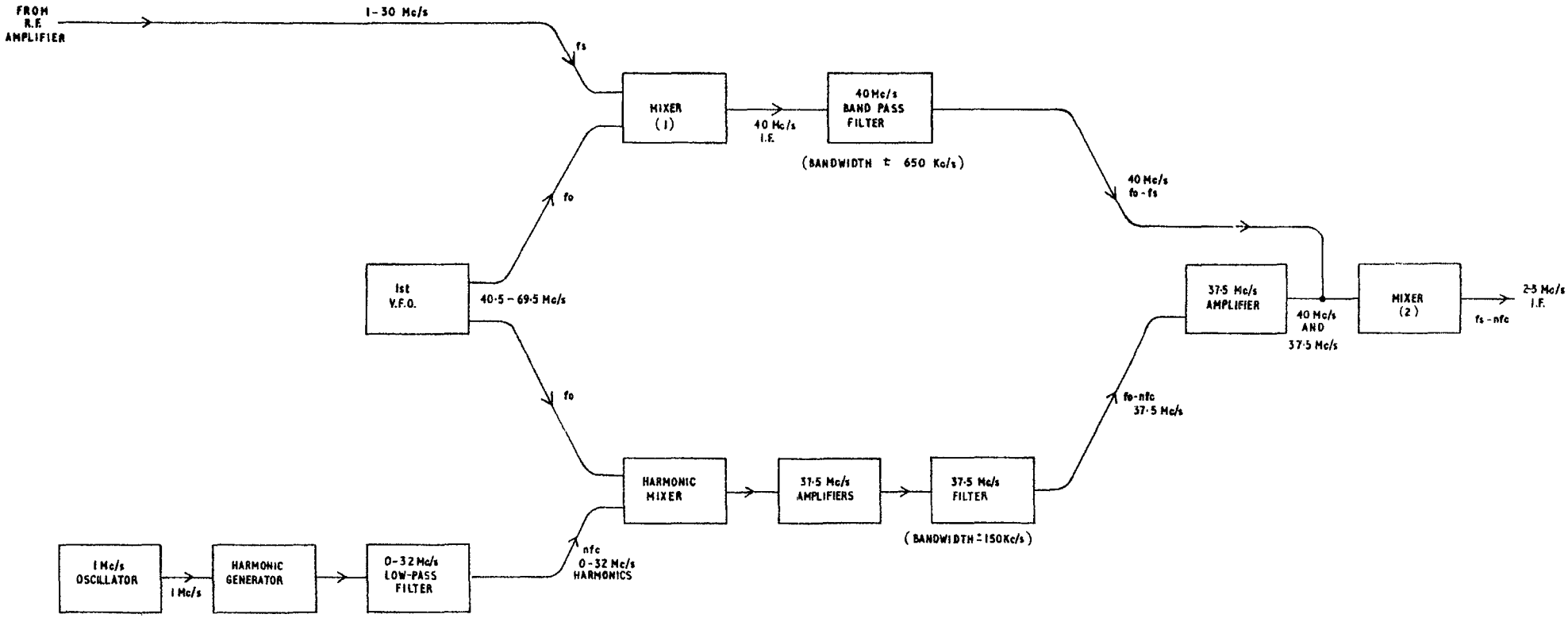
RA. 117 BLOCK DIAGRAM

Fig. 3



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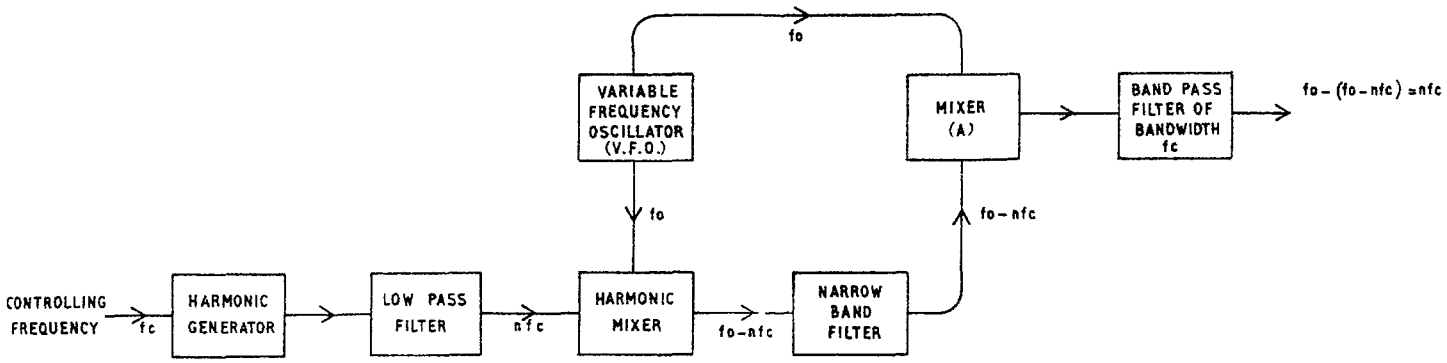
Electronic Band Selection — Explanatory Block Diagram

Fig. 2



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Wadley System — Block Diagram

Fig.