RA. 1218
HF Communications Receiver

Volume 2
Maintenance Manual

RACAL
THE ELECTRONICS GROUP

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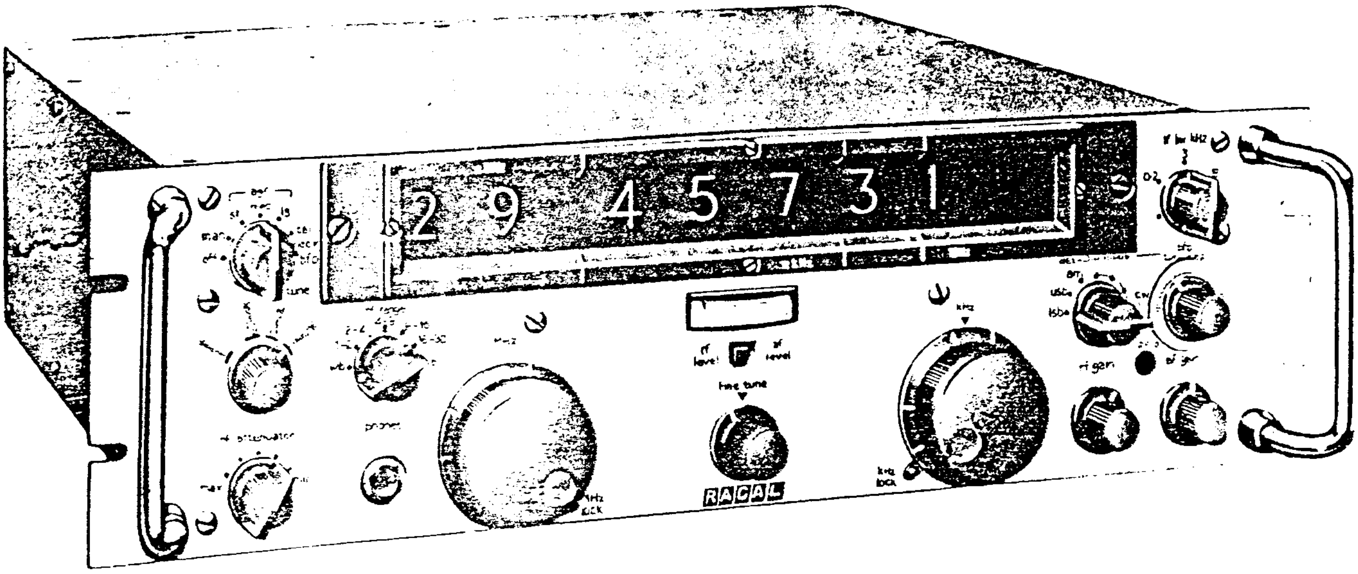

H.F. Communications Receiver Type RA.1218

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.

PREFACE

CAUTION

The RA.1218 receiver is designed to operate with a selection of ancillary units such as the I.S.B. Adaptor RA.298C & D, F.S.K. Converter RA.316C etc. It, must be noted that due to power supply limitations, the 1-watt version of the RA.1218 cannot provide the -16 volt power supply required by such ancillary units.

It must be noted, that if the receiver is fitted with the one-watt amplifier, the pin E of the 12-way outlet SKT11 at the rear of the receiver should not be used for the supply of power to external equipments.

The above restriction does not apply to those RA.1218 receivers which are fitted with the 10 mW audio amplifier board.

Receivers which have serial numbers of 576 or lower will be fitted with the one-watt audio amplifier. In general, receivers having serial numbers of 577 and higher will be fitted with the 10 mW amplifier, but random serial numbers may be equipped or converted to one-watt by special order. If in doubt the audio amplifier section on the underside of the receiver should be inspected. The one-watt amplifier can be identified by the transistors VT4 and VT5 which are mounted separately from the board. (Fig. 18). Also by the components such as transformer 1T1, capacitors 1C12, 1C15 and 1C17, and the resistor 1R8, which are fitted only with the one-watt amplifier.

RA. 1218 MAINTENANCE MANUAL

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ILLUSTRATIONS

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TECHNICAL SPECIFICATION

Frequency Range:	1 to 30 MHz
Modes of Operation:	S.S.B. (U.S.B. and L.S.B.), D.S.B., M.C.W., C.W.
Frequency Display:	Electronic readout with 6-digit presentation in units of 100 Hz. A 10 Hz display is available by push-button operation which illuminates the 7th digit.
Resetting:	±50 Hz using Main Tuning controls. ±10 Hz using Fine Tuning control.
Frequency Stability:	After 2 hours from switch-on: ±50 Hz over an eight hour period at constant ambient temperature and humidity.
Frequency Display Accuracy:	± 10 Hz plus accuracy of frequency standard.
Sensitivity: (Tuned Mode)	With tuned antenna input, and measured in a 3 kHz bandwidth, sensitivity figures are typically:- CW/SSB. 1 microvolt (e.m.f.) for 15 dB signal-to-noise ratio. MCW/DSB. (30% modulated at 400 Hz). 3 microvolts (e.m.f.) for 15 dB signal-to-noise ratio.
Fine Tuning Range:	±200 Hz (Nominal).
Selectivity:	Three I.F. filters are fitted as standard but two additional filters may be fitted at customer's option. Nominal 3dB bandwidths are:-

Standard Filters	Additional Filters available
8 kHz	13 kHz
3 kHz	6 kHz
200 Hz	1.2 kHz
	500 Hz

Cross Modulation:	For a wanted signal level up to 1 mV and with appropriate use of the antenna attenuator, an interfering signal, 20 kHz removed, modulated 30%, at a level of 45 dB above that of the wanted signal will in general produce cross modulation of less than 3%.
Intermodulation:	To produce an equivalent 1 µV input, the level of two equal unwanted signals greater than 10% removed from the wanted frequency must be at least 80 dB above 1 µV in the tuned input mode.
Blocking:	For levels of wanted signal up to 1 mV, and with appropriate use of the antenna attenuator, an interfering signal 20 kHz removed, will be 56 dB above the level of the wanted signal to reduce its output by 3 dB. The ratio of wanted to unwanted signal level is improved at the rate of approximately 2 dB/1% up to 10% off tune in the tuned input mode.
Spurious Response to External Signals in Tuned Mode:	To produce a response equivalent to 1 µV signal, an external signal less than 10% off tune must in general, be greater than 70 dB above 1 µV.
Internally Generated Spurious Responses:	Not greater than 3 dB above noise level in a 3 kHz bandwidth.
Noise Factor: (Tuned Mode)	Typically 10 dB.
I.F. Output: (A.G.C.'on')	(a) At 1.6 MHz: 100 mV (nominal) at high impedance. (10k). (b) At 100 kHz: 270 mV (nominal) across 75 ohms.
Automatic Gain Control:	(a) Time constants (nominal):

	Charge	Discharge
Short	17 mS	60 mS
Medium	40 mS	400 mS
Long	40 mS	6 S

(b) Output change:

An increase in input of 85 dB above 2 microvolts will produce a change in output level of less than 4 dB.

B.F.O.:

(a) Variable ±8 kilohertz with respect to i.f. centre frequency.

(b) Fixed ±1.5 kilohertz (U.S.B./L.S.B.) crystal controlled.

A.F. Output:

(a) Headphone jack on front panel: 10 mW nominal in 600Ω.

(b) 10mW in 600Ω at rear terminals. An alternative version providing one watt into 15 ohms for an external loudspeaker is available to special order.

(c) 1 mW in 600Ω 'line' outlet. The preset level is independent of the A.F. Gain control setting.

Overall A.F. Distortion: Less than 5%

Overall A.F. Response: With a selectivity band pass of 13 kHz the audio frequency output level from 100 Hz to 6000 Hz will not vary more than 4 dB from peak response.

Metering:

(a) 'S' Scale

(b) A.F. level to line

Front Panel Controls:

(a) Meter Switch (A.F. Level/R.F. Level)

(b) 'Megahertz' Tuning

(c) 'Kilohertz' Tuning

(d) System Switch

(e) DET/B.F.O. Mode

(f) B.F.O. Tuning

(g) R.F. Gain Control

(h) A.F. Gain Control

(i) A.F. Line Level

(j) R.F. Tune

(k) R.F. Bandswitch

(l) Tuning Locks

(m) R.F. Attenuator

(n) Fine Tune

(o) Bandwidth Switch

Rear Panel Switches:

(a) 2nd V.F.O.: Internal/External

(b) 1 MHz Reference: Internal/External

(c) 1.7 MHz: Internal/External

(d) A.C. Voltage Selector

External Connections:

(a) Antenna Input

(b) I.F. Output 1.6 MHz

(c) A.F. Line Output

(d) A.F. Phone Output

(e) A.G.C. Line

(f) Power Input

(g) I.F. Output 100 kHz

(h) Detector

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

(j) 2nd V.F.O. Input

(k) 1 MHz Output

(l) 1 MHz Input

(m) 1.7 MHz Input/Output

(n) Input from L.F. Converter

(o) Output to Panoramic Adaptor

(p) A.C. Supply Input

(q) -16 volts output

(r) Diversity A.G.C.

(s) Muting Relay

(t) L.F. Converter h.t.

(u) L.F. Converter a.g.c.

Power Supplies: 100-125V or 200-250V, 45-400 Hz, a.c. single phase.

Power Consumption: 60 voltamperes approximately.

Dimensions: 5.25 inches (13.5 cm) High
x 19 inches (48.3 cm) Wide
x 19 inches (48.3 cm) Deep

Weight: 50 lb (22.9 kg) approximately.

Environmental Conditions: The equipment is designed to meet certain of the requirements of specification DEF 133 L2, for the ambient temperature range of:

(a) Operation $-5^{\circ}C$ to $+55^{\circ}C$

(b) Storage $-40^{\circ}C$ to $+70^{\circ}C$

CHAPTER 1

DETAILED CIRCUIT DESCRIPTION

INTRODUCTION

1. The RA. 1218 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. Module Assembly	Fig. 4	CA. 38538/B
1. Aerial Filter		AA. 28188/A
2. R.F. Range Coil and Capacitor Assembly		CA. 38539
3. R.F. Amplifier Board		BA. 28155/B
4. H.T. Filter (not located in the R.F. Module)		AA. 28179/B
1st Mixer and 40 MHz Filter Assembly	Fig. 8	BA. 28211/A
1. 1st Mixer Board		BA. 28215
2. 40 MHz Filter		BA. 28197
2nd Mixer Assembly	Fig. 9	CA. 30959/A
1. Mixer Board		BA. 28177
3rd Mixer Assembly	Fig. 11	CA. 35970/A
1. Mixer and Filter Board		BA. 35966
1st V.F.O. Assembly	Fig. 5	CC. 28120/C
1. Oscillator Board		BA. 35195/A
2. Buffer Amp (to Harmonic Mixer)		BA. 32535/C
3. Buffer Amp (to First Mixer)		BA. 45309

Units and Sub-Assemblies		Racal Part Number
2nd V.F.O. Assembly	Fig. 10	CA. 28101/B
1. Oscillator Board		BA. 35808/A
2. Buffer Amplifiers		BA. 35807/A
1 MHz Amps, Osc. and Calibrator	Fig. 6	(Part of CA. 28276/C)
1. 1 MHz Amplifier		BA. 32858)
2. Calibrator Board		BA. 41745)
37.5 MHz Generator	Fig. 7	(Part of CA. 28276)) **
1. H.T. Filter		BA. 28284/B)
2. Harmonic Generator Board		BA. 32854)
3.) 4.) Harmonic Filter		BA. 35836)
5. Harmonic Mixer		CA.42059)
6. 37.5 MHz Buffer Amp.		BA. 32850)

** The overall module (CA. 28276/C) is usually referred to as the '37.5 MHz Generator' module although it also contains the 1 MHz and calibrator section.

37.5 MHz Band-Pass Filter	Fig. 7	BA. 28192/A
I.F. Module Assembly (100 kHz i.f.)	Fig. 12	DA. 38580/B
1. I.F. Amplifier Board		BA. 30533/A
2. Detector Board		BA. 28236/A
3. A.G.C. Board		BA. 31466/B
4. Converter Oscillator Board (100 kHz)		BA. 38568B
5. Converter Amplifier Board (100 kHz)		BA. 34783B
B.F.O.	Fig. 13	
1. 600 kHz Oscillator Board		BA. 30540/A
2. Buffer Amplifier Board		BA. 30542/A
Alternative Audio Amplifier Boards		
10 mW version.	Fig. 14a	BA.31462
1 watt version.	Fig. 14b	BA.39442

Units and Sub-Assemblies		Racal Part Number
Power Unit PU.1155 (a.c.)	Fig. 15a	
1. Complete Assembly (with Component board)		CA.39382/A
2. Component Board Assembly		BA.39370
Counter and Display Unit		MDA.75209/A
1. Buffer Amplifier Board Assembly Type RBA/1219		
2. Frequency Generating Board Assembly Type RFG		
3. MHz Display and Overspill Type RMH/1 (printed board assembly)		Refer to Chapter 8 Page 8-45 for the Part numbers.
4. MHz Display Assembly (readout lamps assembly)		
5. Totalizer Board Assembly Type RTT/1		
6. KHz Display Assembly (readout lamps assembly)		
7. Crystal Filter Board Assembly		
8. Power Input (low Pass) Filter Assembly		

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 Fig. 16 and 17. The location of modules in the main chassis is shown in Fig. 18. The Counter and Display Unit is described at the end of this chapter commencing at page 1-36.

H.T. DISTRIBUTION

4. The -16V h.t. supply from the Power Unit is supplied, without switching to the 3rd Mixer, 1 MHz Oscillator, I.F. Module, B.F.O. and 2nd V.F.O. It is also fed, via the 3rd Mixer, to the Audio Amplifier and to 1SKT11-E providing an h.t. supply for ancillary units. The -16V supply to those stages prior to the 3rd Mixer, which are the R.F. Module, 1st Mixer, 2nd Mixer, 1st V.F.O. and 37.5 MHz Generator circuit, is controlled by the System Switch. The switched h.t. to these units is routed via the microswitch 1SB and the terminal block TB1 on the I.F. Module (Fig. 12) which enable the switched h.t. to be connected to an external l.f. adaptor unit, if required.

5. The microswitch 1SB connects h.t. to the terminal 'H.T. R.F.' in all settings of the MHz tuning control except '00'. When the MHz control is turned to display '00' on the scale, a cam moves the microswitch to the opposite contact, thereby transferring the h.t. to the terminal 'H.T. L.F.' on TB1. For operation below a frequency of 1 MHz the terminals 'H.T. L.F.' and H.T. R.F.' can be linked. This link should be removed when the Racal l.f. adaptor is connected.

System Switch SE — Fig. 16

6. In the OFF position the external supply to the power unit is disconnected by the opening of the switch contacts SC1 and SC2 which are mounted on an extension of the shaft of the System switch SE. The function of each wafer of switch SE is described as follows:

7. Wafer SE2R: This wafer controls the distribution of -16V h.t. to certain circuits as follows: In positions CHECK B.F.O. and CAL, the -16V is supplied to the calibrator circuit and disconnected from the units prior to the 2nd Mixer. In the MAN and A.G.C. positions of the switch the -16V is restored to the circuits prior to the 2nd Mixer, and disconnected from the calibrator circuit.

8. Wafer SE1R: In all settings except MAN, this wafer connects the a.g.c. line to the a.g.c. amplifiers in the i.f. module. In MAN. the a.g.c. line is connected to the slider of the R.F. Gain control.

9. Wafer SE3F: This wafer provides an earth connection to the b.f.o. switch (SB1F). In the CAL position the earth is disconnected in order to disable the b.f.o. during the calibration procedure.

10. Wafer SE1F: 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. Module. The contact 'a.g.c. short' is connected to the Bandwidth switch, in order to prevent the use of short time-constant a.g.c. whenever the Bandwidth switch is set to bandwidths of 1.2 kHz, or less.

Meter Switch

11. In the R.F. position the + terminal of the meter is connected to the a.g.c. output from the I.F. Module and the negative terminal to earth via the slider of the set-zero potentiometer 3RV4. With nil signal input and with the R.F. 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 3RV4. 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 3D1-3D4 and indicates the level of the 1 mW 600Ω audio line.

Meter Zero Setting

12. The potentiometer 3RV4 is mounted on a small component board located within the receiver, on the left hand side. (Fig. 18). The setting procedure requires the injection of a 1μV e.m.f. at the antenna socket, with the system switch at AGC Med. and the Meter switch to R.F. The potentiometer is then adjusted to give an 'S' Meter reading of exactly 1 microvolt.

MHz Tuning Control

13. This control rotates the variable capacitor of the 1st v.f.o. thus providing the electronic band selection.

14. A further function of the MHz control is that when set to indicate '00' a pair of microswitches (1SA and 1SB on Fig. 16) are actuated, which disconnect the a.g.c. and h.t. from the r.f. unit, first mixer, second mixer, first v.f.o. and 37.5 MHz generator and transfers 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.

KHz Tuning Control

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

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

16. These controls are described in the paragraphs headed 'I.F. MODULE'. The circuit connections are illustrated in Fig. 12 and Fig. 16.

Fine Tune Control 1RV3

17. Refer to the paragraphs headed '2nd V.F.O.' (page 1-17) and Fig. 10.

2nd V.F.O. Switch

18. Refer to the paragraph headed '2nd V.F.O.' and Fig. 10. (Page 1-16).

Plugs and Sockets

19. Several of the modules are connected to the chassis wiring via Cannon connectors which contain both d. c. and r. f. connections. 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 (SKT) is attached to the chassis wiring and carries d. c. sockets and coaxial pins. Diagrams of these connectors are shown in Fig. 16 Interconnections.

Wiring Identification

20. In the main chassis cableform, interconnections can be traced by reference to marker sleeves for coaxial and screened wiring, and colour coding for d. c. wiring.

R. F. MODULE

21. The R. F. Module 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) From the Antenna input via the Muting relay contact RLA1 to the 0 to 30 MHz low-pass filter.

(b) Antenna attenuation and pre-tuning stage.

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

Wiring Connections

22. Wiring connections to the module are made via a 5-way connector at the forward end, the r. f. outlet to the 1st Mixer is located on the side of the module.

Antenna Input and Filter

23. The antenna is connected to the rear panel socket R. F. INPUT, thence via RLA1 to the antenna filter circuit.
A discharge path is provided to protect the antenna circuit against excessive accumulation of static charges.

The muting relay RLA can be wired, via a pin on the 12-way outlet on the rear panel, to open the antenna circuit when an associated transmitter is keyed. The filter circuit 1L1 1L2 1L3 and 1C1 to 1C5 has a passband of 0 to 30 MHz which is designed to prevent any break-through at the 40 MHz intermediate frequency (1st i.f.) or at the image frequency (80 MHz). The filter also prevents radiation of the first v.f.o. frequency from the antenna.

Attenuator Circuit

24. The switch SB which is operated by the front panel control marked R.F. ATTENUATOR introduces attenuation into the signal path in approximately 10 dB steps. In the minimum attenuation position of SB the switch is fully clockwise and the signal passes from 1L3 via SB2F to the switch 2SA without attenuation. As the switch is moved anti-clockwise the resistor network R4, R5 and R6 is connected, giving 10 dB attenuation. Subsequent switch settings introduce more resistance into the signal path, thereby providing attenuation levels of -20 dB, -30 dB and -40 dB. To maintain specification for measurements such as cross-modulation, intermodulation etc. at levels above 10 microvolts it is essential to use the R.F. ATTENUATOR control.

R.F. Tuning and Range Selection

25. 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 2SA which selects either the required range filter or the wideband (WB) path.

26. Range Selection. The range selection is in octave steps, 1 to 2 MHz, 2 to 4, 4 to 8, 8 to 16 and 16 to 32 MHz. Wafer 2SA4F selects the primary and 2SA1F the secondary of the filter. Wafers 2SA3B and 2SA2B short circuit all the filters except the one in use. The signal path from the r.f. tuning selection is via 2SA1F to transistor 3VT2 on the r.f. amplifier board.

27. 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. In the WB setting of the Range switch the input signal by-passes the range selection

and r.f. tuning circuits and is fed via a 20 dB resistive attenuating network 2R1, 2R2, and 2R3 into the base of transistor 3VT2. The diodes 3D11 and 3D12 provide overload protection against excessive r.f. voltages. (up to 15 volts e.m.f.).

R.F. Amplifier Board

28. 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.

29. 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.

30. 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.

31. 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 3D4. Under these conditions the impedance of the by-pass from the emitter of 3VT2 is at minimum and amplifier gain is therefore at a maximum. It is essential that the diode chain has a low forward resistance. A high resistance diode could cause a reduction in the maximum gain of the amplifier.

32. 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 3D1 to 3D4 is completely cut off, thereby interrupting the emitter by-pass circuit of 3VT2 and reducing the amplifier gain to a minimum.

33. 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 of taking the bias on 3VT1 towards a more positive level, thereby checking the increase in emitter current due to temperature rise.

34. Setting Up 4RV1. The potentiometer 4RV1 which is mounted on the H. T. Filter board on the underside of the receiver (Fig. 18) 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:

35. The system switch is set to Manual and the R. 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. multimeter is connected to the collector of 3VT1 (-ve) on the r.f. amplifier board.

36. Potentiometer 4RV1, 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 multimeter 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 25Ω when measured on the 'ohms ÷ 100' range of the multimeter (diode type HD1812).

FIRST MIXER

FIRST MIXER (BA. 28211) Fig. 8

37. A balanced mixer circuit is used to reduce the possibility of the second harmonic of a 40 MHz signal entering the 40MHz filter.

The incoming signal from the r.f. unit is fed 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.

38. The mixer output appears in the inductor L1 which is mounted in a sub-assembly with the remaining inductors of the 40 MHz 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 pass-band 650 kHz either side of 40 MHz. 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. Fig. 5

39. The first v.f.o. consists of three sub-circuits mounted on individual boards. The oscillator is a conventional Hartley circuit tuned by the Megahertz tuning capacitor C1 which is not mounted on the board. The oscillator frequency range is 40.5 MHz to 69.5 MHz. Normally the lowest frequency used is 41.5 MHz when the Megahertz 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.

40. The two buffer amplifiers are basically similar, the main difference being that one feeds out via plug PL2 and C5 to the first mixer stage and the other via PL1 and transformer T1 to the harmonic mixer. A cascode circuit is employed to obtain adequate buffering, and the circuits are entirely conventional. When removing the 1st V.F.O. module from the chassis the h.t. lead (violet) must be disconnected from the small terminal block beside the module. Some earlier receivers do not have this terminal block, in which case the violet wire must be unsoldered from the H.T. Filter board on the underside of the receiver. (Fig. 18).

37.5 MHZ GENERATOR MODULE

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

(a) The 1 MHz Amplifier and Calibrator

(b) The 37.5 MHz generator assembly consisting of a harmonic generator mixer and amplifier. Refer to instructions in Chapter 7 for obtaining access to this assembly.

The 1 MHz amplifier and calibrator assembly will be described first.

1 MHZ AMPLIFIER AND CALIBRATOR Fig. 6

41. This assembly consists of two sub-circuits. One board contains a 1 MHz crystal oscillator and clibrator circuit, the other board contains the amplifier stages which provide buffering in the 1 MHz input and output circuits. The boards are mounted side-by-side on the upper (hinged) deck of the 37.5 MHz Generator Module. The crystal oscillator is not required in the RA. 1218 although it can be used in an emergency by the fitting of an appropriate crystal.

1 MHz Oscillator and Calibrator

42. Transitor VT1 is contained in a conventional Pierce type of crystal-controlled circuit. As this oscillator is not essential to the RA. 1218 no further description will be given.

43. The calibrator circuit is a 'divide by ten' integrated circuit which receives an input at 1 MHz from the amplifier VT2 on the amplifier board and supplies 100 kHz with harmonics via connector A2 to the third mixer board.

44. The 1 MHz input is applied via pin 4 and R8 to the integrated circuit 1C1. The integrated circuit provides a 100 kHz output which is taken via diode D1 and connector A2 to the third mixer module where the required range of harmonics is injected for calibration of the receiver kHz scale.

1 MHz Amplifier

45. Transistors VT2 and VT3 on the amplifier board are driven by 1 MHz supplied either from the counter unit or 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 MHz.

OUT'. The 1 MHz from VT2 also goes to the Detector board in the i.f. module to mix with the 600 kHz b.f.o. frequency.

46. Amplifier VT3 has a collector circuit which is modified by R15, C12 and R17 in order to pre-shape the output waveform 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, paragraph 18). Amplifier VT1 buffers the 1 MHz input whenever a synthesizer or external frequency source is connected.

47. The calibrator circuit functions only when the system switch (SE2R Fig. 16) is set to CAL or CHECK B.F.O. In other switch positions the h.t. supply to the calibrator is disconnected. When the calibrator is switched off it is essential that there shall be no leakage of 1 MHz into the third mixer stage. The leakage is prevented by diode D1 on the amplifier board which is reverse-biased in all settings of the System switch except CAL and CHECK B.F.O. A similar gating function is performed by diode D6 on the calibrator board.

HARMONIC GENERATOR AND MIXER (37.5 MHZ GENERATOR)

Fig. 7

48. This section consists of five small sub-assemblies which are numbered 1 to 5, the same numbering also being shown on the circuit diagram. The section is contained in the same module as the 1 MHz amplifier and calibrator. The combined module is commonly referred to as the '37.5 MHz Generator'.

Harmonic Generator (Board 1)

49. The function of this stage is to produce a wide range of harmonics of 1 MHz, which it does by virtue of the pre-shaped 1 MHz 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 MHz amplifier (D1 and D2).

Harmonic Filter (Boards 2 and 3)

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

Harmonic Mixer (Board 4)

51. A balanced mixer circuit is used so that the harmonic spectrum and the input from the 1st v.f.o. will tend to cancel at the output. The harmonic spectrum input is supplied via pin 1 and the capacitors C1 and C4, to the base of VT2. The output from the 1st v.f.o. is supplied, via pin 3 and the capacitors C6 and C3, to the base of VT1. Mixing takes place in the common collector circuit L1, L2 and C7 to C10 which is tuned to 37.5 MHz. The mixer circuit is balanced by potentiometer R6 by which the bias on each transistor can be adjusted so that the emitter currents are equal. This adjustment is described in Chapter 3. The output is taken via pin 2 to the cascode amplifier board.

37.5 MHz Amplifier (Board 5)

52. This is a buffer stage in a cascode circuit mounted on board number 5. A cascode circuit is used to provide adequate buffering with a low noise figure. The capacitor C7 provides neutralizing feedback. The collector circuit of VT2 (T1, C4) is tuned to 37.5 MHz and the secondary of T1, is connected to socket SKT1, which mates with plug PL1, on the 37.5 MHz filter unit.

37.5 MHz Filter Unit

53. This is a separate unit mounted on the receiver chassis which is connected to the output from the 37.5 MHz amplifier. The filter is designed and set-up to provide a passband of plus or minus 150 kHz centred on 37.5 MHz. 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 MHz i.f. spectrum with the 37.5 MHz injection, and selecting the 2 to 3 MHz

difference frequency. The stage VT1 and VT2 is a cascode buffer amplifier similar to the buffer circuits in the 37.5 MHz generator module. The 37.5 MHz 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 MHz. The secondary of T1 forms part of the emitter circuit of the mixer stage VT3. The capacitor C3 is wired to the rear of the printed circuit board.

55. The 40 MHz i.f. is supplied via A3 to the base of VT3. The resistor 1R4 terminates the 40 MHz 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 MHz band-pass filter and is tuned to the difference frequency, which is in fact a spectrum of signals extending from 2 MHz to 3 MHz. The output is coupled via C9 to the remainder of the 2-3MHz band-pass filter. Signals via an l.f. adaptor unit, which have been translated to the 2 to 3 MHz band, can be fed in via the LF socket on the receiver rear panel via connector A1 and pin 5 to the input of the 2-3 MHz band-pass filter. 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 MHz spectrum of signal frequencies from the 2nd mixer (2-3 MHz) is mixed with a frequency (3.6 - 4.6 MHz from the second v.f.o. The difference frequency contains the required signal intelligence at a frequency of 1.6 MHz. A 100 kHz input from the calibrator circuit which is supplied via the connector A3 provides harmonics for kHz readout check or b.f.o. alignment.

Signal Input

57. The preceding 2 to 3 MHz 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 MHz. The function of the filter is to give additional protection against 6 MHz and 37.5 MHz.

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 switch is at CAL or CHECK BFO but to guard against leakage of the fundamental 1 MHz, 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 MHz 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 pass-band should extend from 3.6 MHz to 4.6 MHz 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 wideband source and it is necessary to exclude the noise generated at the signal frequencies between 2 and 3 MHz, at 1.6 MHz, and also at the image frequencies of 5.2 MHz and 6.2 MHz.

(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 MHz 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 diod 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 MHz) and the i.f. output (1.6 MHz) 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 MHz. 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 MHz output from the collector is taken via C12 and the coaxial connector A1 to the bandpass filter FL1, thence to the 1st i.f. amplifier unit. The resistor R14 matches the input impedance of the filter.

1st I.F. AMPLIFIER UNIT

1ST I.F. AMPLIFIER UNIT — Fig. 11

65. This is a small unit containing a single stage serving as a buffer between the crystal bandpass filter FL1 and the subsequent crystal bandpass filter selected by the bandwidth switch. The circuit is illustrated on the right hand side of Fig. 11. The wideband tuned inductor L1 is tapped to provide separate outputs having impedances of 100Ω and 1 kΩ respectively. The 1 kΩ output feeds the subsequent filters (Fig. 16) and the 100Ω output is used for reception in the widest setting of the I.F. BW switch without further filtering. The core of L1 is adjustable via a hole in the side of the container.

SECOND V.F.O.

General — Fig. 10

66. 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 MHz by the kHz tuning control of the receiver, also, fine variations of tuning can be made by the FINE TUNE 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 2nd V.F.O. switch to EXT which permits the receiver kilohertz tuning to be determined externally by either a synthesizer or the 2nd v.f.o. of a master receiver.

Oscillator Stage

67. The oscillator VT1 works into a tuned collector circuit comprising the inductor L2, and the kHz tuning capacitor C1 with its associated preset trimming capacitor. These tuning components are mounted on a separate sub-assembly. The oscillator tuning can also be shifted by the variable capacitance diodes 1D1 and 1D2. The junction of the diodes is connected via PL1 pin 1 to the CAL-FINE TUNE potentiometer 1RV3, which provides a variable -ve voltage which can shift the 2nd v.f.o. frequency by a few hundred Hertz. The -ve control voltage supplied to the Fine Tune potentiometer is stabilized by the zener diodes 1D5 and 1D6 (Fig. 16).

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 minimizes 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 INT the 2nd v.f.o. is in operation and an output is available for external use if required. When the switch is set to EXT 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. The external frequency is switched by the gating diodes on the buffer amplifier board.

Buffer 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 on the amplifier board is forward-biased by the negative supply which is connected through the 2nd V.F.O. switch (INT 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 EXT 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 (75Ω) 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 bandpass 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. ASSEMBLY

Fig. 13

74. The B.F.O. assembly consists of the DET - B.F.O. switch assembly and variable tuning capacitor, together with a 600 kHz oscillator board and a buffer amplifier. The b.f.o. frequency can be varied continuously from +8 kHz to -8 kHz with respect to the i.f. centre frequency by the fine tune capacitor, C2, when the DET-B.F.O. switch is set to CW. Capacitor C2 is controlled by the B.F.O. TUNE control.

600 kHz Oscillator Board

75. The oscillator VT1 is tuned by the inductor L1 and the variable capacitor C2. In parallel with C2 is the preset trimmer capacitor, 2C4. This is the 'zero' adjust trimmer and is screwdriver controlled through the front panel aperture, marked 'O', during the alignment procedure (Chapter 4). 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 kHz oscillator stage is connected via pin 5 and the CW position of switch wafer SB1F thence via a wafer on the System switch to earth. In switch positions LSB, USB and A.M. the earth is disconnected from the b.f.o. thus switching off the 600 kHz oscillator.

DET B.F.O. Switch SB

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

78. SB1F: The wiper contact (tag 9) is connected to earth in all positions of the system switch except CAL. (Thus ensuring that the b.f.o. is switched off during the calibration procedure). The LSB and USB positions of SB1F connect the earth to the detector board (i.f. module) where it serves to connect the appropriate crystal for the s.s.b. off-set oscillator.

79. SB1R: In the A.M. position of the DET B.F.O. switch an earth is made to pin 2 of the Detector board (i.f. module) in order to connect the a.m. detector.

80. SB2F: This wafer is not used in the RA.1218 receiver.

81. SB2R: In every switch position except A.M. an earth is made to pin 3 of the Detector board (i.f. module) in order to connect the product detector circuit.

B.F.O. Buffer Amplifier Board

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 kHz variation of b.f.o. frequency. Note that the screen of the cable from T1 secondary, which feeds the 600 kHz b.f.o. frequency to the i.f. module must not be earthed, because it constitutes a part of the base-emitter circuit of transistor VT5 in the Detector board.

I. F. BANDWIDTH SWITCHING

83. Provision is made for the fitting of five crystal bandpass filters, FL1 to FL5. The actual number and specification of the filters which can be fitted is stated in the Technical Specification at the front of this Manual. The filter switching is illustrated in Fig. 16. The widest i.f. bandwidth is determined by FL1. The standard receiver also incorporates FL3 and FL4: the additional filters FL2 and FL5 can be incorporated at customers option. The bandwidths are switched by the I.F. B.W. control which operates the switch SA1F to SA4R illustrated in Fig. 16. This switch also selects the a.g.c. time constants to suit the bandwidth selected.

Bandwidth Switch — Fig. 16

84. The input to the 1st I.F. Amplifier is filtered to the widest available bandwidth by the filter FL1. (Fig. 11). Two outputs are taken from the 1st I.F. amplifier. The 100 ohm output via 2R1 (Fig. 16) goes to switch wafer SA3F without further filtering. The 1000 ohm output goes via SA1F and SA1R to the selected filter, FL2 to FL5, then to the wafers SA3F and SA3R. The filters are terminated by resistor 2R4. The 1.6 MHz output is fed via plug 1PL3 to the socket SKT4 on the main I.F. Module (Fig. 12).

85. A.G.C. Over-ride. It is the function of the wafer SA2 (Bandwidth switch Fig. 16) to ensure that the short time-constant a.g.c. cannot be used whenever the I.F. B.W. control is set to select the filters FL1 or FL2. If the System switch is set to 'A.G.C. Sh' the Bandwidth switch overrides this setting and substitutes "medium time-constant", as follows:

86. The required a.g.c. time-constants are selected by the connection of an earth to the appropriate time-constant capacitor on the a.g.c. board of the i.f. module. This earth connection is made by contacts on the System switch wafer SE1F. The short time-constant path is connected to the System switch (tag 2) via the wafer SA2R of the Bandwidth switch. When the filters FL1 or FL2 are selected, the "a.g.c. short" earth line is connected via SA2F tags 1 or 2, to the medium time-constant capacitor in the a.g.c. board. In the remaining positions of the Bandwidth switch to the 'a.g.c. short' connections are normal. To sum up: 'long' and 'medium' a.g.c. is available in all settings of the I.F. B.W. control, but a.g.c short is confined to the settings 3 kHz and above.

NOTE: The above description refers to the standard bandwidths. Any modification to suit a customers special requirements will be described in an Appendix to the handbook.

I. F. MODULE

87. The I. F. Module contains the following printed circuit boards, illustrated in Fig. 12.

(a) I. F. Amplifier Board.
(b) Detector Board.
(c) A. G. C. Board.
(d) I. F. Converter Oscillator Board.
(e) I. F. Converter Amplifier Board.

CONNECTIONS

88. The 1. 6 MHz i. f. from the bandwidth switch is fed into the i. f. module via the coaxial connector SKT4 at the forward end of the module. All other connections to the receiver are via the 37-way connector 1SKT1. Details of the 37-way connections are shown in Fig. 16. External connections are made via the coaxial sockets, SKT1 and SKT2, and the terminal block TB1 mounted on the module and accessible at the rear of the receiver. These outlets are shown in Fig. 12.

I. F. AMPLIFIER BOARD Fig. 12

89. 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.

90. 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.

91. 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.

92. The 1.6 MHz 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 MHz 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

93. The Detector board contains the a.m. and product detectors, also the offset crystal oscillator for s.s.b. reception. The a.m. detector operates only in the A.M. position of the DET-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

94. In the A.M. position of the DET-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 MHz amplifier with the collector circuit tuned by the inductance of T1 with capacitor C1.

95. The 1.6 MHz 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 5 of the terminal block TB1 at the rear of the receiver to drive a loudspeaker amplifier or tone converter etc.

96. 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 DET-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

97. The product detector utilizes the circuit of VT1 and VT2 but with certain changes achieved by diode biasing. Due to the setting of the DET-B.F.O. switch (all positions except A.M.), 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 via the secondary of T2 is supplied to the emitter circuit of VT2, and the 1.6 MHz signal from the 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. Offset Oscillator

98. Transistor VT6 on the Detector board is a crystal oscillator stage which operates in the L.S.B. and U.S.B. positions of the DET-B.F.O. switch, provided the system switch is <u>not</u> set to CAL. (In the CAL position all b.f.o. circuits are disabled to prevent interference with the calibration procedure).

99. The oscillator frequency is determined by the crystal XL1 (DET-B.F.O. switch set to L.S.B.) or by XL2 (DET-B.F.O. switch set to U.S.B.) according to whether the oscillator is to run 1.5 kHz above or 1.5 kHz below, the 1.6 MHz i.f. Each crystal has a preset capacitor in parallel (C21 and C22) for alignment purposes.

100. When the DET-B.F.O. switch is set to U.S.B. 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 re-

mains open circuited by the reverse bias on diode D6 due to the negative rail connection. In the L. S. B. position of the DET-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.

101. This stage operates as an amplifier when the DET-B. F. O. switch is set to the L. S. B. and U. S. B. positions, and as a mixer when the switch is set to CW. The function of the mixer is to combine the 1 MHz from the receiver crystal source with the variable 600 kHz from the b. f. o.

102. Mixer Action. The emitter of VT5 is connected via plug PL1 to the output winding of the 600 kHz transformer in the b. f. o. assembly. Thus, whenever the DET-B. F. O. switch is set to CW the output from the variable 600 kHz b.f.o. is supplied to VT5. It should be noted that the screen of this connection is the return path of the emitter-to-base circuit of VT5 and must not be earthed. The base of VT5 is connected via C17 and plug PL1 to the receiver 1 MHz crystal source. The output from VT5, which is 1.6 MHz 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.

103. Amplifier Action. When the DET-B. F. O. switch is set to L. S. B. or U. S. B. the 600 kHz b. f. o. frequency is removed and VT5 amplifies the crystal frequency 1601.50 or 1598.50 kHz fed in from VT6 and passes it via L3 to VT4.

Amplifier VT4

104. 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 DET-B. F. O. switch is set to A. M. it is necessary to cut off VT4 to prevent noise reaching the emitter circuit of VT2; this is done by disconnecting R19 from earth at the b. f. o. switch SB2R (Fig. 13).

A. G. C. BOARD

105. The a. g. c. board contains two amplifiers operating at 1.6 MHz, followed by the a. g. c. detector and d. c. amplifier feeding into the

time-constant circuits. The remainder of the board is concerned with providing d.c. amplification and manual gain control facilities etc. Provision is made for connecting the a.g.c. dircuit to a companion receiver in dual diversity operation.

Amplifier VT1

106. This is a 1.6 MHz amplifier tuned by L1 in the collector circuit. The input at 1.6 MHz 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 MHz OUT socket at 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

107. Transistor VT2 is a 1.6 MHz 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.

A.G.C. Detector

108. The amplified 1.6 MHz 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

109. 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.

110. 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 System switch wafer SE1R (all settings except MAN). In the MAN setting of the System switch the a.g.c. level from VT5 is disconnected, and a variable -ve voltage, obtained via the R.F. Gain potentiometer 2RV2, is used to manually bias the a.g.c. line which controls the i.f. and r.f. amplifier stages.

111. 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 1.6 MHz amplifier. The output from pin 14 goes via PL1/1SKT1 pin 34, to the microswitch 1SA (Fig. 16) and from pin 16 the output is fed via the Meter switch (R.F. setting) to the 'S' meter on the receiver front panel.

112. 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, pin H on the 12-way socket at the rear of the receiver, thence to pin 6 on the board.

I.F. Converter

113. The function of the I.F. Converter is to mix a fixed 1.7 MHz frequency with the 1.6 MHz i.f. to produce a 100 kHz i.f. for use in ancillary equipment. Although the i.f. converter circuitry is mounted on two separate boards it should be regarded functionally as one circuit. One of the boards contains a 1.7 MHz crystal oscillator circuit, but this is not required in the RA.1218 and the crystal, therefore, is not fitted.

114. The fixed 1.7 MHz, which is derived from the Counter unit, is fed into the I.F. Module via the 1.7 MHz EXT/INT switch SJ (Fig. 16) and pin 4 of the 37-way connector PL1 (Fig. 12). The 1.7 MHz is fed via the amplifier VT1 on the Converter amplifier board to the emitter of the mixer stage VT2 on the lower board, where mixing occurs with the 1.6 MHz i.f. signal.

115. The mixer output is taken from a tap on L2, and via pin 7 to the amplifier board 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.

116. In the INT position of switch SJ (Fig. 16) the 1.7 MHz frequency from the Counter unit can be fed out to lock a slave receiver. In the EXT position an external 1.7 MHz from a synthesizer, or the variable a.f.c. frequency from an i.s.b. adaptor such as the RA.298, can be fed into the 100 kHz converter.

AUDIO AMPLIFIER BOARDS

Alternatives

117. The standard RA. 1218 receiver is fitted with a 10 mW audio amplifier board, but a one-watt board is available at customers option. It should be noted that there are restrictions on the amount of -16 volt power available from the power unit for external use when the one-watt board is fitted.

10 mW Audio Amplifier Board Fig. 14a

118. The amplifier board contains two separate amplifiers. The circuits are 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 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 600 ohm output is supplied to the PHONES jack socket on the front panel and also to the outlets at the rear panel.

119. The line amplifier VT4 is supplied with an a.f. signal via the slider of the A.F. Level pre-set control. The additional input capacitor C10 may be removed if attenuation of the a.f. input is required. The 1 mW output is taken from the secondary winding of transformer T3 to the meter diodes and to a pair of pins at the rear panel outlet.

One-Watt Amplifier Board Fig. 14b

120. The one-watt board contains two separate amplifiers:

(a) A one-watt push-pull section comprising transistors VT1 to VT5 suitable for driving an external 15 ohm loudspeaker.

(b) A low powered section (VT6 to VT8) which provides 1 mW into the transformer 1T1 for connection to an external 600 ohm line.

121. The one-watt amplifier is a transformerless push-pull circuit employing the principle of "complementary symmetry". The audio input from the signal detector is applied via the A.F. Gain potentiometer to the base of transistor VT1, which serves as a driver to the transistors VT2 and VT3. The bases of VT2 and VT3 are directly coupled to the collector circuit of VT1 and current variations in the circuit RV2, D1, D2, R1 and R2 will vary the base potentials of VT3 and VT2.

122. Transistor VT2 is an n.p.n. transistor which functions as an emitter-follower for positive-going inputs, while at the same time VT3 is cut off. On a negative-going input VT2 will cut off and the p.n.p. transistor VT3 will conduct, thus giving push-pull operation. The output transistors VT5 and VT4 are d.c. coupled to VT3 and VT2 respectively. It should be noted that transistors VT4 and VT5 are mounted in holders adjacent to the board and must be carefully released when removing the board from the chassis.

123. In the static condition the junction of R7 and R8 is at a potential which is half the supply voltage (i.e. at -8V). A variation in the current in VT4 and VT5 will produce a varying voltage at this junction, which via capacitor 1C12 drives the loudspeaker. Under static conditions the amplifier is balanced by means of potentiometer RV1 which permits accurate adjustment of the half-supply voltage at the junction of R7 and R8 (pin 5).

124. A.F. negative feedback is provided by capacitor C1 and to limit the frequency response a low value capacitor C3 is connected between collector and base of VT1. The diodes D1 and D2 provide temperature compensation to balance the effects of temperature change on the base-emitter junctions of VT2 and VT3. The potentiometer RV2 permits adjustment of the quiescent bias conditions of VT2 and VT3.

125. Adjustments. With no audio input connect a d.c. voltmeter to pin 5 (-ve) and chassis (+ve). Adjust RV1 for a reading of -8 volts. To adjust RV2 the -16V (violet) wire must be unsoldered from pin 6 and a milliammeter connected in series. RV2 is then adjusted for a reading of 55 milliamps. Re-connect the -16V lead and then re-check the -8 volt reading at pin 5. Re-adjust RV1 if necessary.

1 mW Amplifier

126. The 1 mW section follows conventional practice. The input from the signal detector is applied via the A.F. Level potentiometer and pin 7 to amplifier VT6 which is coupled via an emitter-follower VT7 to the output transistor VT8. The capacitor C7 is inserted to limit the frequency response.

POWER SUPPLY MODULES

POWER UNIT PU. 1155

127. The standard power unit is the PU. 1155. The unit consists of a main assembly which incorporates two printed circuit component boards. The overall circuit and the circuit of the main component board are shown in Fig. 15a. The circuit of the 5-volt board is shown in Fig. 15b.

INPUTS

128. The power unit can operate from the following a. c. supplies at 45 to 400 Hz.

(a) 100-125 volts (selector switch set to 112. 5).
(b) 200-250 volts (selector switch set to 225).

OUTPUTS

129. The following regulated outputs are available:-

(a)	+5 volts:	1 amp.
(b)	+63 volts:	2 mA.
(c)	+200 volts:	45 mA.
(d)	-16 volts:	400 mA.

VOLTAGE SELECTOR SWITCH

130. This slider switch has two positions marked 112. 5 and 225 respectively, which indicate the input voltage range to be used, either 100-125V (112. 5V setting) or 200-250V (225V setting). A plate retained by a single screw locks the switch in the selected position. To change the setting, remove the screw, move the switch and the plate vertically to the alternative position and replace the screw in the new position. Check that the figures indicating the required voltage range are visible.

FUSELINKS

131. Five fuselinks are fitted, as follows: -

Fuse	Facility	Rating	Replacement	
FS1	A. C. Supply	2 amp	Belling-Lee	L754/2
FS2	+5v. d. c.	2. 5 amp	Belling-Lee	L562
FS3	+200v.	150 mA	Belling-Lee	L562
FS4	+12v.	1 amp	Belling-Lee	L562
FS5	-16v.	1 amp	Belling-Lee	L562

POWER CONNECTION

132. The external a.c. supply should be connected using a 3-core cable to which a suitable 3-pin connector is fitted. The supply should provide a reliable low-resistance earth to pin C of the input. The supply cable is colour coded.

Pin A Red - Line
Pin B Black, or blue - Neutral
Pin C Green - Earth (ground)

The free socket, for mating with the fixed power plug in the unit, is the Plessey Mk. 4 2CZ 83283/5 with the accessory set 508/1/03008/205.

ADJUSTMENTS

133. The two variable adjustments on the PU. 1155 are the potentiometers RV1 on the main component board for setting the -16 volt level and RV1 on the 5 volt board for setting the +5 volt output level.

CIRCUIT DESCRIPTION

Fig. 15a

A. C. INPUT

134. The external a.c. supply enters the module through the 3-pin plug PL1, thence via the fuse 1FS1 and the connector SKT1 to the power ON/OFF switch which is part of the System Switch assembly. From the System Switch the power returns to the power module where it is distributed through the power transformer 1T1 to the four separate bridge-rectifier units. Of these, D1, D2 and D3 are mounted on the main component board, whereas 1D1 is located on the main chassis.

D. C. OUTPUTS

135. The rectifying and stabilizing circuits follow conventional practice, and only those features which are of particular significance will be referred to here.

136. 200 Volt and 63 Volt Channel. The nominal 200 volt from 'secondary two' is rectified by the bridge unit D1. The 200 volt output is fed via the series regulator 1VT1 which is stabilised by the chain of Zener diodes 1D3, 1D4 and 1D5. The 63 volt level is held by the Zener 1D5.

137. <u>12 Volt Channel (Fig. 15a)</u>. The stabilization is conventional. The Zener diodes D4 and D5 provide a nominal stabilizing level of 12.9 volts at the base of the series regulator 1VT2. Two diodes are used to permit a choice of suitable temperature coefficients. An important feature of this channel is that the +12 volt output is also used internally in the stabilizing circuit of the 5-volt channel. Thus a failure of the 12 volt output will cause a failure of the 5 volt supply to the frequency readout unit.

138. <u>-16 Volt Channel</u>. The output from the bridge rectifier D3 is fed to the filter capacitor 1C5. The transistor 1VT3 completes the connection of the -16 volt output line, and stabilizes the output by acting as a series regulator under the control of the d.c. amplifiers VT1 and VT2. The output can be set to -16 volts by adjustment of the potentiometer RV1.

139. The emitter of VT2 is held at a constant voltage by the Zener diode D7. The level at the base of VT2 is determined by the setting of RV1 and also by any change of voltage occurring in the chain R8, RV1 and R9 due to a change in output load. For example, if an increase in output loading causes the voltage at RV1 to go less negative the collector current in VT2 decreases. This causes a change in the base current of the beta multiplier VT1 which in turn increases the output of 1VT3 so as to maintain a constant output voltage.

140 To allow the stabilizer to operate from a wide range of input voltages the network R3, R6 and R7 together with the Zener diode D6 provide input regulation. The diode D6 holds the junction of R3 and R6 at a constant 4.7 volts, thus clamping the base of VT1 at a constant level despit changes in input voltage. The electrolytic capacitor C4 eliminates low frequency ripple. The capacitor C5 provides phase shift to prevent parasitic oscillation.

141. The diode 1D2 has a Zener rating of 18 volts, in order to protect the receiver against an overvoltage condition due to misuse or maladjustment

142. <u>+5 Volt Board</u>. The +5 volt circuit (Fig. 15b) is very similar to the -16 volt circuit. The chain of resistors R6, R7 and R8 in series, together with the Zener diode D3 form a constant voltage pre-regulator which maintains a virtually constant level at the base of VT1. The +5 volt output level is set by the potentiometer RV1.

143. The emitter of VT2 is held at a constant voltage by the Zener diode D2. The voltage across D2 is obtained through the limiting resistor R2 from the +12 volt supply in the main component board.

The diode D3 has a Zener rating of 3.3 volts and the voltage at the junction of R3 and R6 is constant at 8.3 volts. A failure of the +12 volt supply will cause a loss of the +5 volt output because the supply from 1D1 will be shunted by the path in the main component board.

ALTERNATIVE POWER UNITS

Information will be included in the Manual when required.

5MHz FREQUENCY REFERENCE OSCILLATOR

TYPE 840

INTRODUCTION

144. The reference frequency oscillator unit is the fast-warm-up Racal Type 840, which operates from a +12 volt supply. This is a plug-in unit which, in the event of failure, should be replaced by a serviceable unit. The defective oscillator should normally be serviced only by the manufacturer or an authorised repair depot. For this reason only limited technical information is given in this manual. The circuit is illustrated in Fig. 27 at the rear of the book and a simple calibrating procedure is given at the end of Chapter 4. For detailed information on parts and components reference should be made to the Technical Manual for the Fast-Warm-Up Oscillator Type 840 obtainable from Racal Electronics Ltd.

CIRCUIT DESCRIPTION

145. NOTE: Transistors in the Type 840 oscillator are given the circuit reference "Q".

The fast-warm-up oscillator unit Type 840 consists of the following main sections:-

(a)	Control Board Assy.	19-0037	(Circuit reference prefix - 1)
(b)	Amplifier Board Assy.	19-0038	(Circuit reference prefix - 2)
(c)	Xtal (5MHz) Board Assy.	19-0039	(Circuit reference prefix - 3)
(d)	Mother Board Assy.	19-0040	(Circuit reference prefix - 4)

Functionally, the instrument comprises the following stages:-

(a) Crystal-controlled Oscillator
(b) Automatic Gain Control Amplifier (A. G. C.).
(c) Temperature Controller
(d) Voltage Stabilizer.

146. The crystal-controlled oscillator is a standard Pierce circuit with the output taken from the load resistor of 3Q1. Frequency trimming is carried out by varicap diode 3D2, which is supplied with a variable voltage tapped from Zener diode 3D1 by potentiometers 4RV1 and 4RV2. An additional 'adjust-on-test' capacitor, CX is used to tune the crystal frequency to the required mean value. Only the components CX, 3D1, 3D2, 3R1 and the crystal XL1 are temperature controlled.

147. The output of the oscillator is amplified in the common-emitter stage 2Q1 and transformed to a lower impedance by the emitter-follower stage 2Q3. 2Q3 feeds both the output terminal (through 2R8 and 2C5) and the AGC amplifier 2Q2 (via 2C4).

148. In the absence of a signal the collector 2Q2 is held at approximately +4 volts, this voltage being applied to the base of 3Q1. Thus the gain of 3Q1 is high and oscillations build-up. As the oscillations build-up they are rectified at the base of 2Q2. 2Q2 conducts, reducing the potential applied to the base of 3Q1, and thereby stabilizing the level.

149. The temperature controller is of the pulse-width modulated type, so that the minimum amount of power is dissipated in the control transistor, but the advantages of proportional control are retained.

150. The actual operating temperature of the controller is determined by the setting of 1RV1, this normally being adjusted such that the crystal operates at its turnover temperature.

151. Transistors 1Q1 and 1Q2 form a relaxation oscillator, and together with components 1R5, 1C2 and 1C3 they apply a modified saw-tooth waveform of about 1 kHz nominal frequency to the base of 1Q3.

152. The d.c. potential at the base of 1Q3 is derived from the potential divider formed by the thermistor, TH1, resistor 1R6 and potentiometer 1RV1. Under stable conditions 1Q3 is turned off by the initial negative spike of the modified saw-tooth waveform, and on again at a point on the rising portion of the waveform determined by the setting of 1RV1.

153. The thermistor, TH1, is mounted on the crystal. Changes in the crystal temperature cause the resistance of TH1 to vary, which in turn varies the d.c. bias to the base of 1Q3.

154. Transistors 1Q3 and 1Q4 form a Schmitt trigger with a snap-over action at the critical point. The output of 1Q4 is in the form of a pulse-width modulated 1 kHz pulse train, which is applied to the compound emitter follower 3Q2/3Q3, causing this to switch a 1kHz current of 500 mA peak into the crystal heater winding.

155. The function of 2L1 and 2C8 is to prevent the supply line being modulated by the 1kHz current.

156. The fast warm-up facility is provided by allowing the heater controls to saturate when the temperature is too low. The thermistor TH1, thus has a very high resistance, causing 1Q3 to be non-conducting during the warm-up period.

157. The voltage stabilizer 1Q5 uses Zener diode 1D1 as a reference. However, the stabilized voltage will fall as a function of temperature due to changes in Vbe of 1Q5. Further stabilization of the voltage fed to the varicap diode 3D2 is carried out by Zener diode 3D1 in the crystal sub-assembly.

158. To enable the frequency to be controlled externally, or to enable it to be phase-locked, the Varicap control voltage and the stabilized voltage are both brought out to pins on the unit base.

TECHNICAL DESCRIPTION

COUNTER AND DISPLAY UNIT

INTRODUCTION

159. The following description outlines the counting and timing processes. There is no discussion of basic circuits such as decade dividers, latching circuits, etc as these can be studied in suitable reference books. It is assumed that the reader understands the basic principles of the electronic readout system as described in the RA. 1218 Operators Manual page 4-9.

MECHANICAL DESCRIPTION

160. The Counter and Display Unit contains the following individual plug-in boards.

(a) RTT Board. Fig. 25. Contains the timebase, gating control, totalizer, latching and converter/driver circuits. The board can be supplied as an assembly complete with the five "kilohertz" readout lamps.

(b) RMH Board. Fig. 24. Contains the driver transistors for the 'megahertz' readout lamps and logic circuitry for detecting the overspill when the receiver is tuned beyond the upper or lower end of the kilohertz tuning range. The board can be supplied as an assembly, complete with the two megahertz indicator lamps and the neon "overspill" lamps.

(c) RFG Board. Fig. 23. This board contains two separate circuits.

(i) A shaper which converts the sinusoidal reference frequency waveform (5 MHz or 1 MHz) to a square waveform for use in the timebase and control circuits. It should be noted that the 1 MHz reference frequency in the receiver section is also derived from the output of the RFG shaper stage.

(ii) A harmonic selector which receives a 100 kHz square wave input from the timebase and provides a sinusoidal 1.7 MHz output, for use in the i.f. converter stage of the receiver section.

(d) RBA Board. (Fig. 22a). This board contains a buffer amplifier which accepts the 2nd v.f.o. frequency (3.6 to 4.6 MHz) from the receiver and provides the required amplitude to drive the shaper and totalizer circuits in the RTT board. It also buffers the 2nd v.f.o. from harmonics arising in the shaper circuit.

(e) RXF Board. (Fig. 22b). This is a crystal filter unit which filters the 1 MHz reference frequency prior to its use in the receiver section.

(f) Power Input Filter. (Fig. 22c). This unit filters the +5 volt +63 volt and +200 volt power supplies. The terminals on the unit provide convenient test points for checking that the correct voltages are supplied to the unit.

Description of Parts

161. The following terms are used to identify the mechanical features of the unit. The base of the unit is described as the Main Tray. On this is mounted the hinged Bottom Chassis which contains the RMH and RTT boards with their associated readout lamps. The Top Chassis which is also hinged to allow upward movement, carries the RFG board. The RBA, RXF and Power Filter unit are mounted at the rear of the Bottom Chassis. Instructions for removing the various boards are given in Chapter 7 of this Manual.

ELECTRICAL DESCRIPTION

Power Supplies

162. The following supplies are obtained from the power module in the receiver section.

(a) +200 volts for the anode supply to indicator (NIXIE) lamps.

(b) +63 volts. This is a safety voltage, which prevents the 'free' collectors of the transistors in the converter/driver stages of the RTT board from rising above +63 volts. An excess collector voltage could otherwise occur due to electrostatic coupling between pins in the indicator lamps.

(c) +5 volts. This is the supply to the integrated circuit elements in the RMH and RTT boards.

Reference Frequencies

163. The MHz switch at the rear of the receiver determines whether the 5MHz internal reference, or a 1 MHz external reference is supplied to the Counter Unit. The selected reference is fed to the shaper board RFG and thence as a squared waveform to pin 11 on PL1 of the RTT board (Fig. 25).

164. In the RTT board the shaped 5 MHz reference frequency is fed to a divide-by-five element (LG10) thence to an exclusive OR gate LG5. A gate control line (Fig. 25 pin 16) operated by the receiver MHz switch allows the OR gate to accept the output from LG10 whenever the 5 MHz reference is in use (MHz switch set to INT). If the MHz switch is set to EXT, the 1 MHz is accepted by the OR gate and applied to the timebase circuit without division, the output from LG10 being rejected.

Timebase Circuit

165. The timebase chain which comprises the decade dividers LG13, LG14, LG11 and LG12 is driven by the 1 MHz from LG5b. A frequency of 100 kHz is taken from the RTT connector at pin 18 to the RFG board, for multiplication to 1.7 MHz for use in the receiver.

Control Circuit

NOTE: Control Circuit waveforms are shown in Fig. 5-1 at the end of Chapter 5.

166. Referring to Fig. 25 the control circuit consists of the logic elements LG25, LG30a, LG30b, LG31b, the reset generator VT3 and update generator VT4. The control circuit produces the following timing waveforms derived from the 100 Hz input.

(a) An output from LG30a which has a mark/space ratio of 10 : 1. This is applied to the gate LG32 and allows the 2nd v.f.o. frequency to pass to the totalizer chain for a period of 0.1 seconds, followed by an "off" period of .01 seconds.

(b) An update pulse of .01 seconds from the collector of VT4 releases the totalizer count to the readout circuits. This update pulse is delayed by 5 micro-seconds from the end of the counting period to ensure that the count is satisfactorily completed before being released to the readout.

(c) A reset pulse from the collector of VT3, which has a duration of 1.5 microseconds, resets the totalizers to commence a new count. This pulse is delayed by 5 milliseconds from the end of the counting period.

167. The control circuit waveforms are produced in the following sequence. From pin 8 of LG24c, 100 Hz is fed into LG25. This element is required to produce a negative-going timing edge at intervals 0.1 seconds and .01 seconds, alternately. This is achieved by using a divide-by-ten element, with a reset-to-nine facility. This produces a waveform which would normally be down for 8 periods and up for 2 periods, but due to the reset pulse fed back from VT3, it produces a waveform of 0.11 second period and a mark/space ratio of 10:1

168. The output of LG25 is fed via the inverter LG24a to the clock input of the Control Flip-Flop LG30a, which is a binary (dual D-type flip-flop) which clocks on positive edges, and provides an output which is down for 0.1 second and up for .01 second. This output is supplied to the Gate LG32a to determine the counting period, and also to LG30b to provide a delayed update pulse. The binary LG30b is also clocked by 100 kHz from the timebase, this has the effect of delaying the positive edge from LG30b by a half period of 100 kHz, that is, by 5 microseconds. This delayed .01 second pulse is supplied via pin 8 of LG30b to the Update generator VT4. The inverted equivalent of this pulse is supplied from pin 9 of LG30b to the gate LG31b.

169. LG31b is a two-input NAND gate which allows a single pulse of the 100 Hz timebase frequency to pass through, when gated by the .01 second pulse from LG30b. The output from pin 6 of LG31b is differentiated by C11 and R14 to provide a negative-going spike of 1.5 microseconds duration at the base of VT3. Transistor VT3 is normally conducting due to the bias across R14, but on the -ve edge of the base waveform, VT3 is cut off for 1.5 microseconds and thus supplies a +ve spike to the reset line.

Totalizer Circuits

170. The totalizer and readout use conventional circuits, but the interconnections and the reset system are arranged to meet the special requirements of the RA.1218 receiver, which are as follows:

(a) The frequency to be measured in the totalizer chain is derived from the receiver 2nd v.f.o. (kilohertz tuning).

(b) The 2nd v.f.o. tunes over the range 3.600 001 to 4.600 000 MHz in which 4.600 00 represents 000 000 on the kilohertz readout and 3.600 001 represents 999 999 kHz. Thus the totalizer, in effect, is required to count downwards as the 2nd v.f.o. tuned frequency is increased. This requirement is met by using a conventional 'up-counter' but with the output connections wired to illuminate the correct digits, such that when the totalizers are all at '9' the kilohertz display will read 000, 00 and vice versa. Thus, all totalizers (except the 100 kHz) are reset to 9 before commencing a new count.

(c) The lowest readings (000, 00) at the 100 kHz readout corresponds to 4.600 MHz from the 2nd v.f.o., therefore the 100 kHz decade divider must commence its count at an input of 600 kHz. This requires that the decade be reset to '6', which cannot be done using the standard element such as LG8. For this reason the 100 kHz decade uses four binaries (LG34a, LG34b, LG38a and LG38b) plus necessary gating (LG37a, b, c and d). The reset pulse must be -ve going and is therefore inverted by LG31d. Similarly the clock signal is inverted by LG31c.

MHz Readout

Fig. 24

171. The Megahertz readout is contained in the RMH board. The appropriate digit is illuminated whenever the corresponding series transistor is turned on by the application of a -ve bias supplied via encoder switch contacts in the receiver MHz tuning section. (Fig. 16).

172. The logic elements in the RMH board are solely for the indication of overspill and may be regarded as an extension of the totalizer. The 100 kHz decade in the RTT board (LG38b) feeds an output signal to LG1 in the RMH board whenever a complete megahertz is counted. This only occurs when the receiver is tuned beyond the ends of the kilohertz tuning scale, therefore an actual count of megahertz is not required, but only the two states which indicate overspill at each end of the tuning scale. For this purpose a pair of dual D-type flip-flops is suitable.

173. Latching and update facilities are provided by LG2. The update pulse is obtained from the update line in the RTT board. The reset pulse applied to LG1 is obtained from the reset line in the RTT board after inversion by LF31d. (Fig 25). Two reset connections are available at the RMH connector. The connection marked "Reset 3.6 MHz" which goes to pins 4 and 13 on LG1 is used with the RA. 1218 receiver. The connection marked "Reset 2.1 MHz" is used only with the Racal Receiver Type RA. 17.

CHAPTER 2

TEST AND MAINTENANCE EQUIPMENT

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

R. F. Signal Generator

NOTE: A good quality signal generator, with a frequency range up to 8 MHz and a source impedance of 75 ohms is suitable for many of the tests, but to meet all requirements two signal generators of the following specification are required:

Frequency Range	10 kHz to 70 MHz
Output Impedance	75 ohms

A. M. Modulation distortion less than 10%

Example: Marconi TF. 144H, 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 scale
Example	AVO Model 8

Electronic Voltmeter (RF Voltmeter)

D. C. 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 MHz
Example	Airmec Type 301

Electronic Voltmeter (L. F.)

D. C. Input Impedance	Not less than 1 megohm
Range (0 dB = 0. 775 volts)	Minus 50 dB to plus 10 dB
Example	Advance Advac VM77

Digital Frequency Meter (Counter)

Frequency Range	1 Hz to 70 MHz
Accuracy	Internal reference frequency 1 part in 10^6 plus or minus 1 count.
Example	Racal Type SA. 550 with probe for high input impedance.

Output Power Meter

Frequency Range	100 Hz to 6000 Hz
Input Impedances	600 ohms (and 15 ohms if the 1 watt audio amplifier is fitted)
Example	Marconi TF. 893A

Noise Generator

Output Impedance	75 ohms
Example	Marconi TF. 1106

Oscilloscope

Frequency Range	0 to 30 MHz with dual trace
Example	Tektronix 545A

Waveform Analyzer

Frequency Range	100 Hz to 10 kHz; capable of measuring to 40 dB minimum
Example	Wayne Kerr A321

Audio Signal Generator

Frequency Range	100 Hz to 8000 Hz
Example	Advance Type J2

Telephone Headset — 600 ohm impedance (approximately)

Tools

Spanners: $\frac{1}{4}$ inch AF (6. 5 mm) and 10/32 UNF Hex.
Screwdrivers: Various
Soldering iron
The following tools are attached to the underside of the receiver cover:

(a) Hexagonal (key) wrenches: . 050 inch AF and 1/16 inch AF
(b) Neosid trimming tools: 4 mm and T. T. 1.

Terminating Resistors

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

Heat Shunt

Required when soldering certain coil assemblies to the printed circuit board. Refer to the next page for details.

R E P A I R D A T A

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. The procedure is recommended for all coil soldering.

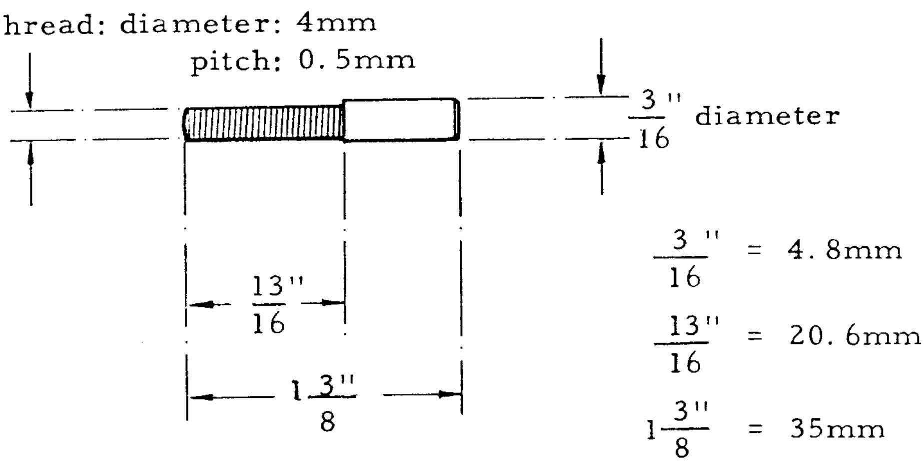
(1) Remove the adjustable core from the replacement coil assembly.

(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 (4 mm core).



Material: Brass

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.

NOTE 1: Unless stated otherwise the signal generator levels are given as e.m.f. and R.F. output voltages as r.m.s.

NOTE 2: To facilitate tests and adjustments in the receiver, the Counter and Display unit can be unscrewed, lifted out a short distance and rested on a book or similar non-metallic base, which may be placed on the i.f. module. Once the MHz tuning has been set to the required readout, it is possible to move the Counter and Display unit further from the receiver by unplugging the Cannon Connector (PL21).

CAUTION 1: This chapter refers to power meter measurements on both the 10 mW 600Ω and the 1 watt 15Ω versions of the RA. 1218. The user must ensure that the correct termination is used for the particular version of the receiver under test.

CAUTION 2: While making test connections to the 12-way outlet on the rear panel, the receiver should be switched off to avoid an accidental short-circuit on the audio output which might damage transistors.

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 (225 or 112.5 as appropriate).
(b) 2nd V.F.O. switch to INT.

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

(5) Set the LOCK controls to the off position. Some receivers are not fitted with tuning control locks.

(6) Check all controls for smooth operation.

(7) Connect the external power supply to receiver.

POWER CHECK

4. (1) Connect the d.c. voltmeter -ve lead, (25 volt range) to the terminal H.T. R.F. on terminal block TB1 (Fig. 19).

(2) Remove the receiver cover.

(3) Set the System switch to MAN.

(4) Check that the voltmeter indicates -16 volts relative to chassis. If necessary, adjust potentiometer RV1 on the main circuit board of the power module, (Fig. L - 15).

(5) Remove the test equipment.

SYSTEM CHECK

5. (1) Connect high impedance headphones to the PHONES socket.

(2) Connect the signal generator (impedance 75 ohms) to the R.F. INPUT (Antenna) socket.

(3) Set the signal generator to 3.5 MHz at 15 microvolts e.m.f. 30% modulation at 400 Hz.

(4) Set the receiver controls as follows:-

(a) MHz control to 03 on the frequency display.
(b) KHz control to 50000 on the frequency display.
(c) R.F. RANGE to WB.
(d) R.F. ATTENUATOR to MIN.
(e) I.F. BW KHz to 3.
(f) R.F. GAIN fully clockwise (maximum gain).
(g) A.F. GAIN mid-position.
(h) FINE TUNE control to mid-position.
(j) DET-B.F.O. switch to A.M.

(5) Set the System switch to CAL.

(6) Adjust the KHz tuning control around the 500 kHz indication and ensure that a beat note is heard in the phones.

(7) Set the System to CHECK B.F.O. Alter the KHz tuning by approximately 20 kHz. Switch the DET-B.F.O. MODE switch to the CW position. Rotate the B.F.O. TUNE control either side of zero and check that a change of beat note occurs.

(8) Set System switch to MAN and DET-B.F.O. switch to A.M.

(9) Reset KHz control to indicate 500.

(10) If necessary, adjust signal generator frequency to the frequency of the receiver tuning.

(11) Set the RA. 1218 meter switch to the A.F. position.

(12) Adjust the preset Line Level control (inside receiver at rear, right) and note that the meter indication changes with variation in setting.

(13) Set the d.c. voltmeter to the 10 volt range and connect the -ve lead to the terminal A.G.C. R.F. on the rear panel.

(14) Set the RA. 1218 meter switch to R.F.

(15) Switch off the signal generator.

(16) Set the System switch to the A.G.C. positions Lg. Med. and Sh. in turn. Check that -4 volts ±.25V is indicated on the d.c. voltmeter in each position. If not satisfactory refer to the I.F. Module check in Chapter 4 page 4 - 3, operations (1) to (4).

(17) Switch on the signal generator and adjust the e.m.f. to 1 μV.

(18) Set the R.F. RANGE to 2-4 and adjust R.F. TUNE for maximum signal.

(19) Set the System switch to A.G.C. Med, then adjust the 'Meter Set Zero' preset control 3RV4 (see Fig. 18). Check that 1 μV is indicated on the RA. 1218 meter.

(20) Note that the d.c. voltmeter indicates approximately -ve 4 volts (not less than 3.8V) at the terminal 'A.G.C. R.F.' at the rear of the receiver.

(21) Increase the signal generator output in 10 dB steps up to +80 dB, check that the a.g.c. level on the d.c. voltmeter becomes less negative at each 10 dB step. Also check that the RA.1218 meter indicates approximately the appropriate 'S' level at each 10 dB step. At the 12-way rear panel outlet (SKT11) briefly earth pin G (Antenna Muting) and note that the 'S' Meter indication changes from 80 dB to less than 10 dB when the earth is applied.

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

(23) Set the MHz tuning control to '00'. Note that the d.c. voltmeter a.g.c. reading is removed.

(24) Transfer the d.c. voltmeter -ve lead to the terminal H.T. R.F. Turn the MHz control clockwise. Note a reading of -16 volts. Reset the MHz control to '00' and check that the voltmeter reading is removed.

(25) Set the MHz control to 03 and the System switch to OFF.

(26) Transfer the -ve lead of the d.c. voltmeter to pin H (A.G.C. DIV) of the 12 way outlet SKT11.

(27) Check that the signal generator is set to 3.5 MHz: 1 µV e.m.f: 30% modulation: 400 Hz.

(28) Set the System switch to A.G.C. Med. The d.c. voltmeter should indicate 9.5V plus or minus 1 volt.

(29) Connect an l.f. electronic voltmeter to the terminal DET on TB1: a reading of 200 mV should be obtained.

(30) Set the System switch to OFF.

(31) Transfer the electronic voltmeter to the coaxial socket '1.6 MHz OUT'. (short connecting leads).

(32) Transfer the signal generator output to the coaxial socket 'L.F.'.

(33) Set the signal generator to 2.5 MHz and an e.m.f. of 200 µV.

(34) Set the System switch to A.G.C. Med and Check that the electronic voltmeter indicates not less than 60 mV.

(35) Set the System switch to OFF.

(36) Connect an electronic voltmeter to the socket 2nd V.F.O. OUT at the rear of the receiver. (unterminated).

(37) Set the System switch to MAN.

(38) Set the 2nd V.F.O. switch to INT. The electronic voltmeter should indicate 100 mV, approximately.

(39) Set the 2nd V.F.O. switch to EXT. Check that the indication noted in (38) has been removed.

(40) Reset the 2nd V.F.O. switch to INT. Remove all test equipment.

Crystal Frequency Check

6. (1) Connect a digital frequency meter to the rear panel socket 1.7 MHz.

(2) Set the System switch to MAN.

(3) Check that the digital frequency meter indicates 1.700 000 ±1 Hz.

(4) Transfer the digital frequency meter to the rear panel socket 1 MHz OUT.

(5) The digital frequency meter should indicate 1.000 000 ±1 Hz. If either of these frequencies is not correct, the Counter and Display unit should be checked also the Fast-Warm-Up Oscillator unit.

Auxiliary Inputs and Outputs

7. (1) Terminate with 75 ohms each of the following sockets in turn and connect an electronic voltmeter to the terminated outlet. Set the System switch to MAN. The outputs should be as follows:-

TABLE 1

	Socket	Required Output
(a)	1 MHz OUT)	50 mV in 75 ohms
(b)	1.7 MHz IN/OUT)	30 mV in 75 ohms
(c)	2nd V.F.O. OUT)	50 mV in 75 ohms

(2) Set the following switches at the rear:-

2nd V.F.O. switch to EXT.
1.7 MHz switch to EXT.
1.0 MHz switch to EXT.

(3) Connect signal generator sequentially to the sockets listed in Table 2 below. The signal 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 50 mV into 75 ohms termination.

TABLE 2

Connect Sig. Gen. to these sockets	Sig. Gen. Frequency	Sig. Gen. Output (75Ω Source)	Measure Output at the Sockets
1 MHz IN	1 MHz	100 mV e.m.f.	1 MHz OUT
2nd V.F.O. IN	4 MHz	100 mV e.m.f.	2nd V.F.O. OUT

(4) Set the System switch to OFF. Replace the module covers.

KHz Tuning Readout Check

8. (1) Rotate the kHz tuning control clockwise and ensure that the + overspill lamp is illuminated when the kHz readout is greater than 99999. Turn the control fully clockwise against its stop and check that an overrun of not less than 25 kilohertz is indicated on the readout.

(2) Rotate the kHz tuning control fully anti-clockwise. Check that the - overspill lamp illuminates when the kHz readout is less than 00000. The overrun should be not less than 25 kHz. (Displayed frequency to be not higher than -9750). Instructions for adjusting the overrun are given in Chapter 7 page 7-10 operation (14).

(3) Connect the digital frequency meter to the 2nd V.F.O. OUT socket. Vary the kHz tuning control over its full range and check the receiver readout against the digital frequency meter reading in accordance with Table 3 below. Press the 10 Hz button on the readout escutcheon to obtain the final digit.

TABLE 3

Kilohertz Readout Check

Receiver Display (Megahertz)	Digital Frequency Meter Reading (Megahertz)
.00000	4.60000 plus or minus 10 hertz
.10000	4.50000 plus or minus 10 hertz
.20000	4.40000 plus or minus 10 hertz
.30000	4.30000 plus or minus 10 hertz
.40000	4.20000 plus or minus 10 hertz
.50000	4.10000 plus or minus 10 hertz

TABLE 3 (Continued)

Kilohertz Readout Check

Receiver Display (Megahertz)	Digital Frequency Meter Reading (Megahertz)
.60000	4.00000 plus or minus 10 hertz
.70000	3.90000 plus or minus 10 hertz
.80000	3.80000 plus or minus 10 hertz
.90000	3.70000 plus or minus 10 hertz
.11111	4.48889 plus or minus 10 hertz
.22222	4.37778 plus or minus 10 hertz
.33333	4.26667 plus or minus 10 hertz
.44444	4.15556 plus or minus 10 hertz
.55555	4.04445 plus or minus 10 hertz
.66666	3.93334 plus or minus 10 hertz
.77777	3.82223 plus or minus 10 hertz
.88888	3.71112 plus or minus 10 hertz
.99999	3.60001 plus or minus 10 hertz

(4) Disconnect the digital frequency meter.

(5) Set the FINE TUNE control to the mid-position.

(6) Adjust the kHz tuning control for a receiver display of +.00000 kHz.

(7) Vary the FINE TUNE control and check that the receiver display is continuously variable by not less than plus or minus 200 Hz but not more than plus or minus 400 Hz.

MHz Tuning Readout Check

9. (1) Set the MHz tuning control to the fully anti-clockwise position and check that the megahertz readout indicates '00'.

(2) Rotate the MHz tuning control slowly clockwise and check that the readout increases by one megahertz at each discrete step in the rotation. In the fully clockwise position of the control the megahertz indication should indicate 29 megahertz.

B.F.O. Calibration

10. (1) Connect a digital frequency meter to the audio output, pins C and D of SKT11.

(2) Set the System switch to CHECK B.F.O. and the DET-B.F.O. switch to CW. Adjust the B.F.O. TUNE control for an audio null. If necessary adjust the 'zero' preset trimmer such that the audio null coincides with the zero setting of the B.F.O. TUNE control dial.

(3) Set the B.F.O. TUNE control to minus 8 kHz. Ensure that the digital frequency meter reads 8 kHz plus or minus 300 Hz.

(4) Set the B.F.O. TUNE control to plus 8 kHz. Ensure that the digital frequency meter reads 8 kHz plus or minus 300 Hz.

(5) Check that an audio tone is produced at each b.f.o. tuning point and ensure that the reading on the digital frequency meter is within 400 Hz of each kilohertz setting of the B.F.O. TUNE control dial.

(6) Set the DET-B.F.O. switch to USB and LSB in turn. Ensure that the digital frequency meter reading is 1500 Hz plus or minus 2 Hz or minus 1.6 (t-25) Hz where t is the room temperature in degrees Centigrade.

(7) Remove the test equipment. Replace the cover of the i.f. module.

Overall Receiver Sensitivity Check

NOTE: The audio power meter must be terminated in 15 ohms for a 1-watt receiver or in 600 ohms for a 10 mW receiver.

(1) Terminate the power meter in 600 ohms (10 mW output) or 15 ohms (1-watt output) and connect it to the audio output at pin D and pin C (screen) of the 12-way outlet 1 SKT11.

(2) Connect the H.F. electronic voltmeter to the unterminated 1.6 MHz OUT socket. The length of cable between socket and voltmeter must not exceed 12 inches. (30 cms).

(3) Connect the Signal generator to the R.F. INPUT (Antenna) socket. Set the generator to 3.5 MHz modulated 30% at 400 Hz. Output level 1 μV e.m.f. from 75Ω source.

(4) Set the receiver control as follows:-

(a) R.F. ATTENUATOR to MIN.
(b) R.F. RANGE to 2-4 MHz.
(c) R.F. TUNE tuned to 3.5 MHz.
(d) DET - B.F.O. switch to A.M.

(e) R.F. GAIN fully clockwise (maximum gain).
(f) I.F. B.W. switch to 3.
(g) System switch to MAN.

(5) Tune receiver MHz and KHz controls to 3.5 MHz and make fine adjustments to obtain maximum output on the electronic voltmeter. Peak the R.F. TUNE control.

(6) Set the System switch to A.G.C. Med.

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

(8) Adjust the A.F. GAIN control for maximum output on the power meter. Note the indicated level which should be not less than "10 mW into 600Ω or 1 watt into 15Ω.

(9) Transfer the electronic voltmeter to the 100 kHz OUT socket on the rear panel, the output to be terminated in 75 ohms. Note the output level as follows:-

(a) For 100 kHz output not less than 230 mV.

(10) Set the System switch to MAN.

<u>Single-Signal Selectivity</u>

12. (1) Set the RA.1218 controls as follows:-

(a) R.F. ATTENUATOR to MIN.
(b) R.F. RANGE to 2-4 MHz.
(c) R.F. TUNE tuned to 3.5 MHz.
(d) I.F. B.W. switch to .2 (200 Hz).
(e) R.F. GAIN fully clockwise (maximum gain).
(f) DET-B.F.O. to A.M.
(g) System switch to MAN.

(2) Set the signal generator to 3.5 MHz, c.w. 1 μV e.m.f.

(3) Connect the digital frequency meter directly to the signal generator output and accurately tune the generator to 3.5 MHz. Remove the digital frequency meter and connect the signal generator to the receiver R.F. INPUT (Antenna) socket.

(4) Connect the H.F. electronic voltmeter to the 1.6 MHz OUT socket of the receiver.

(5) Connect the digital frequency meter in parallel with the electronic voltmeter using a sensitive probe.

(6) Tune the receiver to obtain the maximum indication of the electronic voltmeter. Note the output level obtained, as a reference.

(7) Decrease the frequency of the signal generator until the indication of the electronic voltmeter is 3 dB down relative to the reference level noted in (6). Note the frequency on the digital frequency meter.

(8) Increase the frequency of the signal generator above 3.5 MHz until the electronic voltmeter again indicates 3 dB down relative to the reference level noted in (6). Note the frequency on the digital frequency meter.

(9) Calculate the bandwidth by subtracting the frequency noted in (7) from that noted in (8). This shall be 200 Hz plus or minus 50 Hz.

(10) Repeat the procedure outlined in operations (2) to (9) for each setting of the I.F. BW switch, setting the signal generator frequency accordingly. The limits shall be as specified below.

I.F. BW Setting		Minus 3 dB Bandwidth
3 kHz		3 kHz ±300 Hz
8 kHz		8 kHz ±800 Hz
1.2 kHz)		1.2 kHz ±120 Hz
6.5 kHz)	if fitted	6.5 kHz ±650 Hz
13 kHz)		13 kHz ±1300 Hz

(11) Disconnect the electronic voltmeter and digital frequency meter.

Signal-to-Noise Ratio (C.W. and S.S.B.)

13. (1) Connect the power meter (terminated in 600Ω for 10 mW or 15Ω for 1-watt) to the audio output (1SKT11 pins D and C).

(2) Connect the signal generator to the R.F. INPUT (Antenna) socket. Set the output to 1 μV e.m.f. and the frequency to 3.5 MHz.

(3) Set the receiver controls as follows:-

(a) R.F. RANGE to 2-4 MHz.
(b) R.F. ATTENUATOR to MIN.
(c) I.F. BW to 3 kHz.
(d) DET-B.F.O. to USB.
(e) R.F. GAIN fully clockwise (max. gain).
(f) A.F. GAIN fully clockwise (max. gain).
(g) Set the System switch to MAN.

(4) Tune the receiver (including the R.F. TUNE) to obtain maximum a.f. output on the power meter.

(5) Set the System switch to A.G.C. "Med" and adjust the A.F. GAIN control until the power meter indicates a reference level of 10 mW into 600Ω or 1 watt into 15Ω according to the type of audio board fitted.

(6) Set the System switch to MAN and adjust the R.F. GAIN control to restore the power meter reading to the reference level noted in (5).

(7) Set the signal generator to CARRIER OFF.

(8) Note the power meter reading which should be not less than 15 dB below the reference level noted in (5).

(9) Set the R.F RANGE switch to WB.

(10) Set the signal generator to CARRIER ON and increase the generator output to 15 μV.

(11) Repeat the procedures (6) to (9) inclusive.

Signal-to-Noise Ratio (M.C.W.)

14. On completion of the C.W. Signal-to-Noise check continue as follows:-

(1) Set the DET-B.F.O. switch to A.M.

(2) Set the System switch to MAN.

(3) Set the signal generator output to 30% modulation at 400 Hz at an e.m.f. of 3μV.

(4) Set the R.F. RANGE to 2-4 and tune for a maximum output on the power meter.

(5) Set the System switch to A.G.C. "Med" and adjust the A.F. GAIN control until the power meter indicates a reference level of 10 mW into 600Ω or 1 watt into 15Ω according to the type of audio board fitted.

(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).

(7) Disconnect the power meter.

Gain/Frequency Characteristic

15. (1) Connect a signal generator to the R.F. INPUT (Antenna) socket. Set the signal generator to 1 MHz at 1 μV e.m.f. C.W. Maintain the generator e.m.f. at 1 μV throughout the tests.

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

(3) Set the receiver controls as follows:-

(a) R.F. ATTENUATOR to MIN.
(b) R.F. RANGE to 1-2 MHz.
(c) R.F. GAIN fully clockwise (maximum gain).
(d) I.F. BW to 3.
(e) DET-B.F.O. to L.S.B.
(f) System switch to MAN.
(g) Meter switch to R.F.

(4) Tune the receiver (including R.F. TUNE) for a maximum output on the electronic voltmeter of 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 MHz 2.0 MHz 3.0 MHz 4.0 MHz 6.0 MHz 12.0 MHz 16.0 MHz 24.0 MHz and 29.999 MHz.
Each output should be within a 12 dB range over the frequency band 1-30 MHz. The minimum level shall be not less than 35 mV and the maximum level not greater than 250 mV.

A.G.C. Characteristic Check

16. (1) Connect the signal generator to the R.F. INPUT (Antenna) socket.

(2) Set the signal generator to 10.5 MHz, modulation 30% at 400 Hz, e.m.f. 2 μV.

(3) Connect the power meter (terminated in 600Ω for 10 mW or 15Ω for 1 watt) to the audio output (1SKT11 pins D and C).

(4) Set the receiver controls as follows:-

(a) R.F. RANGE to 8-16 MHz.
(b) R.F. ATTENUATOR to MIN.
(c) I.F. BW to 3.
(d) DET-B.F.O. to A.M.
(e) R.F. GAIN fully clockwise (maximum gain).
(f) System switch to MAN.

(5) Tune the receiver (including R.F. TUNE) to 10.5 MHz and adjust for maximum output on the power meter.

(6) Set the System switch to AGC Med.

(7) Adjust the A.F. GAIN control to provide a reference reading on the power meter of either 1 mW into 600Ω or 100 mW into 15Ω.

(8) 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.

(9) Reset the signal generator to 2 μV and then repeat operation (8) in the AGC 'sh' and AGC 'lg' settings of the System switch.

(10) The power meter should remain connected for the Noise Factor check.

Noise Factor Check

17. (1) Connect the noise generator (75Ω source) to the R.F. INPUT (Antenna) socket. Do not switch on the noise generator.

(2) Connect the power meter (terminated in 600Ω for 10 mW or 15Ω for 1 watt) to the audio output (1SKT11 pins D and C).

(3) Set the receiver controls as follows:-

(a) R.F. ATTENUATOR to MIN.
(b) System switch to MAN.
(c) DET-B.F.O. to U.S.B.
(d) I.F. BW to 3.
(e) R.F. GAIN fully clockwise (maximum).
(f) The R.F. RANGE and R.F. TUNE should be set to the appropriate settings for peak tuning at each test.

(4) Check that the noise generator is switched off. Set R.F. RANGE to 1-2 and tune the receiver (including R.F. TUNE) to 01.000 MHz. Carefully adjust the MHz control for maximum indication on the power meter and peak the R.F. TUNE control.

(5) Adjust the A.F. GAIN control for a power meter reading of either 1mW (10mW receiver) or 100mW (one-watt receiver).

(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 should not exceed 10 dB.

(7) Repeat operations (4), (5) and (6) at the following frequencies:
1.5 MHz 2.0 MHz 3.0 MHz 4.0 MHz 6.0 MHz 12.0 MHz, tuning the receiver to the appropriate range in each case.

(8) With the R.F. RANGE switch set to '16-32' repeat the procedures of (4), (5) and (6) checking that the noise factor does not exceed 12 dB at 16.0, 24.0 and 29.999 MHz.

(9) Disconnect the Noise Generator.

First Mixer Balance Check

18. NOTE: The Counter and Display Unit must be moved to one side to make the adjustments in this test.

CAUTION: Do not remove the cover from the 1st mixer and 40 MHz filter module. A suitable alignment hole is in the cover.

(1) Connect the signal generator to the R.F. INPUT (Antenna).

(2) Set the signal generator to 3.5 MHz, C.W., e.m.f. 15 μV.

(3) Connect the power meter (terminated in 600Ω for 10 mW or 15Ω for 1 watt) to the audio output (1SKT11 pins D and C).

(4) Connect the electronic voltmeter to the socket 1.6 MHz OUT.

(5) Set the receiver controls as follows:-

(a) R.F. ATTENUATOR to MIN.
(b) R.F. RANGE to WB.
(c) DET-B.F.O. to U.S.B.
(d) I.F. BW to 3.
(e) R.F. GAIN fully clockwise (maximum gain).
(f) MHz tuning to 3 and KHz tuning to 500.
(g) Meter switch to A.F.
(h) System switch to MAN.

(6) Tune the receiver to a maximum reading on the power meter and adjust the A.F. GAIN control to obtain a reference level of 1mW (10mW receiver) or 100mW (one-watt receiver).

(7) Set the signal generator frequency to 20 MHz.

(8) Increase the signal generator output by plus 60 dB relative to 15 μV.

(9) Vary the signal generator tuning around the 20 MHz point until a maximum 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. Check that this minimum reading is not less than 60 dB down relative to the reference level noted in (6).

(11) Remove the signal generator.

Spurious Response to Internal Signals

CAUTION: Spurious responses can occur if module securing screws are slack or if covers are loose.

19. (1) Ensure that all module covers are secure also the top and bottom covers of the receiver and Display Unit screwed down.

(2) Connect the power meter (terminated in 600Ω for 10 mW or 15Ω for 1 watt) to the audio output (1SKT11 pins D and C).

(3) Disconnect and switch off the signal generator and terminate the R.F. INPUT (Antenna) socket with 75 ohms.

(4) Set the Receiver controls as follows:-

(a) R.F. ATTENUATOR to MIN.
(b) R.F. RANGE to WB.
(c) DET-B.F.O. to U.S.B.
(d) R.F. GAIN fully clockwise (Maximum).
(e) I.F. BW to 3 kHz.
(f) System switch to MAN.
(g) Set the MHz and KHz tuning to 01.000 initially.

(5) Adjust the MHz tuning carefully for maximum noise level on the power meter.

(6) Adjust the A.F. GAIN control to obtain a noise level on the power meter of 1 mW into 600Ω or 100 mW into 15Ω.

(7) Turn the KHz tuning control slowly and carefully through its range from 000 to 999. When a spurious response is heard in the phones, offset the KHz tuning until the response is no longer audible and then adjust the A.F. GAIN control to restore the reference level noted in (6).

(8) Retune the KHz tuning to the spurious response and carefully tune to obtain a peak reading on the power meter.

(9) Note the increase in the power meter reading relative to the reference level obtained in (7). This increase should not exceed 3 dB

(10) Repeat operations (5) to (9) at each setting of the MHz control from 02 up to 29.

(11) Repeat operations (5) to (9), with the R.F. RANGE set to the appropriate range, and the R.F. TUNE control adjusted to maximum noise setting at each MHz setting from 02 up to 29.

(12) On completion remove the 75Ω termination from the R.F. INPUT socket.

Spurious Response to External Signals

20. (1) Connect the signal generator to the R.F. INPUT (Antenna) socket.

(2) Set the signal generator to 3.5 MHz, C.W. 1 μV e.m.f.

(3) Connect the power meter (terminated in 600Ω for 10 mW or 15Ω for 1 watt) to the audio output (1SKT11 pins D and C).

(4) Set the receiver controls as follows:-

(a) R.F. ATTENUATOR to MIN.
(b) R.F. RANGE to 2-4 MHz.
(c) DET-B.F.O. to L.S.B.
(d) R.F. GAIN fully clockwise.
(e) I.F. BW to 3 kHz.
(f) System switch to MAN.

(5) Tune the receiver (including R.F. TUNE) to the signal generator frequency for a maximum power output.

(6) Adjust the A.F. GAIN control to obtain a reference reading on the power meter of either 1 mW for the 10 mW receiver or 100 mW for the 1 watt receiver.

(7) Set the signal generator to 3.55 MHz and increase the signal generator output level to +70 dB. Make a very fine adjustment of the MHz control until a spurious frequency is heard. Lock the tuning controls at this point. (If locks are fitted).

(8) Tune the signal generator carefully from 3 MHz up to 4 MHz. If a spurious frequency is found, adjust the signal generator output to restore the appropriate reference level noted in (6). Check that such generator level settings are not less than 60 dB above 1 μV to provide the appropriate reference level.

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

(i) Remove the cover from the 37.5 MHz Generator module.

(ii) Make a small adjustment of the potentiometer R6 on the Harmonic Mixer board (Fig. L-7) 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 MHz Generator module. Release the pillar screws and hinge the 1 MHz calibrator deck upwards. Refer to Fig. L-7.

(iii) Adjust the signal generator output level to obtain the reference level on the power meter (either 1 mW or 100 mW as appropriate). The signal generator level should be not less than 60 dB, in accordance with operation (8). If necessary make a further small adjustment of R6 and repeat the test.

(iv) Replace the cover on the 37.5 MHz Generator module and the receiver cover.

(v) Repeat operation (8).

(10) Disconnect the signal generator and power meter.

CHAPTER 4

ALIGNMENT PROCEDURES

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 1: 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.

NOTE 2: In many of the tests the Display Unit is not required, but it is recommended that the unit be connected using the rear (Burndy) connector only. This ensures that the 1 MHz reference frequency is supplied to the receiver, while allowing the unit to be moved sufficiently to provide access to the receiver. If the user is certain that neither the 1 MHz reference nor the readout is required for a particular test the Counter and Display unit can be removed completely.

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

2.

AUDIO AMPLIFIER BOARD

(1 watt Version)

Test Equipment

3. Multimeter: 20 000 ohms/volt. (AVO 8).
Soldering Iron.

Initial Control Settings

4. R.F. GAIN and A.F. GAIN fully anti-clockwise (minimum).

Setting Procedure

5.
(1) Remove the metal panel from the underside of the receiver.

(2) Set the multimeter to the 25 volt d.c. range:
Connect the -ve lead to pin 5 on the audio amplifier board and the +ve lead to chassis.

(3) Set the System switch to MAN.

(4) Adjust the potentiometer RV1 on the audio board for a reading of -8 volts on the multimeter.

(5) Set the System switch to OFF and unsolder the h.t. (violet) lead from pin 6 of the board.

(6) Set the multimeter to the 100 mA d.c. range and connect in series with pin 6 and the disconnected h.t. lead. (+ve lead to pin 6).

(7) Set the System switch to MAN and adjust potentiometer RV2 on the board for a reading of 55 mA on the multimeter.

(8) Set the System switch to OFF.

(9) Remove the multimeter and re-solder the h.t. lead to pin 6.

(10) Repeat operations (2), (3) and (4), adjusting RV1 if necessary.

(11) Remove the test equipment and replace the metal panel.

AUDIO AMPLIFIER BOARD

(10 mW Version)

There are no adjustments in the 10 mW audio amplifier board.

Refer to Chapter 3 paragraph 11 for a check procedure. If the 10 mW level cannot be obtained in operation (8) of that paragraph it will be necessary to employ basic servicing methods to find the cause of low output.

I.F. MODULE

Test Equipment

6. Signal Generator.
D.C. Voltmeter.
Electronic Voltmeter.
Digital Frequency Meter.
Power Meter: (600Ω for 10 mW or 15Ω for 1 watt measurements).
0.1 μF Capacitor 30V rating.

Initial Control Settings

7. R.F. GAIN - Fully clockwise.
A.F. GAIN - Fully clockwise.
System switch - MAN.
DET - B.F.O. switch - A.M.
BANDWIDTH - 3 kHz.

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

CAUTION 1: Coaxial Test connections to the 1.6 MHz OUT socket at the rear panel must be short. (not longer than 12 inches, 30 cm).

CAUTION 2: Note the alternative terminations for the 10 mW (600Ω) and 1 watt (15Ω) audio outputs. The user must determine which one is appropriate for the particular receiver under test.

NOTE: To make tests and adjustments within the I.F. Module the module cover and the receiver sideplate must be removed. Refer to Chapter 7 page 7-2 for removal instructions.

8. (1) Disconnect the coaxial input lead from the socket SKT4 at the forward end of the i.f. module.

(2) Connect the electronic voltmeter to the rear panel socket 1.6 MHz OUT using a short lead.

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

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

(5) Set the signal generator to 1.6 MHz ±10 Hz at an e.m.f. of 40 microvolts. Connect the generator to the i.f. input, SKT4 at the forward end of the I.F. Module

(6) Note the 1.6 MHz output level on the electronic 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 electronic voltmeter.

L1 on the A.G.C. board.
L2 and L1 on the I.F. Amplifier board.

I.F. Module (Continued)

(7) Terminate the audio output (SKT11 pins D and C) in 600Ω (10 mV) or 15Ω (1 watt) and connect the power meter.

(8) Set the signal generator to 1.6 MHz modulated 30% at 1000 Hz, and check that the audio output is not less than 10 mW (or 1 watt). (A.F. GAIN fully clockwise).

(9) If the 10 mW (or the 1 watt) indication is not obtained, adjust the cores L3 on I.F. Amplifier board and T1 on the Detector board to obtain such an indication on the Power meter.

(10) Switch off the modulation and set the DET - B.F.O. switch to L.S.B. and U.S.B. in turn. Note that the Power meter reads at least 10 mW (or 1 watt) in each setting.

(11) Set the DET - B.F.O. switch to the CW position and check that the 10mW (or 1 watt) output is obtained for all settings of the B.F.O. TUNE control.

(12) Set the DET - B.F.O. switch to A.M. and the System switch to A.G.C. 'Sh'.

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

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

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

(16) Terminate the 100 kHz OUT socket in 75 ohms. Connect the electronic voltmeter across the termination. For a 1.6 MHz 40 microvolt input to the i.f. unit the output should be not less than 230 mV into 75 ohms at 100 kHz. 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 I.F. BW switch to the widest bandwidth and tune the signal generator through the receiver passband; note that the response is symmetrical.

I.F. Module (Continued)

(17) Connect the digital frequency meter to the 1.7 MHz OUT socket. Check the appropriate frequency ±2 Hz.

(18) Remove the digital frequency meter and connect the electronic voltmeter in its place. A reading of not less than 100 mV should be obtained.

B.F.O. Check

NOTE: Refer to Chapter 3 page 3-7 para. 10 for calibration check. If necessary align as follows:-

9. (1) Connect a digital frequency meter to test point TP1 on the detector board in the I.F. Module via a 0.1 μF capacitor.

(2) Set the System switch to MAN.

(3) Set the B.F.O. TUNE control to zero. Ensure that the black cursor of the dial is set against the central position of the scale.

(4) Set the B.F.O. KHz switch to L.S.B. The frequency meter should read 1601.50 kHz ±2 Hz. If necessary adjust the Trimmer capacitor C21 on the Detector board to obtain the correct frequency.

(5) Set the DET - B.F.O. switch to U.S.B. The frequency meter should read 1598.50 kHz ±2 Hz. If necessary adjust Trimmer capacitor C22 on the Detector board to obtain this frequency.

(6) Set the DET-B.F.O. switch to CW and the system switch to CHECK B.F.O.

(7) Connect the audio power meter (terminated in 600Ω for 10mW or 15Ω for 1 watt) to the audio output at SKT11 pins C and D.

(8) Set the 'Zero' preset trimmer to the centre of its range.

(9) Ensure that the kHz tuning is set to 020, 120, 220 or any 20 kHz point and that the B.F.O. TUNE control is at zero.

(10) Adjust the core of L1 (B.F.O. board) for a null on the audio power meter.

(11) Remove all test equipment.

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

3RD MIXER

Test Equipment

10. Two Signal Generators with frequency ranges up to 6 MHz and 4 MHz respectively.
Electronic Voltmeter.

Initial Control Settings

11. System Switch - MAN.
2nd V.F.O. Switch - EXT.
MHz Tuning - set to 00 MHz.
FINE TUNE Control - Mid-position of its travel.

Alignment Procedure — Fig. L-11, Fig. 11

12.

(1) Connect the signal generator to the 2nd V.F.O. IN socket on the rear panel.

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

(3) Set the Signal Generator to 5.6 MHz and set the attenuator on the generator for a convenient reading on the electronic voltmeter (50mV).

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

(5) Set the generator to 3 MHz and tune L6 for minimum on the electronic voltmeter.

(6) Set the generator to 3.6 MHz and tune L7 for maximum on the R.F. voltmeter.

(7) Set the generator to 4.6 MHz and tune L2 for maximum on the electronic voltmeter.

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

(9) Transfer the signal generator to the socket L.F. on the rear panel.

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

(11) Set the generator to 3 MHz and set the generator output for a 50 mV reading on the electronic voltmeter.

(12) Tune coil 1L1 on the 3rd Mixer for maximum reading on the electronic voltmeter.

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

(14) Transfer the signal generator from the L.F. socket to pin 3 on the 2nd MIXER board. Set the generator accurately to 2.4 MHz ±10 Hz. 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 V.F.O. IN socket on the rear panel. Set this generator accurately to 4 MHz ±10 Hz 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 electronic voltmeter across the termination.

(17) On the 3rd Mixer board tune coils L5 and L3 for maximum reading on the electronic 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 +20 dB.

(19) Remove the test equipment. Reset the 2nd V.F.O. switch to INT.

2ND MIXER

Test Equipment

13. Two Signal Generators each with a frequency range up to 40 MHz. Electronic Voltmeter.

Initial Control Settings

14. System switch - MAN.
MHz tuning - Set to indicate 00 MHz to disable 1st V.F.O. etc.

Alignment Procedure

Fig. L-9 Fig. 9

15. (1) At the rear of the receiver set the MHz switch to EXT to remove the 1 MHz reference frequency.

(2) Connect the electronic voltmeter to TP2 on the 2nd Mixer board. Connect the signal generator to pin 1.

(3) Set the signal generator to 37.5 MHz and an e.m.f. of 10 mV.

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

(5) Connect the electronic voltmeter to pin 3.

(6) Transfer the signal generator to the socket L.F. on the rear panel.

(7) Set the signal generator to 2.5 MHz and adjust the generator output level for a convenient reference level (say 30 millivolts) on the electronic voltmeter.

(8) Carefully sweep the signal generator through the range 2 MHz to 3 MHz, at the same time noting the electronic voltmeter readings. Check that the response obtained is flat within 3 dB. The following filter data will assist adjustment should this be necessary.

CAUTION: Do not attempt to re-align the 2nd Mixer filters unless absolutely essential.

FILTER FREQUENCIES

L1 .. 2 to 3 MHz	L4 .. 2 to 3 MHz
L2 .. 3.66 MHz (rejection)	L5 .. 4.5 MHz (rejection)
L3 .. 1.6 MHz (rejection)	L6 .. 1.3 MHz (rejection)

T1 .. 2 to 3 MHz

(9) Disconnect the signal generator.

2nd Mixer Check

(10) 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 MHz at an e.m.f. of 10 mV.

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

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

(13) Disconnect all test equipment.

37.5 MHz GENERATOR MODULE

1 MHz AMP, OSCILLATOR AND CALIBRATOR SECTION

Test Equipment

16. Signal Generator with a frequency range at least to 37.5 MHz.
Electronic Voltmeter.
Digital Frequency Meter.
Oscilloscope.

Initial Control Settings

17. System Switch - MAN.

Alignment Procedure

Fig. L-6 Fig. 6

NOTE: The 1 MHz and Calibrator Section is on the upper deck of the module. Refer to the illustration in Fig. L-7.

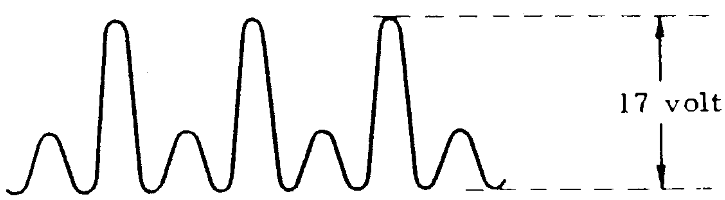
18. (1) The 1 MHz reference from the Counter and Display unit must be functioning correctly.

(2) Connect the electronic voltmeter to the rear panel socket '1 MHz OUT' and check for a reading of approximately 100 mV.

(3) Connect the digital frequency meter to the '1 MHz OUT' socket. The frequency should be 1 MHz ±2 Hz. 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



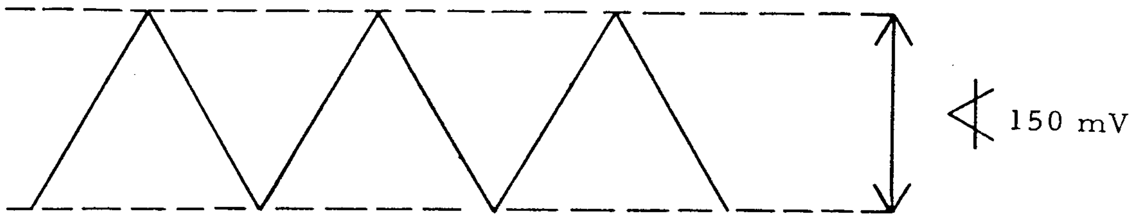
(6) Remove the 1 MHz Crystal from its holder on the calibrator board.

(7) Connect the signal generator to the '1 MHz IN' Socket. Set the signal generator to 1 MHz and 100 mV e.m.f.

(8) Transfer the electronic voltmeter to the junction of C4 and C5 on the calibrator board and check for a reading of approximately 100 mV.

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

(10) Connect the oscilloscope to the -ve side of diode D1 (pin A2). The output waveform display should be as shown below.



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

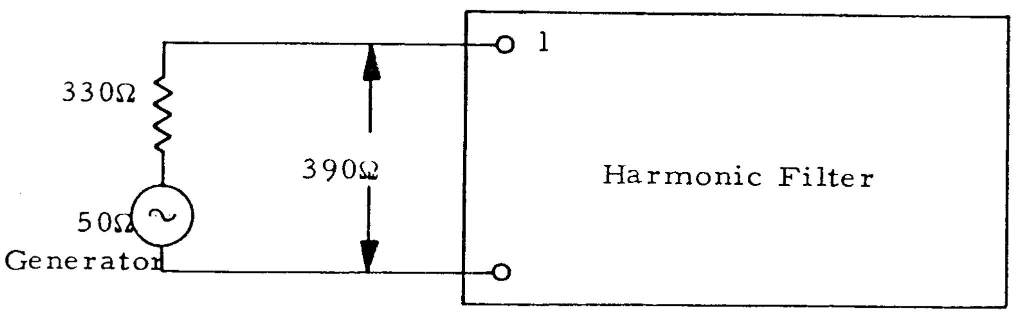
HARMONIC GENERATOR, MIXER AND 37.5 MHz AMPLIFIER

19. Refer to Fig. L-7 and to Chapter 7 for access instructions.

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

(2) Connect the electronic voltmeter to pin 1 on the Harmonic Mixer board.

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



(4) Set the signal generator output to 2 volts e.m.f. Explore the passband of the Harmonic Filter from 1 MHz to 32 MHz. 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 MHz and check that the output is 8 dB down relative to the level at 32 MHz.

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

(7) Connect the oscilloscope to pin 1 of the Harmonic Generator board. The waveform and amplitude should be as measured in para. 18 operation (5) (approx. 17V p-p).

(8) Transfer the oscilloscope to pin 1 of the Harmonic Mixer board. The amplitude should be approx. 1.2V peak-to-peak.

(9) Transfer the electronic voltmeter to pin 2 on the Harmonic Mixer board.

(10) Connect the signal generator to pin 3 on the Harmonic Mixer board.

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

(12) Check that the electronic voltmeter indicates approximately 10 mV.

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

(14) At the bracket on the underside of the receiver disconnect the lead which goes to the 37.5 MHz Generator module (Fig. 18). Connect the signal generator output to this lead and inject 37.5 MHz at an e.m.f. of 20 mV.

(15) Connect the electronic voltmeter to pin 2 on the Harmonic Mixer board. Adjust R6 on the Mixer board for a <u>minimum</u> reading on the electronic voltmeter.

1ST MIXER

Test Equipment

20. Two Signal Generators 3.5 MHz and 43.5 MHz.
Electronic Voltmeter.

Initial Control Setting

21. MHz Tuning - 03.

Alignment Procedure

22. (1) Disconnect the two free coaxial leads which feed the 1st Mixer from their connections to the R.F. Module and 1st V.F.O. (1st V.F.O. connection is at a bracket on the underside of the receiver, see Fig. 18).

(2) Connect signal generator No. 1 to PL1 on the 1st Mixer lead normally fed from the R.F. Unit. Set this generator to 3.5 MHz 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 lead which is normally fed from the 1st V.F.O. (underside of the receiver). Set this generator to 43.5 MHz at an e.m.f. of 200 mV.

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

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

FILTERS

23. No information is given on the alignment of the 40 MHz or the 37.5 MHz 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

24. Digital Frequency Meter.
Electronic Voltmeter.

Procedure

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

25. (1) Refer to Chapter 3 page 3-6 and perform the KHz Tuning Calibration Check in paragraph 8. If the frequencies are not correct make fine adjustment of C4, accessible through a hole in the module cover.

(2) Connect the electronic 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 electronic 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

26. Digital Frequency Meter.
Electronic Voltmeter.

Initial Control Settings

27. MHz Tuning - not set to '00'

Procedure

28. (1) Refer to Chapter 3 and perform the MHz Tuning Calibration Check in paragraph 9.

(2) The 1st V.F.O. output check is described in Chapter 5 page 5-7 operation (5).

R.F. MODULE

Test Equipment

29. Electronic Voltmeter.
Signal Generator (75 ohms source).
DC Voltmeter.
Coil Trimmer Tool (supplied with the receiver).

Initial Control Settings

30. System Switch - MAN.
MHz Tuning - not on 00 MHz.
RF RANGE - Wideband (WB).
R.F. ATTENUATOR - Minimum (MIN).
RF Gain Control - Maximum (fully clockwise).

Antenna Filter Alignment

31. The filter alignment is unlikely to need attention. The procedure is described in para. 36 for use if needed as part of a major overhaul.

Aerial Attenuator (R.F. ATTENUATOR Check) Fig. 4 Fig. L-4

32.
(1) Set the receiver controls according to para. 30 above.

(2) Check that approximately -4 volts is present on the a.g.c. line. (Measure at microswitch 1SA).

(3) Disconnect the 1st Mixer lead from the outlet (SKT2) on the side on the R.F. Module.

(4) Connect the electronic voltmeter across the outlet SKT2.

(5) Set the signal generator to 3.5 MHz and connect the output to the R.F. INPUT (Antenna) socket.

(6) With the receiver R.F. ATTENUATOR control set to MIN, adjust the signal generator output for a suitable dB reference on the electronic voltmeter. Note the signal generator and voltmeter levels.

(7) Set the R.F. ATTENUATOR 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 ±2 dB.

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

R.F. ATTENUATOR Switch Setting		Change in Attenuation	
5	MIN	0 dB	(Reference)
4		-10 dB	±2 dB
3		-20 dB	±2 dB
2		-30 dB	±2 dB
1	MAX	-40 dB	±2 dB

Coil and Capacitor Assembly Alignment

NOTE 1: The cores of coils 2L1 to 2L5 and capacitors 2C1 to 2C5 can be adjusted via holes in the receiver rear panel. Remove the plate marked "R.F. INPUT" to obtain access.

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

33. (1) Remove the cover from the R.F. Module.

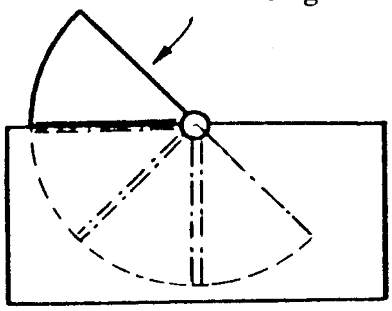
(2) Using the plastic trimming tool set all coil cores, 2L1 to 2L5, to the extreme ends of the coil formers.

(3) Set the trimmer capacitors 2C1 to 2C5 to the fully withdrawn position (minimum capacitance).

(4) Connect the signal generator (75Ω source) to the R.F. INPUT (Antenna) socket.

(5) Connect an electronic voltmeter to the R.F. Module output. (SKT2 on the side of the unit). Set the voltmeter initially to the 10 mV range.

(6) Set the R.F. TUNE control fully anti-clockwise and then turn clockwise about 45 degrees so that the knifing slot of the first segment of the vanes is aligned with the edge of the static vanes. (see illustration opposite). The dot on the R.F. TUNE control should coincide with the 1 MHz engraving on the scale.



(7) Set the signal generator to a frequency of 1.0 MHz at an e.m.f. of 3 mV.

(8) Set the receiver controls as follows:-

System switch - MAN.
R.F. RANGE - '1-2'.
R.F. GAIN - maximum clockwise.
R.F. ATTENUATOR - MIN.
MHz tuning - not on '00'.

(9) Check that approximately -4 volts is present on the a.g.c. line (Fig. L-4).

(10) Re-fit the cover to the R.F. Module.

(11) Insert the trimming tool into the core aperture of 2L1. Engage the secondary core which is at the end nearer to the rear of the receiver. Check that the core is fully anti-clockwise, then screw the core slowly clockwise for a maximum indication on the electronic voltmeter. The core must be set to the first tuning point obtained. Adjust the voltmeter range as necessary.

(12) Push the trimming tool right through to the further end to engage the primary core. Check that the core is fully clockwise, then slowly screw the core inwards (anti-clockwise) to obtain a maximum voltmeter reading at the first tuning point. The primary tuning is fairly insensitive and close attention is required to observe the resonant point.

(13) Set the signal generator to 2.0 MHz.

(14) Adjust the R.F. TUNE control for a maximum indication on the electronic voltmeter and adjust the trimmer capacitor 2C1 for a maximum voltmeter reading. Note this maximum reading as a reference.

(15) Tune the signal generator as follows and note the output readings obtained.

(a) 1.8 MHz.
(b) 2.2 MHz.

The voltage ratio at resonance (operation 14) relative to the off-tune readings in (a) or (b) should be not less than 6 to 1.

(16) Set the signal generator to 1.5 MHz.

(17) Adjust the R.F. TUNE control for a maximum indication on the electronic voltmeter and note this reading as a reference. Check that the R.F. TUNE control cursor lies within the scale calibration marks.

(18) Set the signal generator as follows and note the output readings obtained.

(a) 1.65 MHz.
(b) 1.35 MHz.

The voltage ratio at resonance (operation 17) relative to the off-tune readings in (a) and (b) should be not less than 6 to 1.

(19) Set the signal generator to 1.0 MHz and repeat the procedure of (17).

(20) Repeat the procedure of (18) at signal generator frequencies of 900 kHz and 1.1 MHz.

(21) Align the remaining circuits, that is the 2-4 MHz, 4-8 MHz, 8-16 MHz and 16-30 MHz ranges, as described in operations (6) to (20) but using the frequencies specified in the following alignment table. Set the R.F. RANGE control as stated in the left hand column. The right hand column is available for the tester to insert the readings obtained. The voltage ratio of the resonance reading relative to the 'off-tune' readings must in all cases be not less than 6:1.

Refer to the alignment table on the next page.

ALIGNMENT TABLE

Coil and Capacitor Assembly

R.F. Range Setting	Signal Generator Setting	Adjust	Output Readings Obtained
2 - 4 MHz	2.0 MHz	2L2	
"	4.0 MHz	2C2	
"	3.6 MHz and 4.4 MHz		
"	3.0 MHz		
"	2.7 MHz and 3.3 MHz		
"	2.0 MHz		
"	1.8 MHz and 2.2 MHz		
4 - 8 MHz	4.0 MHz	2L3	
"	8.0 MHz	2C3	
"	7.2 MHz and 8.8 MHz		
"	6.0 MHz		
"	5.4 MHz and 6.6 MHz		
"	4.0 MHz		
"	3.6 MHz and 4.4 MHz		
8 - 16 MHz	8.0 MHz	2L4	
"	16.0 MHz	2C4	
"	14.4 MHz and 17.6 MHz		
"	12.0 MHz		
"	10.8 MHz and 13.2 MHz		
"	8.0 MHz		
"	7.2 MHz and 8.8 MHz		
16 - 30 MHz	16.0 MHz	2L5	
"	30.0 MHz	2C5	
"	27.0 MHz and 33.0 MHz		
"	24.0 MHz		
"	21.6 MHz and 26.4 MHz		
"	16.0 MHz		
"	14.4 MHz and 17.6 MHz		

R.F. Amplifier Alignment

34. (1) Refer to paragraph 32 and set up the receiver and test equipment according to operations (1) to (4). The signal generator level should be set to 3 mV.

(2) Sweep the signal generator across the 1 to 30 MHz passband, note the electronic voltmeter readings and check that the response does not vary by more than 6 dB. If necessary adjust coils 3L1, 3L2, 3L3 and 3L4 on the amplifier board for minimum undulation in the passband.

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

35. (1) The signal generator and electronic voltmeter should be connected as in paragraph 32. Set the signal generator to 5.5 MHz, c.w., 10 mV e.m.f.

(2) Check that the System switch is at A.G.C. Med.

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

(4) Adjust potentiometer 4 RV1 (which is on the Filter component board mounted on the underside of the receiver) until the collector voltage of 3VT1 just 'bottoms'. A reference to the electronic 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 electronic voltmeter. Reconnect the 1st Mixer lead to the R.F. Module

Antenna (0-30) MHz Filter Alignment

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

36. (1) Connect the electronic voltmeter to the output lead of the 0-30 MHz filter.

(2) Connect the signal generator (75Ω source) to the R.F. INPUT (Antenna) socket. Set the generator to 40 MHz and an e.m.f. of 1 volt.

(3) Adjust the coil IL1 for a minimum reading on the electronic voltmeter.

(4) Set the signal generator to 56 MHz and adjust coil IL2 for a minimum reading on the electronic voltmeter.

(5) Set the signal generator to 43 MHz and adjust coil IL3 for a minimum reading on the electronic voltmeter.

(6) Sweep the signal generator frequency from 1 to 30 MHz. Observe the electronic voltmeter readings and check that the response does not vary by more than $1\frac{1}{2}$ dB.

(7) Remove the test equipment.

5 MHz FAST-WARM-UP OSCILLATOR UNIT

37. The reference frequency oscillator unit is the fast-warm-up Racal Type 840. This is a plug-in unit which requires extensive test equipment for satisfactory servicing. It is strongly recommended, that in the event of failure, the unit be returned to the manufacturer or to an authorised repair depot for service or replacement.

Oscillator Re-calibration

38. With this oscillator, as with all other crystal oscillators, best long term stability is obtained under conditions of continous operation. After periods of inactivity exceeding 24 hours the normal warm-up time of three minutes may be followed by a period in which the frequency changes at a rate faster than that assigned to long term ageing. It is recommended, therefore, that the equipment should be operated for several hours before oscillator re-calibration is carried out.

39. There are two frequency adjustments - a coarse and a fine - which are accessible through apertures in the upper face of the oven unit. In the absence of test equipment designed especially for this purpose, a simple calibration procedure may be performed using a suitable oscilloscope. A 1 MHz standard frequency source which has a stability equivalent to the Type 840 must be available. Proceed as follows:-

(1) Assuming that the 5 MHz unit has been in daily use, a stabilising period of not less than 3 hours warm-up should be allowed prior to re-calibration.

(2) Remove the counter and display unit from the receiver.

(3) At the rear of the receiver set the MHz switch to EXT.

(4) Trigger the oscilloscope with the 1 MHz output from the standard frequency source of known accuracy.

(5) Set the oscilloscope sweep time to 0.1 microseconds per cm.

(6) Connect the vertical deflection input of the oscilloscope across the resistor 1R10 which is on the inner face of the receiver rear panel (Fig. 18).

(7) Adjust the "coarse" and "fine" controls on the 5 MHz unit to obtain a stationary pattern on the oscilloscope.

(8) On completion re-set the MHz switch to INT. Re-fit the counter and display unit and the receiver cover.

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. Subsequent paragraphs assume the use of additional test equipment, and will direct the user to the appropriate paragraphs in Chapter 4 (Alignment). Fault location in the Counter and Display unit commences at page 5-9.

PRELIMINARY CHECKS

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

(a) A. C. voltage selector switch correctly set. (rear panel).

(b) Check the settings of the three switches (2nd V.F.O., 1 MHz and 1.7 MHz) on the rear panel. They should be set to INT.

(c) MHz tuning control <u>not</u> set to '00'.

(d) Power connection.

(e) Antenna connected.

INITIAL FAULT LOCATION PROCEDURE

Controls

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

(1) System switch to MAN.
(2) DET-BFO switch to A. M.
(3) Meter switch to R. F.
(4) A. F. GAIN to maximum (clockwise).
(5) R. F. GAIN to maximum (clockwise).
(6) I. F. BW Switch to 3 kHz.
(7) R. F. ATTENUATOR control to the MIN position.
(8) R. F. RANGE switch to a suitable range.
(9) R. F. TUNE set to a "tune" point for the selected range.
(10) Ensure that the MHz tuning control is <u>not</u> set to '00'.

NOTE: When searching for signals it is necessary to make frequent adjustments of the R. F. TUNE for maximum sensitivity.

Basic Diagnosis

4. The most useful indication in elementary fault diagnosis is receiver noise, or 'mush'. The controls should be set as listed in paragraph 3 and the receiver tuned over a suitable portion of the h.f. band. At each step of the MHz 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. Note the receiver meter reading. If a reading is obtained, reduce the R.F. GAIN and the meter should deflect to the right. This indicates that the h.t. supply and a.g.c. line are normal.

POWER CHECK

5. If the receiver appears dead (no noise or meter reading) and the dial lights are not illuminated, check the -16 volts fuse and measure the -16V h.t. at one of the following points.

(a) On the terminal block TB3 at the pin adjacent to the Fine Tune potentiometer (Fig. 18).

(b) At the centre tag of the 2nd V.F.O. EXT/INT switch.

(c) At the rear panel terminal H.T. R.F. which should give a -16 volt reading except when the MHz control is set to '00'.

GENERAL CHECK

6. (1) Set the receiver controls according to paragraph 3.

(2) Set the System switch to CHECK B.F.O. and rotate the DET - B.F.O. MODE switch through all settings. Set to CW and rotate the B.F.O. variable control. Listen for the b.f.o. heterodyne whistle and observe the receiver meter indications. These indications can be used for diagnosis as indicated in the following Table.

TABLE 1

"CHECK B.F.O." INDICATIONS

Meter Indication Observed	B.F.O. Whistle Audible	Diagnosis
(a) Yes	Yes	Receiver is serviceable from 3rd Mixer input through to audio output. Also 1 MHz is functioning.
(b) Yes	No	Fault probably in detector board of I.F. Module (Fig. 12) or audio amplifier board or connections. (Fig. 14).
(c) No	No	Possible areas of fault are:- (a) 1 MHz reference (Fig. 6). (b) 1st i.f. amplifier unit (Fig. 11). (c) Main i.f. amplifier board of I.F. Module (Fig. 12). (d) Transistor stage VT3 in 3rd Mixer (Fig. 11).

7. If both whistle and meter reading are obtained in CHECK B.F.O. set the System switch to CAL. If no calibration whistles are obtained as the kHz tuning is rotated, it suggests a fault in the 2nd V.F.O. or the mixer stage of the 3rd Mixer.

8. If the CHECK B.F.O. and CAL. tests are satisfacoty, set the controls as listed in paragraph 3 and make a front end check as follows:-

FRONT END CHECK

9. Set the DET - B.F.O. switch to A.M. Listen intently and slowly rotate the MHz tuning control. If a very slight rise in noise level can be heard as the MHz tuning passes through each resonant point it suggests that the 37.5 MHz loop is functioning and therefore the fault is more likely to be in the antenna circuit, R.F. Module or 1st Mixer. Make the check in the WB setting of the R.F. RANGE switch as well as in the tuned antenna condition (adjust R.F. TUNE control). Thoroughly check all front end connections as follows:-

(1) Check Antenna.

(2) Ensure that the muting relay is not energised. Touching an earth to pin G of the 12-way socket on the rear panel should cause the relay to operate. At the same time listen for any change of noise level.

(3) Check the connections between the R.F. Module and 1st Mixer (on the side of the R.F. Module).

10. If, when tuning the MHz control as described in the previous paragraph, no noise can be heard, the 1st V.F.O. or its connections may be faulty. Check connections from 1st V.F.O. to 1st Mixer and 37.5 MHz Generator respectively at the bracket on the underside of the main chassis.

R.F. H.T. Check

11. On the terminal block TB1 at the rear of the receiver connect the terminal H.T. R.F. to the terminal H.T. L.F. If the receiver then functions correctly the microswitch 1SB (Fig. 16, Fig. 18) should be checked. Make a voltage check at the microswitch (Centre tag).

1 MHz Check

12. Set the System switch to CAL and tune the KHz control to the 100 kHz calibration check frequencies. If the calibration whistle is heard at each point it indicates that the 1 MHz reference is functioning. If no calibration whistles are heard, turn the System switch to CHECK B.F.O. and set the DET - B.F.O. switch to CW. Rotate the B.F.O. TUNE control. If no heterodyne whistles are heard, it indicates a faulty 1 MHz reference frequency. The 5 MHz oscillator unit, or the Counter unit may be faulty. Refer to paragraph 16. Check with an electronic voltmeter for an e.m.f. of 100 mV at the rear panel socket "1MHz OUT".

13. The internal 1 MHz reference is derived via the Counter and Display Unit from the 5 MHz crystal oscillator unit. Therefore if a fault exists, check the plug and socket connections between the receiver section and the Counter and Display unit. If possible fit a serviceable Counter and Display unit, or a replacement oscillator unit. The output from the 5 MHz oscillator is approximately 35 mV r.m.s. measured across the resistor 1R10 which is on the inner side of the receiver rear panel (Fig. 18). The level should not be less than 1V r.m.s. when the 1 MHz switch is set to EXT.

A.G.C. FAULT

14. If the receiver operates satisfactorily with manual r.f. gain control (System switch to MAN) but overloads on strong signals in the a.g.c. settings of the System Switch check as follows:-

(1) Tune the receiver to a strong signal. Set the System switch to AGC Med and the Meter switch to R.F. If the meter indicates a reading appreciably greater than 1 microvolt the a.g.c. board in the I.F. Module is serviceable. If no reading is obtained the fault is probably in the I.F. Module.

(2) If the meter reading is satisfactory, connect the test meter negative lead to the terminal A.G.C. R.F. on the rear panel (positive lead to chassis). As the receiver is tuned through a powerful signal the a.g.c. level should change from -4V (no signal) to approximately 0 volts (strong signal). If no reading is obtained check the microswitch 1SA adjacent to the MHz tuning shaft. (Fig. 16, Fig. 18). The bottom tag of the microswitch should show the a.g.c. level in all operating modes; the centre tag in all settings of the MHz control except '00' and the top tag only in the '00' setting of the MHz tuning control.

NOTE: The levels quoted in para. 14 cannot be given exactly because the level of a strong signal is not defined.

FREQUENCY READOUT FAULTS

15.	Blurred Display.	Check the supply voltages in the Counter Unit. If the voltages are correct the 5 MHz frequency standard may be faulty.
	The readout indicates only '600'.	The 2nd v.f.o. frequency is not reaching the totalizer chain. Check the 2nd v.f.o. output at the rear panel outlet 2nd V.F.O. OUT (approx. 50 mV in 75Ω).
	Display appears normal but receiver is not serviceable and there is indication of a 1 MHz fault.	The 1 MHz reference is not coming from the counter unit to the receiver. Refer to paragraph 12.

OPERATING WITHOUT THE COUNTER UNIT

16. If a 1 MHz crystal is available of the type used in the RA. 1217 (Racal Part No. CD38871/A) the receiver can be rendered serviceable but without a tuning readout. Proceed as follows:-

(1) Disconnect and completely remove the Counter and display unit.

(2) Insert the 1 MHz Crystal in the 1 MHz deck of the 37.5 MHz Generator module.

(3) To select the required megahertz frequency set the MHz tuning control fully anti-clockwise (00) then count the number of 'clicks' clockwise to the required MHz number.

(4) Set the kHz tuning to the highest frequency end of the scale by rotating the control fully clockwise against its stop.

(5) Set the System switch to CAL and turn the kHz control back approximately half a turn and listen for the first calibration whistle which occurs at 999 kHz.

(6) By rotating the kHz control slowly anti-clockwise the successive calibration whistles will be heard at intervals of 100 kHz, i.e. at 899 kHz, 799 kHz etc.

(7) Tuning between the 100 kHz calibration points is facilitated by the engraved lines on the kHz tuning knob. Each division represents a change of approximately 5 kHz in the tuning.

(8) If the calibration system is not serviceable the kHz tuning can be set to approximately 999 kHz by rotating fully clockwise and then back half a turn.

GENERAL FAULT LOCATION

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

17. If the noise indications of paragraphs 9 and 10 are uncertain, check the receiver front end as follows:-

Front End Check

18. (1) Connect a signal generator, 75 ohm source to the antenna socket and set to 3.6 MHz at 10 mV p.d. (20 mV e.m.f.).

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

(3) Connect the electronic voltmeter across the 100 ohm termination.

(4) Set R.F. RANGE to WB.
R.F. ATTENUATOR to MIN.
System Switch to MAN.
R.F. GAIN fully clockwise.

(5) Carefully tune the MHz and kHz tuning controls to the signal generator frequency. At the resonant point the electronic voltmeter reading should rise to 100 mV approx. If no reading, or very low reading is obtained proceed as described in next paragraph.

<u>Fault Prior to I.F. Unit</u>

19. (1) Refer to paragraphs 12 and 13 and check that 1 MHz reference is functioning.

(2) Move the 2nd V.F.O. switch between the INT and EXT positions and listen for a change of noise level. If noise level does not change, the 3rd Mixer may be faulty. Make sure that the 2nd V.F.O. switch is returned to the INT position. Refer to Chapter 4 for further tests.

(3) If the 3rd Mixer check is satisfactory, but a fine adjustment of the MHz tuning control fails to produce any rise in noise level, proceed as follows:-

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

(5) If approximately 100 mV is not obtained in (4) check the 1st V.F.O. outputs. Disconnect the free coaxial leads from their respective bulkhead sockets on the (underside of the main chassis. (Fig. 18). Terminate the lead which feeds the 1st Mixer in 47Ω and check for approx. 100 mV with the electronic voltmeter. Terminate the lead which feeds the 37.5 MHz Generator in 27Ω, and check for approx. 100 mV with the electronic voltmeter.

(6) If the 1st V.F.O. outputs are satisfactory the 37.5 MHz Generator module must be checked in accordance with Chapter 4 paragraph 19.

(7) If the 37.5 MHz checks are satisfactory refer to Chapter 4 and check the 1st Mixer and R.F. Unit. Connect a signal generator, set to 5.5 MHz at a p.d. of 10 mV, (20 mV e.m.f.) to the Antenna socket (75Ω source).

(8) Disconnect the R.F. Module output coaxial lead from SKT2 and terminate SKT2 in 47Ω. Connect the electronic voltmeter across the termination. Check the output in accordance with Chapter 4 para. 34. Try WB and tuned antenna conditions. Set the R.F. GAIN to maximum. A low output may indicate a fault on the a.g.c. line.

(9) With the System switch to MAN, and the R.F. GAIN to maximum, the d.c. reading on the a.g.c. line should be approx. -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 board 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 should be checked. When measured on the 'ohms + 100' range of the AVO8 testmeter the forward resistance of any one of the diodes should not exceed 25Ω (diode type HD.1812).

Fault in the I.F. Unit

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

COUNTER AND DISPLAY UNIT

SERVICING

21. The servicing of the RTT board requires experience in the interpretation of digital circuit measurements and skill in the replacement of integrated circuit elements. It is an advantage to hold a spare RTT board so that a substitution check can establish the need for servicing and also provide an immediate check on waveform shaping if this is in doubt.

REMOVAL OF BOARDS

22. Refer to Chapter 7 page 7 - 15 for removal instructions.

FAULT LOCATION PROCEDURE

NOTE: The following procedures assume that the Counter and Display Unit is connected to the receiver, and the receiver is switched on.

Power Supply Check

23. Remove the lid from the Counter and Display unit and check the d.c. voltages on the Power Input Filter, (Fig. 22c) using a good quality multimeter.

Pin 5 is	0 volts (-ve lead).
Pins 3 and 6	5 volts (+ve lead).
Pins 1 and 4	200 volts +ve.
Pin 7	63 volts +ve.

NOTE: The following measurements will check the serviceability of the smaller boards in the unit. The only satisfactory check on the RTT board is to fit a serviceable replacement but servicing information is given on pages 5 - 13 to 5 - 17.

RFG Board

Fault Symptom

(a) A fault in the harmonic selector portion of the board will cause a loss of the 1.7 MHz output which will affect only the 100 kHz i.f. output from the receiver.

(b) A fault in the shaper portion of the board will affect the reference frequency which is used in the counter timebase and also in the receiver and will render the receiver and the counter unserviceable.

Measurements

(1) Connect an electronic voltmeter between pin 6 and pin 5 (earth). The level should be 50 mV ±2 dB (into 75 ohms).

(2) Connect an electronic voltmeter between pin 2 and pin 1 (earth). The level should be not less than 1 volt r.m.s.

(3) Connect an electronic voltmeter between pins 16 and 17 (earth). Check that the frequency reference input is not less than 20 mV ±1 dB from the receiver oscillator unit.

(4) A digital frequency meter connected between pins 6 and 5 should indicate 1.7 MHz ±1 Hz, and between pins 2 and 1 the frequency will be 5 MHz if operating from the internal reference, but will be 1 MHz if an external reference is in use.

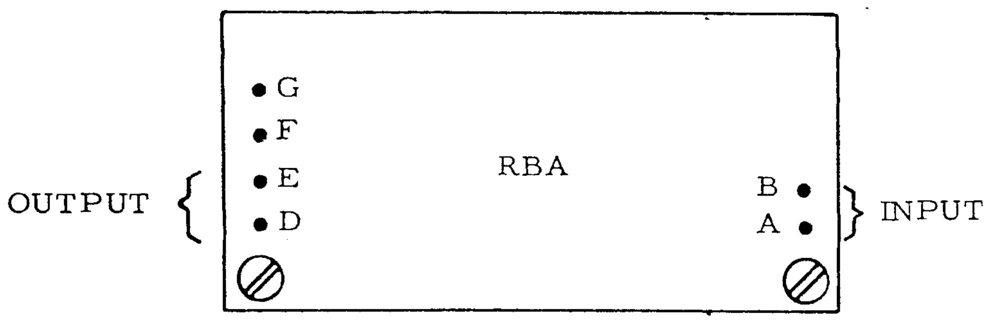
RBA Board Fig. 22a.

Fault Symptom

(a) A total failure will prevent the 2nd v.f.o. frequency from reaching the totalizer. The kilohertz readout may indicate 600,00. A low output may cause an erratic kilohertz display.

Measurements

(1) Remove the cover from the RBA module. Connect an electronic voltmeter to pin D and pin E (screen) on the track (see diagram below).



The output level should be between 360 mV and 540 mV r.m.s.

NOTE: If in doubt as to the pin identification remove the fibre spacers from the pillars, carefully ease up the board, keeping it level to avoid pin distortion, and note the engravings on the terminal board beneath.

(2) If necessary measure the input level between pin A and pin B (screen). This level should be 50 mV r.m.s. approximately, into 75Ω.

RXF Board — Fig. 22b.

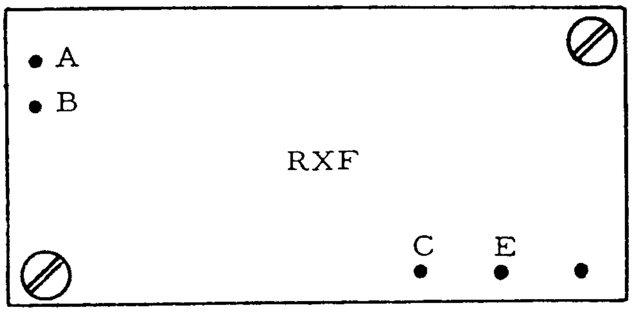
Fault Symptom

(a) A total failure will render the receiver unserviceable due to the loss of the 1 MHz reference frequency.

(b) A fault in the crystal might allow the 1 MHz to reach the receiver but with a high harmonic content, causing spurious responses. To check the content of the waveform a spectrum analyser would be necessary.

Measurements

(1) Remove the cover from the RXF module. Connect an electronic voltmeter between pin A and pin B (screen). See diagram below. The level should be not less than 50 mV r.m.s. into 75Ω.



RMH Board — Fig. 24.

Fault Symptoms

(a) A fault will affect either the megahertz readout or the overspill display. Only a failure of the 200 volt supply will affect both.

(b) The loss of a single digit in the megahertz display may be caused by
(i) Transistor failure.
(ii) Loss of encoder bias supply caused by faulty switch contact.
(iii) Indicator lamp fault, possibly poor pin contact.

(c) The loss of all digits in one of the megahertz indicators could be caused by a loss of the -16v supply to the corresponding switch in the receiver, or by R27 or R28 in RMH having high resistance.

(d) If a fault occurs only on the overspill check that the kHz x 100 display is normal. If it is correct, check that the 5 volt supply across C1 in RMH is satisfactory. If only one neon is not indicating, check the series transistor VT14 or VT15.

Measurements

(1) Set the MHz tuning control to the reading where the fault occurs. On the RMH board check for approximately -16 volts from the appropriate 3.9 kΩ resistor to chassis.

(2) If one indicator lamp appears to have failed, rotate the MHz tuning control on the receiver and check for approximately -16 volts on all appropriate 3.9 kΩ resistors. If no -16v is obtained, check at the MHz switch in receiver and at pin 1 of the component board TB3 which is located beside the Fine Tune Potentiometer (Fig. 18).

(3) Fit a replacement lamp if available. Check for high resistance in R27 or R28 of RMH by comparing volt drops.

(4) For an overspill fault check +200v supply at pin 1 of RMH.

(5) Using a multimeter (millivoltmeter) check the voltage on the base of transistor VT14 in RMH. As the kHz tuning is rotated anti-clockwise towards its end stop, the base voltage on VT14 should change from zero volts to 0.7 volts approximately as the tuning passes 000 kHz. A similar voltage change should occur on the base of VT15 as the receiver is tuned through 999 kHz.

RTT MODULE CHECKS

General

24. It is difficult to locate the fault to a limited area of the board merely by observation of the readout, it is essential, therefore, to carry out a logical series of measurements. The following information will assist in the checking of waveform amplitudes, but may be of limited use in a situation where correct waveform shaping is in doubt. For this reason, it is useful to have a spare RTT board which will enable the user to establish that a fault definitely exists in the RTT board, and not elsewhere in the receiver, and will permit a comparison of waveform displays to be made. The amplitudes given in the following tables were measured by a Tetronix 545A oscilloscope using a low-capacitance probe and are offered as a guide: they should not be regarded as specification figures. If the tests fail to locate the fault the customer is advised to return the board for factory repair or replacement.

Procedure

25. It is suggested that measurements be made in the following order:-

(a) 2nd V.F.O. frequency up to the input of the totalizer chain.
(b) Timebase and Control circuits.
(c) Totalizer chain.
(d) Binary outputs to the readout.

The Counter and Display Unit must be connected to the receiver and the receiver switched on. A good quality oscilloscope such as the Tetronix 545 is necessary. Internal Triggering will be necessary until the Timebase chain is proved satisfactory, then it may be useful to utilize timebase pulses for triggering.

2nd V.F.O. Frequency

26. Adjust the receiver KHz tuning control to a point which is not near The end of its rotation, then, using an oscilloscope with a low capacitance probe, make the following measurements. Note that the integrated circuits have a wide tolerance and should function with inputs as low as 1.6v p-p.

TABLE 2

Test Point	Display	Typical Amplitude
Connector PL1 pin 21	2nd v.f.o. freq. (sine)	Not less than 0.9v p-p Typical 2.0v p-p
Collector of VT2 (resistor R11)	2nd v.f.o. freq. (shaped in VT2)	4.5v p-p
LG8 pin 14	2nd v.f.o. freq. (gated by LG32)	3.5v p-p

Timebase

27. TABLE 3

5 MHz and Dividers

Test Point	Frequency	Typical Amplitude
LG10 pin 1	5 MHz	3.0v p-p
LG5 pin 6	1 MHz	3.5v p-p
LG13 pin 12	100 kHz	3.5v p-p
LG14 pin 12	10 kHz	3.6v p-p
LG11 pin 12	1 kHz	3.6v p-p
LG12 pin 12	100 Hz	3.7v p-p
LG24 pin 8	100 Hz	3.7v p-p

Control Circuit

28. For waveforms refer to Figs. 5-1 and 5-2 in this chapter.

Update Pulse

(1) At the collector of transistor VT4 (Resistor R17) check for a narrow pulse with an amplitude of 4 to 5v p-p. The recurrence frequency is 0.1 seconds.

Reset Pulse

(1) This has a recurrence frequency of 0.1 second with a width of only 1.5 microseconds and may therefore be difficult to see on the oscilloscope unless careful adjustments are made. Measure at pin 73 or at the collector of VT3. The amplitude should be approximately 4v p-p.

Totalizer Chain

29. LG8, LG18, LG22, LG28 and LG34/37/38.

TABLE 4

Test Point	Facility	Typical Amplitude
LG8 pin 14	Frequency input	2.8v p-p
LG8 pin 11	Decade output	3.0v p-p
LG18 pin 11	Decade output	3.0v p-p
LG22 pin 11	Decade output	3.0v p-p
LG28 pin 11	Decade output	3.0v p-p
LG38 pin 8	Decade output	3.0v p-p

Totalizer Frequencies

30. (1) Using a digital frequency meter measure the frequency at LG8 pin 14 and note the exact frequency as a reference.

(2) Measure the frequency at pin 11 of LG8, LG18, LG22 and LG28, and at pin 8 of LG38. Check that division by 10 occurs in each case.

(3) Alternatively, using an oscilloscope, check for division by 10 between inputs at pin 14 and outputs at pin 11, up to LG28. Instructions for checking the 100 kHz decade are given in the next paragraph.

31. 100 kHz Decade

The waveforms for LG34, LG37 and LG38 are shown in Fig. 5-2 in this chapter. To obtain a clear waveform display it is necessary to inhibit the Reset pulse, as follows:-

(1) Unsolder the link from pins 73 and 74 thus disconnecting the Reset pulse.

(2) Unsolder the link from pins 76 and 77 thus inhibiting the input frequency gate.

(3) Connect pin 73 to an earth on the RTT board.

(4) Trigger the oscilloscope from pin 8 of LG38.

(5) Connect the oscilloscope probe to pin 8 of LG38. The display should have a mark/space ratio of 4:1 with an amplitude of approximately 3.5 volts p-p. The frequency should be the 2nd v.f.o. frequency $\div 10^5$.

(6) Remove the earth from pin 73 and re-connect the links after completing the test unless the Reset Check is to be performed.

Totalizer Reset Check

32. (1) Unsolder the link from pins 73 and 74.

(2) Connect pin 73 to an earth point on the RTT board, thus permanently holding the decades in the reset state.

(3) Using the oscilloscope check the decade states as follows:-

TABLE 5

Decade	Pin Numbers				Reset State
	12	9	8	11	
LG8	Up	Down	Down	Up	0
LG18	Up	Down	Down	Up	0
LG22	Up	Down	Down	Up	0
LG28	Up	Down	Down	Up	0
	LG34		LG38		
	5	9	5	9	
	Up	Up	Down	Down	6

(4) Remove the earth from pin 73 and replace the links which may have been disconnected.

Binary Readouts

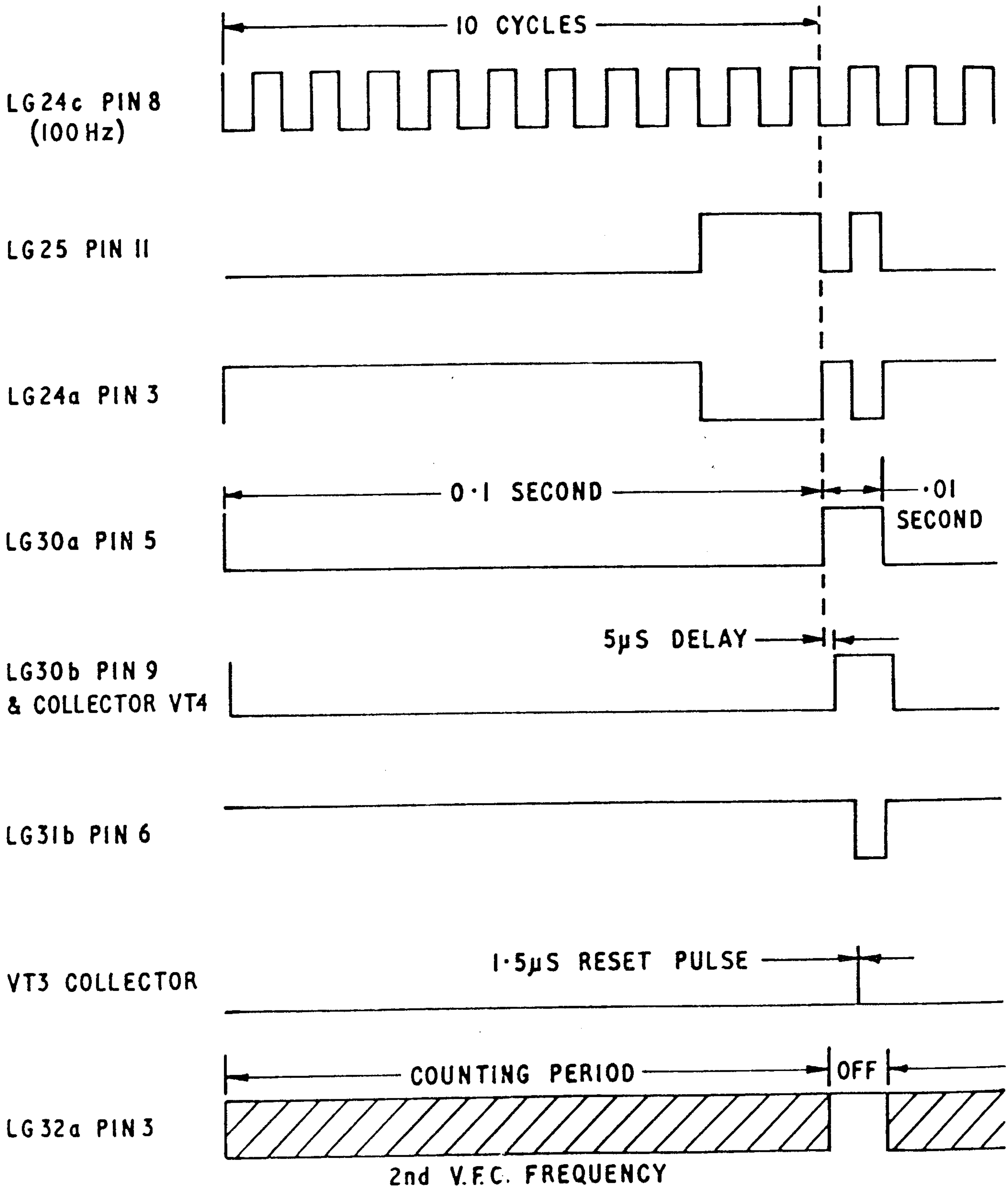
33. (1) The pins 8, 9, 11 and 12 of LG8, LG18, LG22 and LG28 should show an amplitude of approximately 4v p-p. (+ve going) as the KHz tuning is rotated.

(2) The pins 3, 4, 6 and 7 of the Decade Drivers LG7, LG17, LG21, LG27 and LG35 should show binary logic. As the receiver KHz tuning is rotated the oscilloscope trace should "jump" vertically by about 4 volts. A failure to jump, or a jump of double amplitude (8 volts) indicates a fault in an integrated circuit element. The following truth table provides a check on the decades and the latching circuits. The measurements apply to LG7, LG17, LG21, LG27 and LG35 at the pin numbers indicated in the table.

TABLE 6

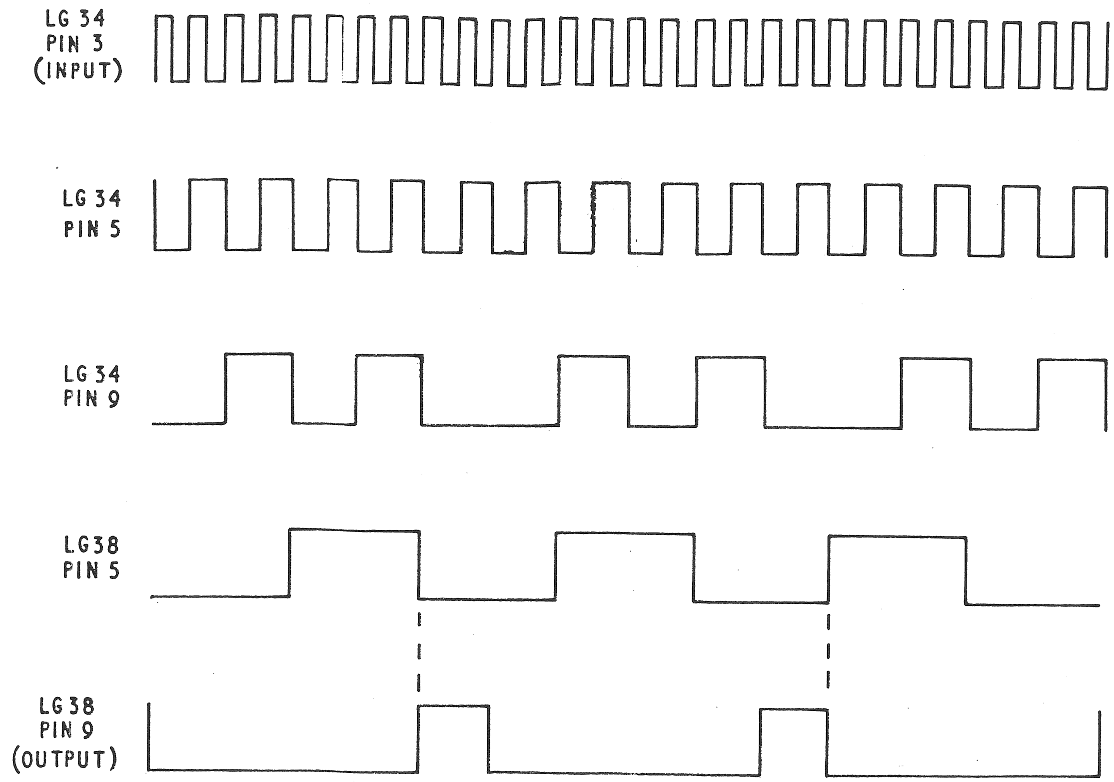
Displayed Digit	Pin 3	Pin 6	Pin 7	Pin 4
0	1	0	0	1
1	0	0	0	1
2	1	1	1	0
3	0	1	1	0
4	1	0	1	0
5	0	0	1	0
6	1	1	0	0
7	0	1	0	0
8	1	0	0	0
9	0	0	0	0

(3) The output pins from LG7, LG17, LG21 and LG27 which drive the nixie tubes (pins 2, 1, 10, 11 etc) should show a level of +56 volts on the lines to the digits which are not on display but only approximately + 1.0 volts on the displayed digits. For example, if '9' is glowing in the 100 Hz tube, the pin 16 of LG17 will be at approximately + 1.0 volt. This voltage will rise to + 56 volts if the kHz tuning is changed to illuminate a different digit.



RTT Module: Control Circuit Waveforms

Fig.5-1



100kHz Decade Waveforms

Fig. 5-2

CHAPTER 6

ROUTINE MAINTENANCE

GENERAL

1. The RA. 1218 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. Whenever a module has been removed ensure that on replacement it is clean and free from grease or corrosion to ensure good electrical bonding. Ensure that retaining screws are made tight.

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 be given to the stop-collars of the MHz and KHz tuning system. Remove any surplus lubricant to prevent the accumulation of dirt.

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: (1) When refitting 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.

(2) All module retaining screws should be firmly tightened to ensure good electrical bonding throughout the receiver. Loose screws can cause spurious frequencies to develop. When tightening screws, do not apply such force that screw threads might become stripped.

RECEIVER TOP COVER

2. The top cover of the rack mounted receiver is retained by 17 screws around the edge. This cover must be removed as a first step in any dismantling operation, except for removal of the power unit.

UNDERSIDE SCREWS

3. Those screws on the underside of the receiver which secure the various modules are marked with a circle of paint.

RECEIVER BOTTOM COVER

4. A small cover on the underside of the receiver is held by 8 screws. This cover may be removed for access to the audio amplifier board, the H.T. Filter board and the connectors to the 2nd and 3rd Mixer modules.

REMOVAL OF COUNTER AND DISPLAY UNIT

5. Refer to page 7 - 13 for removal instructions. To remove any module, except the power unit and 3rd Mixer, the Counter and Display Unit must be removed first. The need to remove this unit is obvious to the user, and the instruction will not be repeated at each stage in this chapter.

FRONT PANEL

6. The removal of the panel is normally of no benefit in servicing, but it is necessary if the B.F.O. assembly is to be removed.

7. Tools: Hexagonal keys (attached to underside of receiver cover).
Screwdriver.
Spanner.

Front Panel Removal

8. (1) Remove the Counter and Display Unit.

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

(3) The panel is held by 8 chromium plated screws. Remove these screws.

(4) The panel can now be withdrawn.

POWER UNIT

9. Removal

(1) Release the four captive retaining screws from the edge of the unit on the rear panel and ease the unit gently towards the rear.

10. Re-assembly

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

I.F. MODULE

11. Tools: Medium and large screw drivers:
Spanner .25 inch A.F.

12. Removal

(1) Using the spanner, undo the external coaxial connector from the socket at the forward end of the module.

(2) Remove two screws from the underside.

(3) Remove two screws from the right-hand side (viewed from the rear) of the rear connector panel.

(4) Withdraw the module towards the rear, releasing the 37-way connector at the front end while doing so.

R.F. MODULE

13. Tools: Hexagonal Key (.050).
Screwdrivers.
Spanner .25 inch A.F.

14. Removal

(1) Remove the chassis side plate (6 screws).

(2) Slacken the grub screws in the R.F. TUNE control knob and remove.

(3) Within the receiver behind the front panel, on the side, remove the two screws which hold the shaft bearing bracket.

(4) Slacken the grub screws in the boss of the R.F. Range sprocket. Hold the sprocket and withdraw the shaft by pulling on the R.F. Range knob. Note spacers on the shaft to be retained for re-fitting. Remove sprocket from chain.

(5) Slacken the grub screws in the R.F. Attenuator shaft flexible coupler. Pull the control shaft forward a short distance out of the coupler.

(6) Release the five retaining screws on the underside of the chassis.

(7) Remove the coaxial connector from the side of the module adjacent to the 1st Mixer.

(8) Release the connector plug from the forward end.

(9) Draw the module forward a short distance and then lift upwards. Remove the chain from the sprocket.

(10) If a new unit is to be fitted the sprocket on the range shaft must be transferred to the new unit.

R. F. Module Refitting

15. (1) Remove the cover from the R. F. Module.

(2) Place the driving chain on the sprocket on the tuning shaft, and also place the bearing bracket on the shaft.

(3) Connect the coaxial lead from the 1st Mixer to the socket on the side of the R. F. Module.

(4) Place the module in position and screw-up the five retaining screws on the receiver underside.

(5) Insert the connector plug at the forward end of the module.

(6) Set the R. F. Attenuator switch by hand fully clockwise (viewed from the front).

(7) Insert the R. F. Attenuator control shaft into the shaft coupler.

(8) Set the R. F. Attenuator control knob to indicate MIN and tighten up the grub screws in the shaft coupler.

(9) Turn the R. F. Range switch by hand to its fully anti-clockwise setting (viewed from the front).

(10) Place the R. F. Range knob and shaft in its position in the front panel aperture.

(11) Place the R. F. Range driving sprocket into the chain and fit the sprocket and chain to the knob shaft.

(12) Set the R. F. Range knob so that the pointer is line with the anti-clockwise "WB" setting and tighten up the grub screws in the driving sprocket. Rotate the knob and check that the knob pointer lines up with the panel engravings at each setting.

(13) Insert and tighten the screws to secure the bearing bracket of the R. F. Tune shaft.

(14) In the R. F. Module set the R. F. Tune capacitor so that one segment of vanes is clear (see illustration in Chapter 4 page 4 - 17).

(15) Place the R. F. Tune knob on the shaft so that the white spot is in line with the panel markings '1 to 16', and tighten the grub screws.

(16) Replace the module cover and the chassis side plate.

37.5 MHz GENERATOR

1 MHz AMPLIFIER AND CALIBRATOR

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

Tools: Screwdrivers.

17. Removal

(1) On the underside remove the cover plate and disconnect the 37.5 MHz Generator coaxial lead from the connector bracket (Fig. 18).

(2) Release the four screws on the underside of the receiver.

(3) Unplug the multi-way connector from the module.

(4) Lift out the module.

18. Sub-Unit Separation

(1) The upper deck is the 1 MHz and calibrator unit, the lower unit contains the harmonic generator, harmonic mixer and 37.5 MHz 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 MIXER and 40 MHz FILTER

19. Tools: Screwdriver.
Spanner .25 inch AF

20. Removal

(1) Disconnect the coaxial lead from the side of the R.F. Module.

(2) On the receiver underside remove the cover plate and disconnect the 1st Mixer lead from the connector bracket.

(3) On the underside, adjacent to the H.T. Filter Board release the screw which is located in a tubular shroud. (The one further from the rear panel).

(4) On the upperside release one screw at each end of the 1st Mixer and 40 MHz unit.

(5) Pull the unit upwards taking care not to trap the free coaxial leads which are attached.

2nd MIXER

21. Tools: Screwdriver

22. Removal

(1) Remove the cover plate from the underside of the receiver.

(2) On the underside remove two of the four retaining screws. (from diagonally opposite corners).

(3) Slacken off the two remaining screws and push them upwards, thereby partly easing the module out of its connector. Then completely remove these screws.

(4) On the upperside grip the module and pull upwards. If sufficient grip cannot be obtained, remove the module cover and carefully pull on the pillars.

3rd MIXER

23. Follow the same procedure as for the 2nd Mixer in the previous paragraphs.

37.5 MHz BANDPASS FILTER

24. Tools: Screwdriver.

25. Removal

(1) On the receiver underside remove the cover plate and release the retaining screw which is located in a tubular shroud adjacent to the H. T. Filter board. (The screw nearer the rear of the receiver).

(2) On the upper chassis release the two end screws from the 37.5 MHz Filter Unit.

(3) Ease the unit upwards, keeping it level to avoid distortion of the fixed coaxial connectors.

1st V.F.O.

26. Tools: Screwdriver.
Hexagonal key.
Spanner .25 AF.
Soldering iron (earlier receivers only).

NOTE: Instructions for refitting are given in paragraph 27.

27. Removal

(1) Disconnect the violet h.t. lead from the small terminal block adjacent to the 1st V.F.O. If this terminal block is not fitted refer to operation (2).

(2) On earlier receivers it may be necessary to unsolder the violet h.t. lead from the H.T. Filter board on the underside of the receiver. (Remove the cover plate).

(3) Slacken the grub-screws in the coupler on the 1st v.f.o. tuning shaft.

(4) On the receiver underside remove the cover plate and disconnect the two 1st v.f.o. coaxial leads from the connector bracket.

(5) Hold the 1st v.f.o. firmly in position with one hand. With the other release the four retaining screws on the underside of the receiver.

(6) When the retaining screws are free the 1st v.f.o. can be drawn free of the shaft coupler and lifted out.

1st V.F.O. Refitting

NOTE: It is assumed that all other parts of the receiver are installed and are serviceable. A digital counter to read up to 70 MHz is required.

28. (1) Place the 1st v.f.o. module into its correct position on the chassis and slide the tuning shaft into the shaft coupler. Do not tighten the grub screws. Check that the coaxial leads are fed through to the underside of the receiver.

(2) Hold the 1st v.f.o. module with one hand and make it secure with the four retaining screws on the underside.

(3) Connect up the h.t. lead at terminal block TB2 (or resolder the violet lead if this was disconnected in operation (2).

(4) Attach a digital counter to one of the 1st v.f.o. coaxial output leads.

(5) Connect power to the receiver and set the System switch to MAN.

(6) Set the MHz control to indicate 01 MHz.

(7) Move the 1st v.f.o. section of the tuning shaft by hand (not the MHz control) until the digital counter reads 41.5 MHz ±10 kHz.

(8) Check that the MHz control is at '01' and tighten the grub-screws in the shaft coupler. On completion the digital counter must read 41.5 MHz ±20 kHz.

(9) Refer to Chapter 3 paragraph 9 and perform the MHz calibration check.

(10) On completion connect both the 1st v.f.o. output coaxial leads to their correct sockets at the bracket on the underside of the receiver.

2nd V.F.O.

29. Tools: Spanner 10/32 U.N.F. Hex.
Large and small screwdrivers.
Trimming screwdriver (brass).

NOTE: Instructions for refitting are given in paragraph 31.

30. Removal

(1) Remove the four screws on the chassis underside which hold the Fast-Warm-Up Oscillator unit and move the oscillator and bracket to give clearance.

(2) Slacken all the grub screws in the shaft coupling.

(3) Slacken the three bolts which hold the 2nd V.F.O. to the cast lugs of the chassis and detach the connector which carries the chassis wiring.

(4) Completely remove the three bolts which hold the module.

(5) Draw the module away so that the tuning shaft slips out of the shaft coupler.

Fitting the 2nd V.F.O. Module

31. NOTE: It is assumed that the stop-collar mechanism has not been damaged or dismantled.

(1) Remove the panel in the cover of the 2nd v.f.o. to give access to the capacitor vanes.

(2) Place the shaft coupler on to the shaft of the 2nd v.f.o. capacitor and press it on as far as it will go.

(3) Insert the fixing bolts (three) into the correct holes in the 2nd v.f.o. and give them one or two turns only.

(4) Place the 2nd v.f.o. into its correct position in the chassis bracket.

(5) Place the wiring connector squarely in position and press carefully into the receptacle on the 2nd v.f.o.

(6) Slide the shaft coupler along to couple the two shafts. Do not tighten any grub screws.

(7) Tighten up the module fixing bolts.

(8) Rotate the kHz tuning control to the fully clockwise setting.

(9) Press the 2nd v.f.o. capacitor vanes into the fully meshed position.

(10) Tighten one grub screw in each half of the shaft coupler.

(11) Connect the Counter and Display unit via the rear connecting lead only.

(12) Switch on the receiver and check the displayed kilohertz frequency which should be not lower than +0250.

(13) Rotate the kHz tuning control to the fully anti-clockwise position and check that the displayed frequency is not higher than -9750.

(14) To make the upper and lower over-run frequencies balance, a fine adjustment may be made to the trimmer capacitor which is accessible via the upper hole in the cover of the 2nd v.f.o. Turning the trimmer slightly anti-clockwise will reduce the over-run frequency at the top (clockwise) end of the kHz tuning, and increase it at the lower end, and vice versa.

(15) Switch off the receiver. Tighten up the remaining grub screws in the shaft coupler.

(16) Replace the panel on the 2nd v.f.o. cover.

(17) Replace the Fast-Warm-Up Oscillator and its bracket. (Four screws on chassis underside)

1st I.F. UNIT

32. This small unit is part of a large assembly which includes the i.f. bandwidth filters together with the Bandwidth switch and B.F.O. controls.

33. Tools: Screwdriver.
Spanner .25 inch AF.
Soldering iron.

34. Removal of 1st I.F. Unit

(1) Remove the main I.F. Module (Refer to paragraph 11) and unplug the 2nd Mixer module.

(2) On the underside of the receiver remove the five screws which retain the bandpass filter assembly.

(3) On the upper side remove the two screws which secure the 1st I.F. Unit to the Bandpass filter assembly.

(4) Move the bandpass filter assembly sideways. This gives access for the unsoldering of the wires from the 1st I.F. Unit. Ensure that the coaxial leads to the 1000Ω and 100Ω output pins are identified for correct re-connection.

(5) Push the 1st I.F. Unit out of its mounting and lift out.

NOTE: The coaxial connection to the 3rd mixer (wire number 8) may have to be unsoldered if it restricts the movement of the filter assembly.

METER CONTROL BOARD

35. Tools: Screwdriver.
Spanner 4BA.
Soldering iron.

Removal

(1) Remove the side plate from the receiver (Six screws).

(2) Remove the four screws which secure the pillars of the control board to the side memeber of the receiver.

(3) Unsolder the connecting wires and lift out the board.

(4) When re-connecting identify the leads as follows. Also refer to Fig. 18.

R1	Sleeve 65	Blue	D1/D2	Red/Blue
D2/D4	Sleeve 65	Red	D3/D4	Blue/Orange
R2	Violet		R3	Blue/White

H.T. FILTER BOARD

36. Tools: Soldering iron.
4BA Spanner.
Screwdriver.

37. Removal

(1) Remove the small cover from the underside of the receiver.

(2) Unsolder the connecting wires from the H.T. Filter board.

(3) Remove the two nuts and lift up the board sufficiently to unsolder the remaining connections.

(4) Lift out the board.

AUDIO AMPLIFIER BOARD

38. Tools: Soldering iron.
Screwdriver.

Removal of 1-Watt Board

(1) Remove the small cover from the underside of the receiver.

(2) Unsolder the connecting leads from pins 2, 3, 4, 5, 6, 7, 8, 9, of the 1-watt audio board

(3) Remove the four retaining screws.

(4) Carefully ease the transistors VT4 and VT5 out of their holders at the same time as the board is lifted out.

(5) When re-assembling identify the connecting wires to the 1-watt board as follows:-

Pin 2:	To audio Transformer (Red/Orange)	Pin 6:	Violet (Red sleeve) Violet (White sleeve)
Pin 3:	To capacitor 1C15	Pin 7:	Sleeve 32
Pin 4:	Sleeve 31	Pin 8:	Earth, (Black)
Pin 5:	To capacitor 1C12 (Red/White)	Pin 9:	To capacitor 1C17

10 mW Board Connections

Pin 1:	Sleeve 68	Pin 5:	Sleeve 50 Red
Pin 2:	Sleeve 65 Red	Pin 6:	Violet (White sleeve)
Pin 3:	Sleeve 65 Blue	Pin 7:	Sleeve 16 Red
Pin 4:	Screen to 50		

B.F.O. and Bandwidth Assembly — Fig. L-18

39. The following items are mounted on an assembly which can be removed as a single unit, but such removal should not normally be attempted due to the numerous connections which have to be unsoldered.

(a) B.F.O. oscillator and amplifier boards.
(b) 1st I.F. Amplifier unit.
(c) DET - B.F.O. Mode Switch.
(d) Bandwidth (I.F. BW) switch.
(e) R.F. Gain potentiometer.
(f) A.F. Gain potentiometer.
(g) Crystal bandwidth filters.

Tools: Screwdrivers.
Soldering Iron.

40. Assembly Removal

(1) Remove all the control knobs from the front panel.

(2) Remove the four chromium screws from the front panel and remove the panel.

(3) Remove the main I.F. Module.

(4) On the underside of the receiver remove the five screws which secure the B.F.O. and Bandwidth Assembly.

(5) At the front, above the B.F.O. controls, remove two screws. The assembly is now free to move, subject to The wiring connection which must be unsoldered.

REMOVAL OF FAST-WARM-UP OSCILLATOR UNIT

41. (1) Remove the receiver cover and the Counter and Display Unit.

(2) Pull off the base connector from the fixed plug on the oscillator unit.

(3) Turn the receiver on its side. Hold the oscillator unit and remove the four 10/32 screws which are accessible through apertures in the underside of the receiver.

(4) Lift out the oscillator unit complete with its mounting bracket.

(5) To separate the oscillator unit from its mounting bracket remove the four retaining screws from the bracket.

COUNTER AND DISPLAY UNIT

REMOVAL OF COUNTER AND DISPLAY UNIT

42. (1) Remove the receiver top cover.

(2) Remove two chrome retaining screws from the receiver front panel. Remove two screws from the flange across the rear of the unit; viewed from the front these screws are the second and fourth from the left.

(3) The unit can now be moved a short distance to provide access to the receiver main chassis. To obtain further access to the receiver, while at the same time keeping the Counter and Display unit in operation, proceed as follows:-

(i) With the receiver switched on, tune the MHz control to obtain the required MHz display.

(ii) Disconnect the Cannon connector PL21 (at the forward left hand side of the receiver). The Counter and Display unit will continue to provide all facilities except change of MHz readout.

(4) To remove the unit completely, switch off the receiver, unscrew and disconnect the Burndy connector, and lift off the unit.

REMOVAL OF DISPLAY (INDICATOR) TUBES

NOTE: Provision is made for the replacement of an indicator tube without removal of the top cover, refer to Method 1, below.

43. Method 1

(1) Remove the plastic escutcheon from the front of the unit (4 screws).

(2) Remove the plastic screen. This is a polaroid light filter. Note the fitting and ensure that it goes back the same way on replacement.

(3) Ease out the wire mesh screen.

(4) Insert a suitable removing tool through the appropriate aperture in the top cover and gently ease out the indicator tube from its holder, at the same time supporting the tube through the aperture in the front panel.

(5) When replacing the plastic escutcheon, screen etc the plastic screen, and the wire mesh should be first assembled into the plastic escutcheon. The complete assembly should then be fitted to the unit.

44. Method 2

CAUTION: When raising the bottom chassis the perspex rods which contain the neon overspill lamps may brush against the screening braid which is attached to the front panel, thereby defacing the + and - painted symbols on the rods. Damage can be avoided by pressing the braiding clear of the rods.

(1) If the unit is being serviced and the bottom chassis is free to hinge upwards, an indicator lamp can be removed by raising the chassis upwards (note CAUTION above) and pulling out the indicator tube, while at the same time firmly supporting the plastic tube-holder cradle.

Removal of Neon Overspill Tubes

45. (1) At the two pins on the neon tube holder unsolder the leads which connect to the neon tube, leaving the leads attached at the neon tube end. (Hinge up the top chassis to unsolder the leads from the lower neon tube).

(2) Pull the leads gently upwards to slide the neon tube upwards and out of the holder.

REMOVAL OF TOP COVER

46. The cover of the Counter and Display unit is held by a total of 14 screws. One in the front panel and 13 around the edge of the cover. Two of the cover screws, at the rear edge, are removed when disconnecting the unit. When replacing the top cover ensure that all screws are tight to maintain correct screening.

REMOVAL OF BOARDS

NOTE: The following instructions assume that the cover has been removed from the Counter and Display unit. Refer to Fig. 18 for the location of boards.

Removal of RBA Board

47. (1) Remove the cover (2 screws).

(2) Ease off the fibre spacers from the two corner pillars.

(3) Carefully draw the board upwards, keeping it level to avoid pin distortion.

Removal of RXF Board

48. The removal procedure is identical to that of RBA. See previous paragraph.

Removal of RFG, RMH, and RTT Boards

49. To remove any of these boards the top chassis must be free to hinge upwards. Remove the retaining screw and nut (Fig. 18). The nut requires a hexagonal box spanner (6BA/440 Hex). With later versions of the unit a screwdriver can be used.

Removal of RFG Board

CAUTION: Do not grip the crystal nor any component when pulling out the board.

50. (1) Ease out the connector plug at the rear of the board to free the connector and then pull the board towards the front of the unit.

(2) Hinge the top chassis upwards sufficient to allow the board to be drawn out towards the front of the unit.

Removal of RMH and RTT Boards

CAUTION: When raising the bottom chassis avoid damage to the markings on the overspill rods by pressing the front panel screening braid clear of the rod ends.

51. (1) Remove the retaining screw and nut from the top chassis and hinge the top chassis upwards.

(2) On the bottom chassis remove the retaining screw from each of the four blue horizontal plastic bars which attach the RMH and RTT boards to the tube holders. These screws secure the plastic bars to the base of the chassis.

(3) Hinge the bottom chassis upwards, taking care to protect the overspill rods from defacement.

(4) Slide the required board, complete with lamp assembly, out of the chassis. A sharp initial pull is required to free the plug and socket connection; this must be made at the connector, do not pull on the indicator tube assembly, nor on any board component. To free the grip of the connector it may be necessary to ease the board out very slightly, using a broad bladed screwdriver inserted between the board edge and the connector shell. Turn the screwdriver just enough to free the connector. Do not insert the screwdriver between the mating faces of the connector. Perform the operation at the two ends of the connector shell to avoid distorting the connector pins by uneven movement of the board.

Removal of Power Input Filter

52. This is attached by a nut at the rear of the main assembly. Note the colour coding of the connections to the top of the unit before unsoldering.

CHAPTER 8

LIST OF COMPONENTS

CONTENTS

NOTE: Component values are quoted as follows:-

Resistors

No suffix = ohms
Suffix 'k' = kilohms
Suffix 'M' = megohms

Capacitors

No suffix = microfarads
Suffix 'p' = picofarads

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, Racal part number, and manufacturer of part required.

(3) Quantity required.

NOTE: If the equipment is designed on a modular basis, please include the type and description of the module for which the replacement part is required.

NOTES ON COMPONENT CHANGES AND ADDITIONS

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufactur

REPLACEMENT MODULES AND ASSEMBLIES

NOTE 1: Table 1, below, lists the "plug-in" modules which can be quickly fitted in the receiver and are therefore essential to a rapid service procedure. Table 2 on the next page lists the principal component board assemblies likely to be required in servicing the various modules.

NOTE 2: When ordering a replacement module please state the module title and the part number. When ordering a circuit board of sub-assembly please state the module in which the part is fitted, as well as the name of the item and the part number, as listed in Table 2.

NOTE 3: Always quote the receiver title (RA.1218A, RA.1218B etc) and the serial number and drawing number on the plate at the rear of the receiver.

TABLE 1

Module Assemblies

Name	Part Number
R.F. Unit	CA.38538/B
1st Mixer and 40 MHz Filter	BA.28211/A
2nd Mixer	CA.30959/A
3rd Mixer	CA.35970/A
1st VFO	CC.28120/C
2nd VFO	CA.28101/B
37.5 MHz Generator with 1 MHz Amp and Calibrator	CA.28276/B
37.5 MHz Band-Pass Filter Unit	BA.28192/A
1st I.F.; Crystal Filters and B.F.O. Assembly	CA.39541
I.F. Module (100 kHz output)	DA.38580/D
Power Unit PU.1155	CA.39382
5 MHz Fast-Warm-Up Oscillator Unit Type 840	911880
Counter and Display Unit	MDA.75209/A

TABLE 2

Sub-Circuit Assemblies

R.F. Unit	Part Number
0-30 MHz Filter	AA.28188/A
R.F. Range Coil and Capacitor Assembly	CA.38539/B
R.F. Amp. Board	BA.28155/B
Attenuator Switch Assy.	AA.34081
H.T. Filter Board	AA.28179/B
1st Mixer	
Mixer Board	BA.28215
40 MHz 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/C
Amplifier Board	BA.45309
2nd VFO	
Oscillator Board	BA.35808
Amplifier Board	BA.35807
Component Board	AA.39599/A
1 MHz Amp. and Calibrator	
Complete Assembly	BA.28285/B
1 MHz Amplifiers	BA.32858
Calibrator Board	BA.41745

37.5 MHz Generator	Part Number
Complete Sub-Assembly	BA.28284/B
Harmonic Gen. Board	BA.32854
Harmonic Filter Assembly	BA.35836
Harmonic Mixer Board	CA.42059
37.5 MHz Amp. Board	BA.32850
1st I.F. Amp. Unit	BA.28203
Circuit Board	BA.31474
I.F. Module	
I.F. Amp. Board	BA.30533
Detector Board	BA.28236
A.G.C. Board	BA.31466/B
Converter (100 kHz) comprising	BA.38571/D
Osc. Board (100 kHz)	BA.38568/D
Amp. Board (100 kHz)	BA.34783/D
H.T. Supply Filter	AA.30535
BFO (600 kHz)	
Oscillator Board	BA.30540
Amplifier Board	BA.30542
Audio Amp Board	
Amplifier Board (1 watt) or	BA.39442
Amplifier Board (10 mW)	BA.31462
Power Unit Type PU.1155	
Main Component Board	BA.39730
5 Volt Component Board	BA.39726
Control Board	BA.38883

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer

MAIN CHASSIS ITEMS

(Fig. 16)

NOTE 1: Components prefixed '1' are located in various parts of the chassis, but are not in any module.

NOTE 2: Components prefixed '2' are located in the Bandwidth and BFO switch assembly.

NOTE 3: Components prefixed '3' are located on the Meter Control Board.

NOTE 4: Components prefixed '4' are located on the H.T. Filter Board. (Chassis underside).

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
	ohms	Resistors				
1R1		Not Used				
1R2		Not Used				
1R3		Not Used				
1R4	10k	Metal Oxide			906023	Electrosil TR5
1R5	680	Metal Oxide			908390	Electrosil TR4
1R6	4.7k	Metal Oxide			906022	Electrosil TR5
1R7	100	Metal Oxide			908276	Electrosil TR4
1R8	100	Metal Oxide (1-watt receivers only)			908276	Electrosil TR4
1R9	680	Metal Oxide			906345	Electrosil TR5
1R10	1k	Composition			902508	Erie 15
1R11	82	Metal Oxide			908290	Electrosil TR4
1R12	100	Metal Oxide			908276	Electrosil TR4
1R13		Not Used				
2R1	390	Composition			902503	Erie 15
2R2		Not Used				
2R3		Not Used				
2R4	100	Metal Oxide		5	908276	Electrosil TR4
2R5		Not Used				
2R6		Not Used				
2R7	3.3k	Metal Oxide			900991	Electrosil TR4
2R8		Not Used				
2R9		Not Used				
2R10		Not Used				
3R1	3.9k	Metal Oxide		5	906029	Electrosil TR5
3R2	22k	Metal Oxide		5	906553	Electrosil TR5
3R3	5.6k	Metal Oxide		5	906032	Electrosil TR5

Cct. Ref.	Valve	Description	Rat.	Tol. %	Racal Part No.	Manufacturer

MAIN CHASSIS ITEMS (continued)

(Fig. 16)

Cct. Ref.	Valve	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
		Potentiometers				
1RV1		Not Used				
1RV2		Not Used				
1RV3	200	Fine Tune			BD44596/3	
2RV1	10k	A.F. Level preset			900615	Plessey MP.
2RV2	1k	R.F. Gain			BD44596/1	
2RV3	10k	A.F. Gain			BD44596/2	
3RV4	47k	'S' meter setting: :	linear preset		908635	Plessey MP
4RV1	2.2k	AGC set: linear:	preset		909836	Plessey MP
		Capacitors	volts			
1C1	.001	Ceramic	350	20	902122	Lemco 310K
1C2		Not Used				
1C3	0.1	Polyester	250	20	909428	Mullard C280AE/P100K
1C4	0.22	Ceramic	50	-20+50	908338	T.C.C. CML10
1C5	0.1	Polyester	250	10	909847	Mullard C280AE/A100K
1C6		Not Used				
1C7		Not Used				
1C8	0.1	Polyester	250	20	909428	Mullard C280AE/P100K
1C9	0.1	Polyester	250	20	909428	Mullard C280AE/P100K
1C10	0.1	Polyester	250	20	909428	Mullard C280AE/P100K
1C11	0.1	Polyester	250	20	909428	Mullard C280AE/P100K
*1C12	500	Electrolytic	25	-20+50	900748	Hunts MEF37T
1C13	10	Electrolytic	20	20	905399	S.T.C. 472/LWA/401GA
1C14	.0022	Ceramic	350	20	902126	Lemco 310K
*1C15	.033	Polyester	150	5	908114	Wima Tropyfol M
1C16	0.1	Polyester	250	20	909428	Mullard C280AE/P100K
*1C17	500	Electrolytic	25	-20+50	900748	Hunts MEF 37T
1C18	0.1	Polyester	250	20	909428	Mullard C280AE/P100K
1C19	100p	Polystyrene	125	2	908424	Salford PF
1C20	100p	Polystyrene	125	2	908424	Salford PF
1C21	680p	Polystyrene	125	2	910997	Salford PF
1C22	0.1	Polyester	250	20	909428	Mullard C280AE/P100K
1C23	0.1	Polyester	250	20	909428	Mullard C280AE/P100K
1C24	0.1	Polyester	250	20	909428	Mullard C280AE/P100K
1C25 to 1C27	1.0	Electrolytic	40	-10÷100	910952	Mullard C426AS/G1

Items marked thus (*) are fitted with the one-watt audio amplifier board.

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer

MAIN CHASSIS ITEMS (continued)

(Fig. 16)

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
		Capacitors (Contd).	volts			
2C1	0.1	Polyester	250	20	909847	Mullard C280AE/A100K
2C2	4-34p	Variable B.F.O. Tune			AD 42761	
2C3	1	Electrolytic	40	-10+100	910952	Mullard C426AS/G1
2C4	12p	Trimmer			905125	Mullard C004/E4
4C1	0.1	Polyester	250	10	909847	Mullard C280AE/A100K
4C2		Not Used				
4C3	50	Electrolytic	25	-10+50	908798	Mullard C426AR/F50
		Transformers and Inductors				
1T1		Audio output (one-watt receiver only)			CT.39257	
1T2		1 MHz internal			BT.39914	
1T3		Freq. Standard			BT.39915	
1L1		1 MHz Filter (on same assembly as 1T2)			BT.40448	

NOTE: 1T2 and 1L1 are mounted on component board AA.40450 together with 1C19, 1C20 and 1C21.

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
		Switches				
1SA		Microswitch a.g.c.			919888	) Unimax DPST Type LMF
1SB		Microswitch h.t.			919888	)
1SC/1		) Power switching: part				
1SC/2		) of System switch 1SE			BSW.38691	
1SD		2nd V.F.O. INT/EXT: break before make			912063	E.M.I. S5
1SE		System switch			BSW.38691	
1SF		Meter switch: break before make			912063	E.M.I. S5
1SG		Not Used				
1SH		MHz Switch: break before make			912063	E.M.I. S5
1SJ		1.7 MHz switch: break before make			912063	E.M.I. S5
2SA		Bandwidth switch			BSW.38719	
2SB		DET-B.F.O. Mode Switch			BSW.38585	
		Diodes				
3D1 to 3D4		Meter Rectifiers			900071	Mullard OA91
1D5		Zener 6.2V ± 5%			905395	Mullard OAZ 243
1D6		Zener 6.2V ± 5%			905395	Mullard OAZ 243

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer

MAINS CHASSIS ITEMS (continued)

(Fig. 16)

Connectors

Plugs (Free)

Cct. Ref.	Description	Racal Part No.	Manufacturer
1PL1	Antenna plug: 75 ohms coaxial	905034	Transradio BN 1/7
1PL2	Chassis wiring to Power module 25 way	911784	Cannon DBM 25P
1PL3	I.F. Module input: coaxial elbow	906391	Belling Lee L1403/FP/Ag
Plug free: 12 way: external connections		906612	Plessey Mk4 2CZ83302/5
Accessory Set for 12-way plug			Plessey 508/1/03013/205

Sockets

Cct. Ref.	Description	Racal Part No.	Manufacturer
Socket (free for external power connection		905151	Plessey Mk4 2CZ 83283/5
Accessory set		905154	Plessey 508/1/03008/205
1SKT1	I.F. connector: free: 37 way	908603	Cannon DCM37S
1SKT2	Double ended bulkhead adaptor	908405	Belling Lee L1403/BS/Ag
1SKT3	Double ended bulkhead adatpor	908405	Belling Lee L1403/BS/Ag
1SKT4	1st Mixer: insert	908600	Cannon DM53743-5001
1SKT5	HT to 1st Mixer	908604	Sealectro 5 BC
1SKT6	37.5 MHz Filter: insert	908600	Cannon DM53743-5001
1SKT7	2nd Mixer connector - multiway	911160	Cannon DBMF9W4S
1SKT8	3rd Mixer connector - multiway	911160	Cannon DBMF9W4S
1SKT9	37.5 MHz Gen. connector - multiway	908602	Cannon DBM9W4S
1SKT10	2nd VFO connector - multiway	908599	Cannon DBM13W3S

NOTE: The coaxial inserts in the Cannon connectors SKT7, SKT8, SKT9 and SKT10 can be renewed separately, using coaxial insert DM53743-5001: Part No. 908600.

Cct. Ref.	Description	Racal Part No.	Manufacturer
SKT11	12-way outlet: fixed	906607	Plessey Mk4 CZ 63979/5

NOTE: The free coaxial plugs for connection to the rear panel sockets 1SKT12 to 1SKT17 are BNC 75Ω Part number 905034.

Cct. Ref.	Description	Racal Part No.	Manufacturer
1SKT12	2nd VFO IN: fixed, 75Ω coaxial	907457	Transradio BN 12/7
1SKT13	2nd VFO OUT: fixed, 75Ω coaxial	907457	Transradio BN 12/7
1SKT14	L.F. fixed, 75Ω coaxial	907457	Transradio BN 12/7
1SKT15	PAN fixed, 75Ω coaxial	907457	Transradio BN 12/7
1SKT16	1 MHz IN fixed, 75Ω coaxial	907457	Transradio BN 12/7
1SKT17	1 MHz OUT fixed, 75Ω coaxial	907457	Transradio BN 12/7
1SKT18	Connector 5-way free to R.F. Unit	911785	Cannon DEM5W1S
Coaxial insert to SKT18		908600	Cannon 53743-5001

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer

MAIN CHASSIS ITEMS (continued)

(Fig. 16)

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
Sockets (contd.)						
1SKT19		Multiway to Display Unit			912628	Burndy MS34RM58
1SKT20		1.7 MHz: fixed, 75Ω coaxial			907457	Transradio BN 12/7
1SKT21		Multiway to Display Unit				Cannon DAM15S
1SKT22		37.5 MHz Filter: insert			908600	Cannon DM53743-5001
1SKT23		5 MHz Oven octal holder: free			907140	5935-99-056-0132
JK1		Phones jack socket			901509	Igranic P71
Phones Plug-Free		Phones jack plug to fit JK1			901557	Igranic P50
		Terminal Blocks				
TB1		6-way: Refer to I.F. Module components list				
TB2		1st V.F.O. h.t. connection			AD.39835/1	
TB3		-16V to Fine Tune control			905221	Wingrove & Rogers TS8-04
		Meter				
M1		'S' Meter			BSW 35519	
		Crystal Bandpass Filters Available				
	13 kHz				38733/A	
	8 kHz				38733/B	
	6 kHz				38733	
	3 kHz				38733/C	
	1.2 kHz				38733/D	
	500 Hz				38733/F	
	200 Hz				38733/E	
	6.5 kHz				38733/H	
Ferrite Beads						
X1					907488	Mullard FX1242
X2					907488	Mullard FX1242
X3					907488	Mullard FX1242

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer

R.F. MODULE - Fig. 4

Resistors

Coil Board and Capacitor Assembly

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
	ohms		watts			
2R1	1k	Metal Oxide		5	908267	Electrosil TR4
2R2	100	Metal Oxide		5	908276	Electrosil TR4
2R3	100	Metal Oxide		5	908276	Electrosil TR4

Ae. Attenuator Switch Assembly

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
R1	56	Carbon Hi. Stab.		5	906559	Erie N6
R2	15	Carbon Hi. Stab.		5	908300	Erie N6
R3	56	Carbon Hi. Stab.		5	906559	Erie N6
R4	33	Carbon Hi. Stab.		5	908301	Erie N6
R5	47	Carbon Hi. Stab.		5	905320	Erie N6
R6	33	Carbon Hi. Stab.		5	908301	Erie N6
R7	15	Carbon Hi. Stab.		5	908300	Erie N6
R8	56	Carbon Hi. Stab.		5	906559	Erie N6
R9	56	Carbon Hi. Stab.		5	906559	Erie N6

R.F. Amplifier Board (BC.28155)

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
3R1	8.2k	Metal Oxide		5	908275	Electrosil TR4
3R2	820	Metal Oxide		5	908282	Electrosil TR4
3R3	560	Metal Oxide		5	909841	Electrosil TR4
3R4	1.5k	Metal Oxide		5	908296	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	Electrosil TR4
3R11		Not Used				
3R12		Not Used				
3R13		Not Used				
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	Electrosil TR4
3R19	22	Metal Oxide		5	911495	Electrosil TR4

Thermistor

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
3TH1					909839	Mullard VA1038

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer

R.F. MODULE (continued)

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
		Capacitors				
Module			volts			
C1		Not Used				
C2	0.1	Polyester	250	10	909847	Mullard C280AE/A100K
0 - 30 MHz Filter (AC.28188/A)						
1C1	68p	Polystyrene	30	2½	908321	Suflex HS7/A
1C2	82p	Polystyrene	30	2½	908322	Suflex HS7/A
1C3	18p	Polystyrene	30	1p	907171	Suflex HS7/A
1C4	82p	Polystyrene	30	2½	908322	Suflex HS7/A
1C5	68p	Polystyrene	30	2½	908321	Suflex HS7/A
Coil and Capacitor Assembly						
2C1	6p	Trimmer: tubular			901987	Mullard C004AE/6E
2C2	6p	Trimmer: tubular			901987	Mullard C004AE/6E
2C3	6p	Trimmer: tubular			901987	Mullard C004AE/6E
2C4	6p	Trimmer: tubular			901987	Mullard C004AE/6E
2C5	6p	Trimmer: tubular			901987	Mullard C004AE/6E
2C6a		(Variable: R.F. TUNE. Minimum 8.5pF)			BD38556	
2C6b		(Range 157 pF each Section)				
2C7		Not Used				
2C8	4.7p	Ceramic	750	½p	902007	Lemco 310P100
2C9	680p	Silver Mica	300	2	902254	J & M C12S
2C10	680p	Silver Mica	300	2	902254	J & M C12S
2C11	6.8p	Ceramic	750	½p	902009	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
3C6	0.1	Ceramic	30	-25+50	906675	Erie 811T/30
3C7	68p	Polystyrene	30	2½	908321	Suflex HS7/A
3C8	100p	Polystyrene	30	2½	908241	Suflex HS7/A
3C9	27p	Polystyrene	30	±1p	907172	Suflex HS7/A
3C10	220p	Polystyrene	30	2½	908320	Suflex HS7/A

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
		R.F. MODULE (continued)				
3C11	33p	Polystyrene	30	±1p	906497	Suflex HS7/A
3C12	150p	Polystyrene	30	2½	908331	Suflex HS7/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 HS7/A
3C16	18p	Polystyrene	30	±1p	907171	Suflex HS7/A
3C17	220p	Polystyrene	30	2½	908320	Suflex HS7/A
3C18	33p	Polystyrene	30	±1p	906497	Suflex HS7/A
3C19	82p	Polystyrene	30	2½	908322	Suflex HS7/A
3C20	0.1	Ceramic	30	-25+50	906675	Erie 811T/30
3C21	68p	Polystyrene	30	2½	908321	Suflex HS7/A
		Inductors and Transformers				
0 - 30 MHz Filter						
1L1		Aerial Filter Coil			CT.32963/A	
1L2		Aerial Filter Coil			CT.32964/A	
1L3		Aerial Filter Coil			CT.32963/A	
Coil and Switch Assembly						
2L1		Coil Assembly			CT.32934/B	
2L2		Coil Assembly			CT.32933/B	
2L3		Coil Assembly			CT.32932/B	
2L4		Coil Assembly			CT.32931/B	
2L5		Coil Assembly			CT.32930/B	
R.F. Amplifier Board						
3L1		Coil Assembly: L.P. Filter			CT.28154/A	
3L2		Coil Assembly: L.P. Filter			CT.28152/A	
3L3		Coil Assembly: L.P. Filter			CT.28154/A	
3L4		Coil Assembly: L.P. Filter			CT.28152/A	
3T1		Transformer Assembly			CT.28149/A	
3T2		Transformer Assembly			CT.28149/A	
		Switches				
2SA		R.F. RANGE Switch			BSW.38550	
SB		AE ATT (R.F. Attenuator Switch)			BSW.28141	
Switch SB Assembly, complete					AA.34081	

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer

R.F. MODULE (continued)

Transistors

R.F. Amplifier Board

3VT1					900618	Texas 2S303
3VT2					918397	RCA 60048
3VT3					918397	RCA 60048

Diodes

R.F. Amplifier Board

3D1 to 3D4		Semi-conductor diodes			914144	Emihus HD 1812
3D5 and 3D6		Semi-conductor diodes			908343	Texas 1S920
3D11 and 3D12		Semi-conductor diodes			909837	Hughes HS 9003

NOTE: Earlier versions had diodes 3D7 to 3D10 in parallel with 3D1 to 3D4, and the diodes were then Part No. 911796 Hughes HPS 1672/B.

Plugs and Sockets

R.F. INPUT		Antenna: socket 75Ω fixed				Transradio BN12/7
PL1		Connector fixed, 5-way				Cannon DEM5WIP
Coaxial insert to PL1						Cannon DM53740-5001

Miscellaneous Items

X1		Ferrite Bead			907488	Mullard FX1242
3X1		Ferrite Bead on 3VT3			907488	Mullard FX1242
Voltage Surge Arrester (Spark Gap)						Siemens America Inc. Type B1-A230
Relay, Muting 340Ω 17.6V					911478	C.P. Clare Type F F.L. 7631

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer

FIRST MIXER AND 40 MHz FILTER
(BC.28211) - Fig. 8

Resistors

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
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 MHz Filter (AC.28197)						
R1	1k	Metal Oxide		5	908267	Electrosil TR4

Potentiometers

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
1st Mixer Board						
RV1	2.2k				909838	Ancillary Dev. Type T.O.5.

Capacitors

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
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 HS7/A
C6	39p	Polystyrene	30	1p	905374	Suflex HS7/A
40 MHz Filter (AC.28197)						
C1	47p	Polystyrene	30	2½	908318	Suflex HS7/A
C2	47p	Polystyrene	30	2½	908318	Suflex HS7/A
C3	47p	Polystyrene	30	2½	908318	Suflex HS7/A
C4	47p	Polystyrene	30	2½	908318	Suflex HS7/A
C5	47p	Polystyrene	30	2½	908318	Suflex HS7/A
C6	47p	Polystyrene	30	2½	908318	Suflex HS7/A
C7	56p	Polystyrene	30	2½	908319	Suflex HS7/A
C8	470p	Polystyrene	30	2½	908317	Suflex HS7/A

Inductors

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
1st Mixer Board						
T1		Transformer			CT.28212/A	

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
		FIRST MIXER AND 40 MHz FILTER (continued)				
40 MHz Filter						
L1		Coil Assembly			CT.31031/A	
L2		Coil Assembly			CT.31030/A	
L3		Coil Assembly			CT.31030/A	
L4		Coil Assembly			CT.31030/A	
L5		Coil Assembly			CT.31030/A	
L6		Coil Assembly			CT.31030/A	
L7		Coil Assembly			CT.31030/A	
L8		Coil Assembly			CT.31030/A	
		Transistors				
VT1					906517	Texas 2N918
VT2					906517	Texas 2N918
		Plugs and Sockets				
PL1		From R.F. Unit			906391	Belling Lee L1403/FP/Ag.
PL2		-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) - Fig. 9

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
		Resistors				
Module Chassis						
	ohms					
1R1	270	Metal Oxide			908284	Electrosil TR4
1R2 + 1R3		Not Used				
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	Electrosil 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		Not Used				
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	10	909847	Mullard C280 AE/A100K
C5	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
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	10	909847	Mullard C280 AE/A100K
C13	100p	Polystyrene	30	2½	908241	Suflex HS7/A
C14	300p	Polystyrene	30	2½	908335	Suflex HS7/A
C15	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
		SECOND MIXER (continued)				
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 310NPO
		Transformers and Inductors				
T1		37.5 MHz coupling			CT.28317/A	
T2		2-3 MHz output			CT.28316/A	
L1		Mixer Load			CT.28310/A	
L2		Filter Coil Assembly			CT.28311/A	
L3		Filter Coil Assembly			CT.28312/A	
L4		Filter Coil Assembly			CT.28313/A	
L5		Filter Coil Assembly			CT.28314/A	
L6		Filter Coil Assembly			CT.28315/A	
		Transistors				
VT1					909414	Mullard 2N3323
VT2					909414	Mullard 2N3323
VT3					910866	Texas 2N2996
		Plugs and Sockets				
PL1		9-way			908388	Cannon DBM9W4P
		Coaxial inserts A1 to A4			908341	Cannon DM53740-5001
		Ferrite Bead				
1X1		Ferrite Bead Assembly			AA.40269	
1X2		Ferrite Bead			907488	Mullard FX1242
1FX3		Ferrite Bead			907488	Mullard FX1242
1FX4		Ferrite Bead			907488	Mullard FX1242

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer

THIRD MIXER
(BC.35970) - Fig. 11

Resistors

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
Module Chassis						
	ohms		watts			
1R1	39	Composition		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	Electrosil TR4
R7	82	Metal Oxide		5	908290	Electrosil TR4
R8	680	Metal Oxide		5	908390	Electrosil TR4
R9	33	Metal Oxide		5	908690	Electrosil TR4
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	Composition	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

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
Module Chassis			volts			
1C1	820p	Polystyrene	30	2½	908389	Suflex HS7/A
1C2	820p	Polystyrene	30	2½	908389	Suflex HS7/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	5	908396	Suflex HS7/A
1C7	82p	Polystyrene	125	2	905587	Salford AAD
Circuit Board (BC.35966)			volts			
C1	0.1	Polyester	250	20	909428	Mullard C280 AE/P100K
C2	0.1	Polyester	250	20	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

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
		THIRD MIXER (continued)				
C6	680p	Silver Mica	300	2	902254	J.M.C. C12S
C7	39p	Polystyrene	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			CT.31026/A	
1L2		Coil Assembly			AA.38847/A	
1L3		Coil Assembly			AA.38847/A	
Circuit Board						
T1		Transformer			CT.35968/A	
T2		Transformer			CT.35968/A	
T3		Transformer			CT.35968/A	
L1		Coil Assembly			CT.35969/A	
L2		Coil Assembly			CT.31023/A	
L3		Coil Assembly			CT.35971/A	
L4		Coil Assembly			CT.31022/A	
L5		Coil Assembly			CT.34745/A	
L6		Coil Assembly			CT.31021/A	
L7		Coil Assembly			CT.31020/A	
		Transistors				
VT1		n.p.n.			900893	S.T.C. BSY27
VT2		n.p.n.			900893	S.T.C. BSY27
VT3		n.p.n.			918397	RCA 60048
		Diodes				
1D1		(Mounted on the Module)			908349	Hughes HD1871
D1-D4		Diode Quad on circuit board			909846	Cosem A505GE
1D2		Diode			914898	S.T.C. 1N1419
		Plugs and Sockets				
PL1		(Plug Shell			908388	Cannon DBM9W4P
		(Plug coaxial inserts (4)			908341	Cannon DM53740-5001
		Ferrite Beads				
1FX1 to 1FX4		Ferrite Beads			907488	Mullard FX1242

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer

FIRST V.F.O.
(CC.28120/C - Fig.5)

Resistors

Oscillator Board (1st V.F.O.) (AC.35195)

Cct. Ref.	Value ohms	Description	Rat. watts	Tol. %	Racal Part No.	Manufacturer
R1	100	Metal Oxide		5	908276	Electrosil TR4
R2	10	Composition	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/C)

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
R1	1k	Metal Oxide		5	908267	Electrosil TR4
R2	1k	Metal Oxide		5	908267	Electrosil TR4
R3	470	Metal Oxide		5	900992	Electrosil TR4
R4	100	Metal Oxide		5	908276	Electrosil TR4
R5	33	Metal Oxide		5	906342	Electrosil TR5
R6	68	Metal Oxide		5	907494	Electrosil TR5
R7	50	Metal Oxide		5	918002	Electrosil TR4
R8	150	Metal Oxide		5	909121	Electrosil TR4

Amplifier Board (1st V.F.O.) (CC.45309)

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
R1	120	Metal Oxide		5	908286	Electrosil TR4
R2	390	Metal Oxide		5	908472	Electrosil TR4
R3	4.7k	Metal Oxide		5	900989	Electrosil TR4
R4	10k	Metal Oxide		5	900986	Electrosil TR4
R5	680	Metal Oxide		5	908390	Electrosil TR4
R6	10k	Metal Oxide		5	900986	Electrosil TR4
R7	4.7k	Metal Oxide		5	900989	Electrosil TR4
R8	33	Metal Oxide		5	908690	Electrosil TR4
R9	180	Metal Oxide		5	909125	Electrosil TR4

Capacitors

Module Assembly

Cct. Ref.	Value	Description	Rat. volts	Tol. %	Racal Part No.	Manufacturer
1C1		Megahertz tuning			CA.27752/A	
1C2	.047	Ceramic	200		908722	Erie Filtercon 1201-051

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
		FIRST V.F.O. (continued)				
Oscillator Board (AC.35195)						
C1	6.8p	Ceramic	750	½p	902075	Erie N750A
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 HS7/A
C5	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C6	.0015	Ceramic	350	20	902124	Lemco 310K
Amplifier Board (AC.32535/C)						
C1	.01	Ceramic Disc	25	-25+50	911845	Erie 831/T/25V
C2	220p	Polystyrene	30	5	908320	Suflex HS7/A
C3	47p	Polystyrene	30	5	908318	Suflex HS7/A
C4	0.1	Ceramic Disc	30	-25+50	906675	Erie 811/T/30V
C5	.01	Ceramic Disc	25	-25+50	911845	Erie 831/T/25V
Amplifier Board (CC.45309)						
C1	82p	Polystyrene	30	2.5	908322	Suflex HS7/A
C2	.01	Polystyrene	30	2.5	900595	Mullard C280AA/P10K
C3	1000p	Polystyrene	30	2.5	908583	Suflex HS7/A
C4	1500p	Polystyrene	30	2.5	908322	Suflex HS7/B
C5	82p	Polystyrene	30	2.5	908322	Suflex HS7/A
C6	1000p	Polystyrene	30	2.5	908583	Suflex HS7/A
		Transformers and Inductors				
T1 (BC.32535/C)					CT.41872	
L1 (BA.35195)		Oscillator Coil Assembly			CT.28220/A	
		Transistors				
Oscillator Board						
TR1		p.n.p.			910866	Texas 2N2996
Amplifier Board (AC.32535/C)						
TR1		n.p.n.			906517	Texas 2N918
TR2		n.p.n.			906517	Texas 2N918
Amplifier Board (CC.45309)						
TR1		n.p.n.			906517	Texas 2N918
TR2		n.p.n.			906517	Texas 2N918
		Plugs and Sockets				
PL1		Cable and Connector Assembly			AA.33091/9	
PL2		Cable and Connector Assembly			AA.33091/6	
		Ferrite Beads				
FX1		(AC.32535/C & CC.45309)			907488	Mullard FX 1242

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer

SECOND V.F.O.
(CC.28101/B) - Fig. 10

Resistors

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
Fine Tune Board						
	ohms		watts			
2R1	47k	Metal Oxide		5	908391	Electrosil TR4
Oscillator Board (BC.35808)						
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 (BC.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	Composition	0.1	10	902487	Erie 15
R13	68	Metal Oxide		5	908278	Electrosil TR4
R14	4.7k	Metal Oxide		5	900989	Electrosil TR4
R15	18k	Metal Oxide		5	908272	Electrosil TR4
R16	270	Metal Oxide		5	908284	Electrosil TR4
R17	22	Composition	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

SECOND V.F.O. (continued)

Capacitors

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
Module Assembly			volts			
1C1		kHz Tuning			CA.30948/A	
1C2	8.5p	kHz Tuning Trimmer			908732	Erie 562-013
Fine Tune Board						
2C1	0.1	Polyester	250	20	909428	Mullard C280 AE/P100K
Oscillator Board (BC.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	47p	Ceramicon	750	2½	912898	Erie N150 Style B
C5	22p	Ceramicon	750	±0.25p	See Note	Erie NPO

NOTE: C5 is selected by test for suitable temperature coefficient. The standard component (NPO) has zero coefficient. The type actually fitted may be in the Erie range P100 (+ve t.c.) or N080 to N750 (-ve t.c.).

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
Amplifier Board						
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/P10K

Inductors

NOTE: 1L2 is not mounted on a board

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
1L1		Not Fitted				
1L2		Oscillator Coil			CT.35809/A	
L1		Coil Assembly			AA.38847/A	

Transistors

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
Oscillator						
VT1		n.p.n.			906517	Texas 2N918

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
		SECOND V.F.O. (continued)				
		Transistors				
Amplifier Board						
VT1		n.p.n.			906517	Texas 2N918
VT2		n.p.n.			906517	Texas 2N918
VT3		n.p.n.			906517	Texas 2N918
		Diodes				
Fine Tune Board						
2D1 and 2D2		Variable capacitance diodes (15pF)			911878	Motorola MV830
Oscillator Board						
D1		Zener 7.5V ±5%			900897	Mullard OAZ245
D2		Zener 7.5V ±5%			900897	Mullard OAZ245
D3		Zener 6.2V ±5%			905395	Mullard OAZ243
D4		Zener 6.2V ±5%			905395	Mullard OAZ243
Amplifier Board						
D1		Not Used				
D2 and D3					908343	Texas 1S920
		Plugs and Sockets				
PL1		Multi-way connector			908716	Cannon DBM13W3P
		Coaxial inserts for PL1 (3 off)			908341	Cannon DM53740-5001
Fine Tune Component Board Assembly containing 2R1, 2C1, 2D1 and 2D2					AA.39599/A	

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer

37.5 MHz GENERATOR
(BC.28284/B) - Fig. 7

Resistors

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
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 (CA.42059)						
R1	270	Metal Oxide		5	908284	Electrosil TR4
R2	56	Metal Oxide		5	908289	Electrosil TR4
R3	120	Metal Oxide		5	908286	Electrosil TR4
R4	4.7k	Metal Oxide		5	900989	Electrosil TR4
R5	3.3k	Metal Oxide		5	900991	Electrosil TR4
R6	1k	Variable		5	916051	Morganite 81E
R7	3.3k	Metal Oxide		5	900991	Electrosil TR4
R8	4.7k	Metal Oxide		5	900989	Electrosil TR4
R9	120	Metal Oxide		5	908286	Electrosil TR4
R10	1.5k	Metal Oxide		5	908296	Electrosil TR4
R11	68	Metal Oxide		5	908278	Electrosil TR4
37.5 MHz 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

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
Module		Capacitors				
1C1	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
1C2	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K

Cct. Ref.	Value	Description	Rat.	Tol %	Racal Part No.	Manufacturer
		37.5 MHz GENERATOR (Continued)				
Harmonic Generator (AC.32854)			volts			
C1	4.5/15p	Trimmer			908796	Steatite Triko 7S02N750
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	Suflex HS7/A
C2	2.5-6p	Pre-set Ceramic sub-micro			907886	Steatite Triko 7S02N033
C3	27p	Polystyrene		±1p	908325	Suflex HS7/A
C4	7-35p	Pre-set Ceramic sub-micro			908806	Steatite Triko 7S02N1500
C5	27p	Polystyrene		±1p	908325	Suflex HS7/A
C6	2.5-6p	Pre-set Ceramic sub-micro			907886	Steatite Triko 7S02N033
C7	27p	Polystyrene		±1p	908325	Suflex HS7/A
C8	7-35p	Pre-set Ceramic sub-micro			908806	Steatite Triko 7S02N1500
C9	18p	Polystyrene		±1p	907171	Suflex HS7/A
Harmonic Mixer (CA.42059)						
C1	0.1	Ceramic		20	917277	Erie W5R 8133-101
C2	0.1	Ceramic		20	917277	Erie W5R 8133-101
C3	0.1	Ceramic		20	917277	Erie W5R 8133-101
C4	0.1	Ceramic		20	917277	Erie W5R 8133-101
C5	0.1	Ceramic		20	917277	Erie W5R 8133-101
C6	.01	Ceramic		20	917276	Erie W5R 8123-100
C7	56p	Mica		2	916055	Lemco MS 89
C8	.01	Ceramic		20	917276	Erie W5R 8123-100
C9	68p	Mica		5	916056	Lemco MS 89
C10	220p	Mica		5	916057	Lemco MS 89
37.5 MHz Amplifier (AC.32850)						
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	68p	Polystyrene	30	2½	908321	Suflex HS7/A
C5	0.1	Polyester	250	10	909847	Mullard C280 AE/P100K
C6	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C7	15p	Ceramic	750	5	902047	Lemco 310NPO
		Transformers and Inductors				
Harmonic Filter (AC.32862 and AC.32548)						
L1		Coil Assembly			CT.32956/A	
L2		Coil Assembly			CT.32954/A	
L3		Coil Assembly			CT.32956/A	
L4		Coil Assembly			CT.32954/A	

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
		37.5 MHz GENERATOR (continued)				
Harmonic Mixer (CA.42059						
L1		Coil Assembly			CT.42153	
L2		Coil Assembly			CT.42153	
37.5 MHz Amplifier (AC.32850)						
T1		Coil Assembly inc. capacitor C4			CT.28317/A	
		Transistors				
Harmonic Generator						
VT1		p.n.p.			910866	Texas 2N2996
Harmonic Mixer						
VT1 and VT2		n.p.n.			916052	Mullard BFY90
37.5 MHz Amplifier						
VT1		p.n.p.			910866	Texas 2N2996
VT2		p.n.p.			910866	Texas 2N2996
		Diodes				
Harmonic Generator						
D1					908347	Hughes HG 5085
D2					908347	Hughes HG 5085
37.5 MHz Amplifier						
D1 and D2					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 MHz Filter Unit			907076	Cannon insert DM53742-5001
		Ferrite Beads				
FB1		On H.T. Filter			900461	Mullard FX 1115
		37.5 MHz Filter				

NOTE: If this unit is faulty a replacement should be obtained from the Racal Service Department quoting Part number BA.28192.

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
		Plugs (fixed)				
PL1		Coaxial insert			908341	Cannon DM 53740-5001
PL2		Coaxial insert			908341	Cannon DM 53740-5001

Cct. Ref.	Value	Description	Rat.	Tol %	Racal Part No.	Manufacturer

1 MHz AMP. OSC. & CALIBRATOR
(CC.28285/B) - Fig. 6)

Resistors

Cct. Ref.	Value	Description	Rat.	Tol %	Racal Part No.	Manufacturer
	ohms		watts			
1R1	56	Metal Oxide		5	910545	Welwyn F25
1R2	22k	Metal Oxide		5	908289	Electrosil TR4

1 MHz Amplifier Board (BC.32858)

Cct. Ref.	Value	Description	Rat.	Tol %	Racal Part No.	Manufacturer
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	10	Composition		10	902484	Erie 15
R6	1k	Metal Oxide		5	908267	Electrosil TR4
R7	8.2k	Metal Oxide		5	908275	Electrosil TR4
R8	6.8k	Metal Oxide		5	900987	Electrosil TR4
R9	33	Composition	0.1	10	902490	Erie 15
R10	560	Metal Oxide		5	909841	Electrosil TR4
R11	33	Metal Oxide		5	908690	Electrosil TR4
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

Calibrator Board (BC.41745)

Cct. Ref.	Value	Description	Rat.	Tol %	Racal Part No.	Manufacturer
R1	33k	Metal Oxide		5	908291	Electrosil TR4
R2	10k	Metal Oxide		5	900986	Electrosil TR4
R3	2.2k	Metal Oxide		5	908270	Electrosil TR4
R4	100	Metal Oxide		5	908276	Electrosil TR4
R5	6.8k	Metal Oxide		5	900987	Electrosil TR4
R6	2.2k	Metal Oxide		5	908270	Electrosil TR4
R7	68	Metal Oxide		5	908278	Electrosil TR4
R8	1.2k	Metal Oxide		5	908285	Electrosil TR4
R9	27k	Metal Oxide		5	908295	Electrosil TR4
R10	4.7k	Metal Oxide		5	900989	Electrosil TR4
R11	330	Metal Oxide		5	908153	Electrosil TR4
R12	39k	Metal Oxide		5	908292	Electrosil TR4
R13	150k	Metal Oxide		5	908277	Electrosil TR4
R14	680	Metal Oxide		5	908390	Electrosil TR4

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
		1 MHz AMP. OSC. & CAL. (continued)				
		Capacitors	volts			
1C1	0.22				908338	TCC CML10
1C2	0.1		250	10	909847	Mullard C280 AE/A100K
1 MHz Amplifier Board (BC.32858)						
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	20	909428	Mullard C280 AE/P 100K
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	2½	908455	Suflex HS7/A (See Note)
C10*	0.1	Polyester	250	20	909428	Mullard C280 AE/P 100K
*NOTE: In later production if VT3 is type 2N1396 then C10 becomes 0.1uF						
C11	150p	Polystyrene	30	2½	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
Calibrator Board (BC.41745)						
C1	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C2	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C3	220p	Polystyrene	30	2½	908320	Suflex HS7/A
C4	.001	Polystyrene	30	2½	908583	Suflex HS7/A
C5	.001	Polystyrene	30	2½	908583	Suflex HS7/A
C6	22p	Polystyrene	30	1p	906703	Suflex HS7/A
C7	7-35p	Pre-set: Steatite Ceramic Sub- Micro	75		908806	Triko 02 N1500
C8	0.1	Polyester	250	10	909428	Mullard C280 AE/P100K
C9	0.1	Polyester	250	10	909428	Mullard C280 AE/P100K
C10	0.1	Polyester	250	10	909428	Mullard C280 AE/P100K
C11	2.5	Electrolytic			908808	Mullard C426AS/E2-5
C12	0.1	Polyester	250	10	909428	Mullard C280 AE/P100K
C13	1200p	Polystyrene	30	2½	910645	Suflex HS7/B

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
		1 MHz AMP. OSC. & CAL. (continued)				
		Transformers and Inductors				
1 MHz Amplifier Board (BC.32858)						
L1		Coil Assembly			CT.32955/A	
		Transistors				
1 MHz Amplifier Board (BC.32858)						
VT1		p.n.p.			909414	Motorola 2N3323
VT2		p.n.p.			909414	Motorola 2N3323
VT3		p.n.p. (earlier versions only)			909414	Motorola 2N3323
VT3		p.n.p. (fitted in later versions)			915244	Amperex 2N1396
Calibrator Board (BC.41745)						
VT1		p.n.p.			909414	Motorola 2N3323
		Diodes				
1 MHz Amplifier Board (BC.32858)						
D1		Semi-conductor			900620	Mullard OA200
Calibrator Board (BC.41745)						
D1		Semi-conductor			900652	Mullard AAZ13
		Integrated Circuits				
Calibrator Board (BC.41745)						
1C1					915471	S.C.S.CμL 9958
		Plugs and Sockets				
PL1		(Plug shell			908388	Cannon DBM9W4P
		(Plug inserts (2)			907080	Cannon Dm53741-5001
		Crystals				
XL1		1 MHz crystal Style D			AD.45335/A	
		Crystal Holder			900397	X2/UG

NOTE: Crystal XL1 is not required in the RA.1218 except for emergency use.

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
			B.F.O. - Fig. 13			
600 kHz Oscillator Board (BC.30540)						
	ohms					
R1	220	Metal Oxide		5	900988	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/A		10	908246	Nutec RKL10
		Capacitors				
B.F.O. Assembly			volts			
2C1	0.1	Polyester	250	10	909847	Mullard C280AE/A100K
2C2	4-34p	Variable B.F.O. Tune			AD42761	
2C4	12p	Trimmer			905125	Mullard C004/E4
600 kHz Oscillator Board (BC.30540)						
C1	0.1	Polyester	250	10	909428	Mullard C280 AE/P100K
C2		Not used				
C3		Not used				
C4		Not used				
C5		Not used				
C6		Not used				
C7	390p	Polystyrene	30	2½	908243	Suflex HS7/A
C8	82p	Ceramic	750	2	902099	Erie N750B
C9	0.1	Polyester	250	20	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 (BC.30542)			volts			
C1	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C2*	180p	Polystyrene	30	2½	907884	Suflex HS7/A
C3	0.1	Polyester	250	10	909847	Mullard C280 AE/100K

*C2 is part of transformer assembly CT.35216/A

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
		B.F.O. (continued)				
		Transformer and Inductors				
600 kHz Oscillator Board						
L1		Oscillator Coil			CT.35217/A	
Amplifier Board						
T1		600 kHz Output Transformer			CT.35216/A	
		Switches				
SB		DET-B.F.O. Mode Switch			BSW.38585	
		Transistors				
600 kHz Oscillator Board						
VT1		n.p.n.			906433	S.T.C. BSY95A
Amplifier Board						
VT1		n.p.n.			906433	S.T.C. BSY95A

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer

1st I.F. AMPLIFIER UNIT
(BC.31474)

NOTE: This unit is a small module located adjacent to the crystal bandwidth filters (Fig. 18). The circuit is shown in Fig. 11.

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
		Resistors				
	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
R5	1k	Metal Oxide		5	908267	Electrosil TR4
R6	470	Metal Oxide		5	900992	Electrosil TR4
R7	10	Composition	0.1	10	902484	Erie 15
		Capacitors				
			volts			
C1	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
C2	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C3*	180p	Polystyrene	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

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
		Inductors				
L1		Coil Assembly			CT.31472/A	
		Transistor				
VT1		p.n.p.			909414	Motorola 2N3323

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer

MAIN I.F. MODULE - Fig. 12

Resistors

	ohms					
2R1	1k	Metal Oxide		5	908267	Electrosil TR4
2R2		Not Used				
2R3	120	Metal Oxide		5	908286	Electrosil TR4

NOTE: 2R1 and 2R3 are not mounted on a board.

H.T. Supply Filter (AC.30535)

R1	100	Metal Oxide		5	908276	Electrosil TR4

I.F. Amplifier Board (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	Electrosil TR4
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		10	908246	Nutec RKL10
R21	47	Metal Oxide		5	908298	Welwyn F25
R22	1k	Metal Oxide		5	908267	Electrosil TR4

Detector Board (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	3.3k	Metal Oxide		5	900991	Electrosil TR4
R5	56	Metal Oxide		5	908289	Electrosil TR4

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer

I.F. MODULE (continued)

Detector Board

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
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	6.8k	Metal Oxide		5	900987	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
R16	33	Composition	0.1	10	902490	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	15k	Metal Oxide		5	908280	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 (BC.31466/B)

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
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	910488	Nutec RKL10
R5	22	Composition	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	Composition	0.1	10	902487	Erie 15

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer

I.F. MODULE (continued)

A.G.C. Board

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	Composition	0.1	10	902543	Erie 15
R19	1k	Metal Oxide		5	908267	Electrosil TR4
R20	2.2k	Metal Oxide		5	908270	Electrosil TR4
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
R25	470	Metal Oxide		5	900992	Electrosil TR4

Converter Amplifier Board (BC.34783/VAR) (Top Board)

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	100	Metal Oxide		5	908276	Electrosil TR4

*R10 is fitted only to the 100 kHz board BC.34783/B.

Converter Oscillator Board (BC.38568/VAR) (Bottom Board)

NOTE: Except for R12, Resistor details are identical in the 100 kHz (B) and 455 kHz (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
		I.F. MODULE (continued)				
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	Electrosil TR4
R12	39k	Metal Oxide		5	908292	Electrosil TR4
R12	82k	Metal Oxide		5	908691	Electrosil TR4
NOTE:	R12 is 39k (100 kHz) or 82k (455 kHz0					
AGC Board						
RV1	2.2M				908365	Plessey Type MP
Module		Capacitors	volts			
2C1	0.22	Ceramic	50	-20+50	908338	T.C.C. CML10
2C2	0.22	Ceramic	50	-20+50	908338	T.C.C. CML10
2C3	0.22	Ceramic	50	-20+50	908338	T.C.C. CML10
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
I.F. Amplifier Board (BC.30533)						
C1	0.1	Polyester	250	10	909847	Mullard C280 AE/A100K
C2	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C3	10	Electrolytic	16	-10+50	900068	Mullard C426 AR/E10
C4	180p	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
C8	180p	Polystyrene	30	2½	907884	Suflex HS7/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 HS7/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 HS7/A

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer

I.F. MODULE (continued)

Detector Board (CC.28236)

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
C1	180p	Polystyrene	30	2½	907884	Suflex HS7/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 HS7/A
C5	10	Electrolytic	16	-10+50	900068	Mullard C426 AR/E10
C6	120p	Polystyrene	30	2½	908332	Suflex HS7/A
C7	10	Electrolytic	16	-10+50	900068	Mullard C426 AR/E10
C8	120p	Polystyrene	30	2½	908332	Suflex HS7/A
C9	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C10	.01	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 HS7/A
C13	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C14	180p	Polystyrene	30	2½	907884	Suflex HS7/A
C15	0.1	Ceramic	30	-25+50	906675	Erie 811T/30
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	-20+80	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	2½	908324	Suflex HS7/A
C26	10p	Polystyrene	30	2½	908324	Suflex HS7/A
C27	270p	Polystyrene	125	2	908426	Suflex HS7/160V

AGC Board (BC. 31466/B

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
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	30	2½	908242	Suflex HS7/A
C5	.047	Polyester	250	20	909227	Mullard AE/P47K
C6	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C7	33p	Polystyrene	30	1p	906497	Suflex HS7/A
C8	.047	Polyester	250	20	909227	Mullard C280 AE/P47K
C9	180p	Polystyrene	30	2½	907884	Suflex HS7/A
C10	390p	Polystyrene	30	2½	908243	Suflex HS7/A

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
		I.F. MODULE (continued)				
Converter Oscillator Board						
VT1		p.n.p.			909414	Motorola 2N3323
VT2		n.p.n.			906433	S.T.C. BSY95A
		Diodes				
Main I.F. Amplifier						
D1					908343	Texas 1S920
Detector Board						
D1					908343	Texas 1S920
D2					908343	Texas 1S920
D3		Not Used			(900652	Mullard AAZ13 or
D4					(908349	Hughes HD1871
D5		Zener			908344	International MZ13T5
D6					908343	Texas 1S920
D7					908343	Texas 1S920
AGC Board						
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						
SKT4		Coax. Fixed I.F. Input			906878	Belling Lee L1403/CS/Ag
PL3		Plug, free, to mate with SKT4			908370	Belling Lee L1403/RFP/Ag
PL1		Main 37-way connector (fixed)			908674	Cannon DCF37P
1SKT1		Free 37-way connector			908603	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
		Crystals				
Detector Board						
XL1	1601.50 kHz				AD.45335/B	
XL2	1598.50 kHz				AD.45335/C	
Converter Oscillator Board (8)						These crystals are not fitted in the RA.1218 receiver.
XL1	1145 kHz in 455 kHz Converter				AD.45335/E	
XL1	1700 kHz in 100 kHz Converter				AD.45335/D	
Terminal Strip						
TB1		5-way - rear panel			909928	Carr. Fastener 44-79-593-5M
Ferrite Beads						
FX1 to FX3		On detector board outputs			907488	Mullard FX1242

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part	Manufacturer

10 mW AUDIO AMPLIFIER

(BC.31462)

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part	Manufacturer
	ohms	Resistors				
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
		Capacitors				
C1	80	Electrolytic	16	-10+50	908810	Mullard C426 AR/E80
C2	.022	Polyester	250	20	900982	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	Ceramic	350	20	902122	Lemco 310K
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
		Transformers				
T1		Transformer assembly			CT.31476/A	
T2		Transformer assembly			CT.31478/A	
T3		Transformer assembly			CT.31477/A	

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer

10 mW AUDIO AMPLIFIER (continued)

(BC.31462)

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
		Transistors				
VT1		p-n-p			911928	Mullard BCY 71
VT2		n-p-n			909017	Texas 2N929
VT3		n-p-n			909017	Texas 2N929
VT4		n-p-n			909017	Texas 2N929

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer

1-WATT AUDIO AMPLIFIER BOARD

(BC.39442)

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
	ohms	Resistors	watts			
R1	4.7k	Composition	0.1	10	902516	Erie 15
R2	1.5k	Composition	0.1	10	902510	Erie 15
R3	12k	Composition	0.1	10	902521	Erie 15
R4	1k	Composition	0.1	10	902508	Erie 15
R5	390	Composition	0.1	10	902503	Erie 15
R6	1k	Composition	0.1	10	902508	Erie 15
R7	1	Wirewound	1.5	10	911767	Welwyn W21
R8	1	Wirewound	1.5	10	911767	Welwyn W21
R9	15	Composition	0.1	10	902486	Erie 15
R10	33k	Composition	0.1	10	902526	Erie 15
R11	3.9k	Composition	0.1	10	902515	Erie 15
R12	120	Composition	0.1	10	902497	Erie 15
R13	3.3k	Composition	0.1	10	902514	Erie 15
R14	22k	Composition	0.1	10	902524	Erie 15
R15	100	Composition	0.1	10	902496	Erie 15
R16	390	Composition	0.1	10	902503	Erie 15
R17	1k	Composition	0.1	10	902508	Erie 15
R18	470	Composition	0.1	10	902504	Erie 15
R19	10	Composition	0.25	10	902411	Erie 16
		Potentiometers				
RV1	200k				914155	Beckman Helitrim 62P200K
RV2	2k				914154	Beckman Helitrim 62P2K
		Capacitors	volts			
C1	32	Electrolytic	10	-10+50	911764	Mullard C426AR/D32
C2	1	Electrolytic	40	-10+100	910952	Mullard C426AS/G1
C3	10p	Polystyrene	125	1pF	906840	Salford PF
C4	80	Electrolytic	16	-10+50	908810	Mullard C426AR/E80
C5	0.1	Polyester	250	20	909428	Mullard C280AE/P100K
C6	1	Tantalum	25	20	912994	S.T.C. TAG 1.0/25
C7	470p	Polystyrene	125	5	905362	Salford PF
C8	10	Tantalum	15	20	911763	S.T.C. TAG 10/15

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer

1-WATT AUDIO AMPLIFIER BOARD (continued)

(BC.39442)

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
		Transistors				
VT1		n-p-n			911929	Mullard BC107
VT2		n-p-n			911929	Mullard BC107
VT3		p-n-p			911928	Mullard BCY71
VT4		n-p-n			908753	Mullard BFY51
VT5		n-p-n			908753	Mullard BFY51
VT6, VT7, VT8		n-p-n			909927	Texas 2N3711
		Diodes				
D1 and D2		Semi-conductor			906001	Texas 1S130

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer

POWER UNIT TYPE PU.1155

Main Component Board Assembly BA.39730
5 Volt Component Board Assembly BA.39726

Components

NOTE: Components pre-fixed '1' are located on the chassis assembly. Those without prefix are on the component boards.

Resistors

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
Main Assembly			watts			
1R1	1M	Metal Oxide		5	911692	Electrosil TR5
1R2	3.3	Wirewound	3	5	903713	Welwyn V1
1R3	68	Wirewound	3	5	903739	Welwyn V1
1R4	68	Wirewound	1.5	5	903662	Painton MV1A
Main Component Board						
R1	2.2k	Wirewound	2.5	5	913634	Painton MV1A
R2	2.2k	Wirewound	2.5	5	913634	Painton MV1A
R3	1k	Metal Oxide		5	906031	Electrosil TR5
R4	390	Metal Oxide		5	908144	Electrosil TR5
R5	390	Metal Oxide		5	908144	Electrosil TR5
R6	1.8k	Metal Oxide		5	906026	Electrosil TR5
R7	2.2k	Metal Oxide		5	906020	Electrosil TR5
R8	2.7k	Metal Oxide		5	906347	Electrosil TR5
R9	2.7k	Metal Oxide		5	906347	Electrosil TR5
R10	1.2k	Metal Oxide		5	906346	Electrosil TR5
R11	560k	Metal Oxide		5	913953	Electrosil TR5
5 Volt Component Board						
R1	560	Metal Oxide		5	907496	Electrosil TR5
R2	1k	Metal Oxide		5	906031	Electrosil TR5
R3	560	Metal Oxide		5	907496	Electrosil TR5
R4	1.2k	Metal Oxide		5	906346	Electrosil TR5
R5	820	Metal Oxide		5	906024	Electrosil TR5
R6	390	Metal Oxide		5	908144	Electrosil TR5
R7	390	Metal Oxide		5	908144	Electrosil TR5
R8	390	Metal Oxide		5	908144	Electrosil TR5
R9	180	Metal Oxide		5	905114	Electrosil TR5
R10	1.2k	Metal Oxide		5	906346	Electrosil TR5

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
		POWER UNIT TYPE PU.1155 (continued)				
		Potentiometers				
Main Component Board						
RV1	1k				911693	Colvern CLR 058
5 Volt Component Board						
RV1	100				911723	Colvern CLR 058
Main Assembly		**Capacitors**	volts			
1C1	.02	Paper	350	20	902279	TCC CP33N
1C2	.02	Paper	350	20	902279	TCC CP33N
1C3	10000	Electrolytic	16	-10+50	911745	Mullard C431 BR/E10000
1C4	500	Electrolytic	40	-10+50	911744	Mullard C431 BR/G500
1C5	500	Electrolytic	64	-10+50	906759	Mullard C431 BR/H500
Main Component Board						
C1	16	Electrolytic	450		901271	Hunts JFQ 554AT
C2	8	Electrolytic	350	-20+50	907281	Dubilier S-BR3514
C3	100	Electrolytic	6.4	-10+50	911691	Mullard C426AR/C100
C4	100	Electrolytic	6.4	-10+50	911691	Mullard C426AR/C100
C5	0.1	Polyester	250	20	909428	Mullard C280AE/P100K
C6	400	Electrolytic	25	-10+50	911742	Mullard C437AR/F400
5-Volt Component Board						
C1	64	Electrolytic	10	-10+50	911814	Mullard C426AR/D64
C2	64	Electrolytic	10	-10+50	911814	Mullard C426AR/D64
C3	0.1	Polyester	250	20	909428	Mullard C280AE/P100K
C4	640	Electrolytic	10	-10+50	911743	Mullard C437AR/D640
		Transformer				
1T1		Power Transformer			CT.39693	
		Transistors				
Main Assembly						
1VT1		n-p-n			911950	Texas 2S035
1VT2		n-p-n			911951	RCA 2N3054
1VT3		n-p-n			906371	Mullard 2N3055
1VT4		n-p-n			906371	Mullard 2N3055

Cct. Ref.	Value	Descriptio	Rat.	Tol. %	Rocal Part No.	Manufacturer

POWER UNIT TYPE PU.1155 (continued)

Transistors (contd.)

Main Component Board						
VT1		p-n-p			911565	Mullard BCY40
VT2		p-n-p			911565	Mullard BCY40
5-Volt Component Board						
VT1		n-p-n			908753	Mullard BFY51
VT2		n-p-n			908753	Mullard BFY51

Diodes

Main Assembly						
1D1		Encapsulated rectifier unit			911730	Motorola MDA.952/2
1D2		Zener: 18V ± 5%			911123	Mullard OAZ234
1D3		Zener: 75V ± 5%			911726	S.T.C. Z5D 750CF
1D4		Zener: 62V ± 5%			911788	S.T.C. Z5D 620CF
1D5		Zener: 62V ± 5%			911788	S.T.C. Z5D 620CF
1D6		Zener: 5.6V ± 5%			908744	Mullard OAZ 222
Main Component Board						
D1		Encapsulated rectifier unit			911732	Semtech SB6
D2		Encapsulated rectifier unit			911787	Motorola MDA 920A/3
D3		Encapsulated rectifier unit			911787	Motorola MDA 920A/3
D4		Zener: 4.7V ± 5%			910236	S.T.C. Z2A47 BF
D5		Zener: 8.2V ± 5%			900670	S.T.C. Z2A82 BF
D6		Zener: 4.7V ± 5%			909717	Mullard OAZ 240
D7		Zener: 6.8V ± 5%			907223	Mullard OAZ 244
5-Volt Component Board						
D1		Semi-conductor diode			911952	Int. Rect. 5D4
D2		Zener: 6.8V ± 5%			907223	Mullard OAZ 244
D3		Zener: 3.3V ± 5%			911811	Hughes HS 2033

Fuselinks

1FS1	2 amp				901959	Belling Lee L754/2
1FS2	2.5 amp				900943	Belling Lee L562
1FS3	150 mA				914055	Belling Lee L562
1FS4	1 amp				900916	Belling Lee L562
1FS5	1 amp				900916	Belling Lee L562
Fuseholders for 1FS1 to 1FS5					900412	Belling Lee L575

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
		POWER UNIT TYPE PU.1155 (continued)				
		Switches				
1SA		Voltage Selector Switch			912063	E.M.I. S5
		Connectors				
PL1		Power plug (fixed)			900011	Plessey Mk4 CZ 63953/4
Socket (free) for power connection to PL1					905151	Plessey 2CZ 83283/5
Accessory set for free socket					905154	Plessey 508/1/03008/205
SKT1		Socket, fixed: 25-way			911738	Cannon DBMF25S

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer

COUNTER AND DISPLAY UNIT

GENERAL ASSEMBLY ITEMS

Counter and Display Unit: complete assembly MDA.75209.

Boards and Sub-Assemblies

1.	Buffer Amplifier Board Assy. Type RBA/1219	MBA.75394
2.	Frequency Generator Board Assy. Type RFG	MCA.75220
3.	MHz Display Board Assy. Type RMH	MCA.75202
4.	MHz Display Assy.	MCA.75255
5.	Totalizer Board Assy. Type RTT/1	MCA.75224
6.	KHz Display Assy.	MCA.75250
7.	Crystal Filter Board Assy. Type RXF	MBA.75395
8.	Power Input Filter Assy.	MBA.75396C
9.	1.7 MHz Filter Board Assy.	BA.41388

General Assembly Components (Refer to Fig. 26)

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
R1	82	Composition	1/10W	10	902495	Erie 15
D1		Zener diode			912615	Mullard BZY93-C6V8R
PL19		Plug Moulding			912611	BICC-Burndy Type MS34PM-B118
PL21		(Plug: 15 way			908598	Cannon DAM 15P
		(Shell: plastic rt. angle			912760	Cannon DA5121-1
SKT1		Connector 23 contacts			913535	Varicon 7008-23-163-001
SKT2		Connector 23 contacts			913535	Varicon 7008-23-163-001
SKT3		Connector 17 contacts			913534	Varicon 7008-17-163-001
SKT6		Connector rt. angle				Sealectro 50-011-0000
SKT7		Connector rt. angle				Sealectro 50-011-0000

Buffer Amplifier Board RBA/1219

The buffer amplifier unit RBA/1219 is a sealed thick film unit and therefore no component information is given. The band is connected via the contact assembly Racal Part Number MAA.75405.

NOTE: Earlier versions of the RA.1218 used a conventional printed circuit board type MBA.75231.

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer

COUNTER AND DISPLAY UNIT (continued)

Frequency Generator Board RFG (Fig. 23)

		Resistors	watts			
R1	3.3k	Metal Oxide	1/4	5	900991	Electrosil TR4
R2	470	Composition	1/10	10	902504	Erie 15
R3	2.2k	Metal Oxide	1/4	5	908270	Electrosil TR4
R4	33	Composition	1/10	10	902490	Erie 15
R5	2.2k	Metal Oxide	1/4	5	908270	Electrosil TR4
R6	12k	Metal Oxide	1/4	5	908274	Electrosil TR4
R7	3.3k	Composition	1/10	10	902514	Erie 15
R8	33	Composition	1/10	10	902490	Erie 15
R9	51	Metal Oxide	1/4	5	912757	Electrosil TR4
R10	3.3k	Composition	1/10	10	902514	Erie 15
R11	1.8k	Composition	1/10	10	902511	Erie 15
R12	470	Composition	1/10	10	902504	Erie 15
R13	47	Metal Oxide	1/4	5	911930	Electrosil TR4
R14	180	Composition	1/10	10	902499	Erie 15
R15	3.3k	Composition	1/10	10	902514	Erie 15
R16	1.8k	Composition	1/10	10	902511	Erie 15
R17	33	Composition	1/10	10	902490	Erie 15
R18	470	Composition	1/10	10	902504	Erie 15
R19	47	Metal Oxide	1/4	5	911930	Electrosil TR4;
R20	180	Composition	1/10	10	902499	Erie 15
R21	4.7k	Composition	1/10	10	902516	Erie 15
R22	390	Composition	1/10	10	902503	Erie 15
R23	1k	Metal Oxide	1/4	5	908267	Electrosil TR4

NOTE: R23 not fitted on earlier versions.

		Capacitors	volts			
C1	4.7	Electrolytic	10	20	912643	Kemet K4R7J10S
C2	.047	Polyester	160	20	900602	Wima Tropyfol M
C3	100p	Polystyrene	160	5	912661	Salford RPF
C4	.047	Polyester	160	20	900602	Wima Tropyfol M
C5	39p	Polystyrene	160	2	912658	Salford RPF
C6	75p	Polystyrene	160	2	912660	Salford RPF
C7	39p	Polystyrene	160	2	912658	Salford RPF
C8	330p	Polystyrene	160	20	912663	Salford RPF
C9	4.7	Electrolytic	10	20	912643	Kemet K4R7J10S
C10	.047	Polyester	160	20	900602	Wima Tropyfol M

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
		COUNTER AND DISPLAY UNIT (continued)				
		Capacitors (contd.)	volts			
C11	.047	Polyester	160	20	900602	Wima Tropyfol M
C12	.047	Polyester	160	20	900602	Wima Tropyfol M
C13	4.7	Electrolytic	10	20	912643	Kemet K4R7J10S
C14	.047	Polyester	160	20	900602	Wima Tropyfol M
C15	.047	Polyester	160	20	900602	Wima Tropyfol M
C16	.047	Polyester	160	20	900602	Wima Tropyfol M
C17	4.7	Electrolytic	10	20	912643	Kemet K4R7J10S
		Miscellaneous				
RV1	5k				912659	Morganite 81E
T1		Vinkor transformer assembly			MCT.75321	
PL3		Connector: fixed 17 way			912665	Varicon 7022-017-000-001
VT1 to) VT6)		n-p-n			906842	Texas 2N2369
XL1 and XL2		Crystal 1699.85 kHz			CD.34093	
FX1 and FX2		Ferrite Bead assembly			MAA.75244/1	
MHz Display Board RMH (Fig. 24)						
		Resistors	watts			
R1	3.9k	Composition	1/10	10	902515	Erie 15
R2	1k	Composition	1/10	10	902508	Erie 15
R3	3.9k	Composition	1/10	10	902515	Erie 15
R4	1k	Composition	1/10	10	902508	Erie 15
R5	3.9k	Composition	1/10	10	902515	Erie 15
R6	1k	Composition	1/10	10	902508	Erie 15
R7	3.9k	Composition	1/10	10	902515	Erie 15
R8	1k	Composition	1/10	10	902508	Erie 15
R9	3.9k	Composition	1/10	10	902515	Erie 15
R10	1k	Composition	1/10	10	902508	Erie 15
R11	3.9k	Composition	1/10	10	902515	Erie 15
R12	1k	Composition	1/10	10	902508	Erie 15
R13	3.9k	Composition	1/10	10	902515	Erie 15
R14	1k	Composition	1/10	10	902508	Erie 15
R15	3.9k	Composition	1/10	10	902515	Erie 15

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
		COUNTER AND DISPLAY UNIT (continued)				
		Resistors (contd.)	watts			
R16	1k	Composition	1/10	10	902508	Erie 15
R17	3.9k	Composition	1/10	10	902515	Erie 15
R18	1k	Composition	1/10	10	902508	Erie 15
R19	3.9k	Composition	1/10	10	902515	Erie 15
R20	1k	Composition	1/10	10	902508	Erie 15
R21	3.9k	Composition	1/10	10	902515	Erie 15
R22	1k	Composition	1/10	10	902508	Erie 15
R23	3.9k	Composition	1/10	10	902515	Erie 15
R24	1k	Composition	1/10	10	902508	Erie 15
R25	3.9k	Composition	1/10	10	902515	Erie 15
R26	1k	Composition	1/10	10	902508	Erie 15
R27	22k	Metal Oxide	1/4	5	908269	Electrosil TR4
R28	22k	Metal Oxide	1/4	5	908269	Electrosil TR4
R29	82k	Metal Oxide	1/4	5	908691	Electrosil TR4
R30	2.2k	Composition	1/10	10	902512	Erie 15
R31	2.2k	Composition	1/10	10	902512	Erie 15
R32	4.7k	Composition	1/10	10	902516	Erie 15
R33	4.7k	Composition	1/10	10	902516	Erie 15
		Capacitors	volts			
C1	4.7	Electrolytic	10	20	912643	Kemet K4R7J10S
C2	.047	Polyester	160	20	900602	Wima Tropyfol M
		Miscellaneous				
VT1 to) VT15)		Transistor n-p-n			912647	Fairchild C407
LG1		Integrated Circuit			912648	Texas SN 7474N
LG2		Integrated Circuit			912648	Texas SN 7474N
LG3		Integrated Circuit			912650	Texas SN 7400N
FX1		Ferrite Bead Assembly			MAA.75244/2	
PL2		Connector 23 way			912652	Varicon 7022-023-000-001
MHz Display Assembly (Fig. 24)						
V1		Numerical Indicator Tube			914276	Mullard ZM 1102
V2		Numerical Indicator Tube			914276	Mullard ZM 1102
ILP1		Neon Overspill Lamp 220/250			912682	Thorn L1166
ILP2		Neon Overspill Lamp 220/250			912682	Thorn L1166

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer

COUNTER AND DISPLAY UNIT (continued)

Totalizer Board RTT (Fig. 25)

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
		Resistors	watts			
R1		Not Used				
R2	22k	Metal Oxide	1/4	5	908269	Electrosil TR4
R3	33	Composition	1/10	10	902490	Erie 15
R4	68	Composition	1/10	10	902494	Erie 15
R5	1k	Composition	1/10	10	902508	Erie 15
R6	1k	Composition	1/10	10	902508	Erie 15
R7	22k	Metal Oxide	1/4	5	908269	Electrosil TR4
R8	22k	Metal Oxide	1/4	5	908269	Electrosil TR4
R9	51	Metal Oxide	1/4	5	912757	Electrosil TR4
R10	4.7k	Composition	1/10	10	902516	Erie 15
R11	390	Composition	1/10	10	902503	Erie 15
R12	22k	Metal Oxide	1/4	5	908269	Electrosil TR4
R13	22k	Metal Oxide	1/4	5	908269	Electrosil TR4
R14	22k	Metal Oxide	1/4	5	908269	Electrosil TR4
R15	1k	Composition	1/10	10	902508	Erie 15
R16	100	Composition	1/10	10	902496	Erie 15
R17	1k	Composition	1/10	10	902508	Erie 15
R18	4.7k	Composition	1/10	10	902516	Erie 15
R19	4.7k	Composition	1/10	10	902516	Erie 15
		Capacitors	volts			
C1	4.7	Electrolytic	10	20	905388	Kemet K4R7J10S
C2	.047	Polyester	160	20	900602	Wima Tropyfol M
C3	.047	Polyester	160	20	900602	Wima Tropyfol M
C4	4.7	Electrolytic	10	20	905388	Kemet K4R7J10S
C5	1200p	Polystyrene	160	2	912669	Salford RPF
C6	.047	Polyester	160	20	900602	Wima Tropyfol M
C7	100p	Polystyrene	160	5	912661	Salford RPF
C8	.047	Polyester	160	20	900602	Wima Tropyfol M
C9	.047	Polyester	160	20	900602	Wima Tropyfol M
C10	4.7	Electrolytic	10	20	905388	Kemet K4R7J10S
C11	1000p	Polystyrene	160	5	912666	Salford RPF
C12	.047	Polyester	160	20	900602	Wima Tropyfol M
C13	.01	Polyester	400	20	900747	Wima Tropyfol M
C14	1000p	Ceramicon	500	20	915243	Erie 831/2600
		Diodes				
D11 to D60					900651	Texas IN914

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer

COUNTER AND DISPLAY UNIT (continued)

Integrated Circuits

LG1 to LG4 and LG15 are not used. Four types of integrated circuit are used:-

1.	Dual-in-line Quad 2-input NAND gate	912650	Texas SN 7400N
2.	Dual-in-line Type D Flip-Flop	912648	Texas SN 7474N
3.	Dual-in-line BCD Decoder/Driver	916931	Transitron SN 7441 AP
4.	Dual-in-line Decade Counter	912071	Texas SN 7490N

In type form the list is as follows:-

1. LG5, LG24, LG31, LG32, LG37
2. LG6, LG9, LG16, LG19, LG20, LG23, LG26, LG29, LG30, LG33, LG34, LG36, LG38
3. LG7, LG17, LG21, LG27, LG35
4. LG8, LG10, LG11, LG12, LG13, LG14, LG18, LG22, LG25, LG28

Miscellaneous

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
VT1 to) VT4)		Transistor n-p-n			906842	Texas 2N2369
T1		Vinkor Coil Assembly			MBT.75320	
PL1		Connector: fixed 23 way			912652	Varicon 7022-023-000-001
FX1 to FX3		Ferrite Board Assembly			MAA.75244/1	

KHz Display Assembly (Fig. 25)

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
V2 to V6		Numerical Indicator Tube			914454	Mullard ZM 1102
SA		Switch: 10 Hz Readout			912681	Highlands Electronic Ltd. Ultra Miniature 39-1-NO

Crystal Filter RXF (Fig. 22)

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
R1	3.9k	Metal Oxide	$\frac{1}{4}$W	5	900990	Electrosil TR4
C1	33p	Polystyrene	160V	2	912607	Salford RPF
C2	15p	Polystyrene	160V	2	912608	Salford RPF
XL1		Crystal 999.875 kHz			MCD.75315	
T1		Transformer Assembly			MBT.75319	
PL6		Connector				Conhex 50-053-0000
PL7		Connector				Conhex 50-053-0000

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer

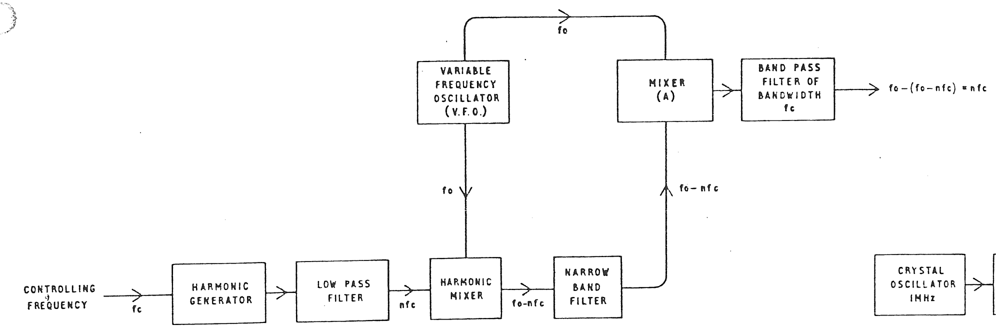
COUNTER AND DISPLAY UNIT (continued)

Power Input Filter (Fig. 22)

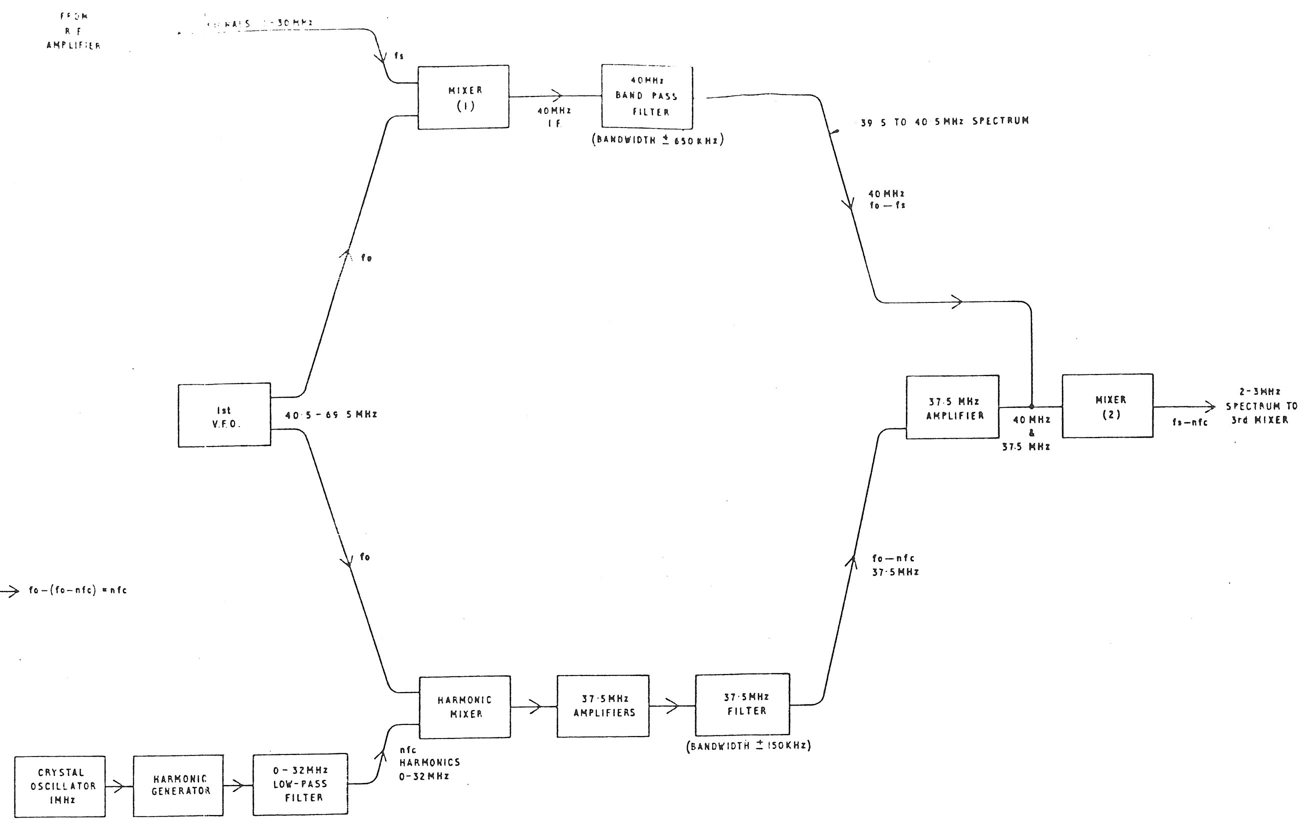
Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
R1	150k	Composition	1/10W	10	902534	Erie 15
C2	0.1	Polycarbonate	100V	20	914173	S.T.C. PMF Type M100
C3	.01	Polyester	400V	20	900747	Wima Tropyfol M
C7	4.7	Electrolytic	10V	20	912643	Kemet K4R7J10S
L1		Coil Assembly			MCT.75409	
FX1		Ferrite Bead Assembly			MAA.75244/2	
D1		Diode: Zener	56V		914167	Motorola IN 5263B

1.7 MHz Filter Board Assembly

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
C1	82p	Polystyrene	30V	2½	908322	Suflex HS7/A
C2	560p	Polystyrene	30V	2½	908452	Suflex HS7/A
C3	10p	Polystyrene	30V	2½	908324	Suflex HS7/A
C4	390p	Polystyrene	30V	2½	908243	Suflex HS7/A
C5	270p	Polystyrene	30V	2½	913452	Suflex HS7/A
L1, L2		Coil Assemblies			BT.41097	

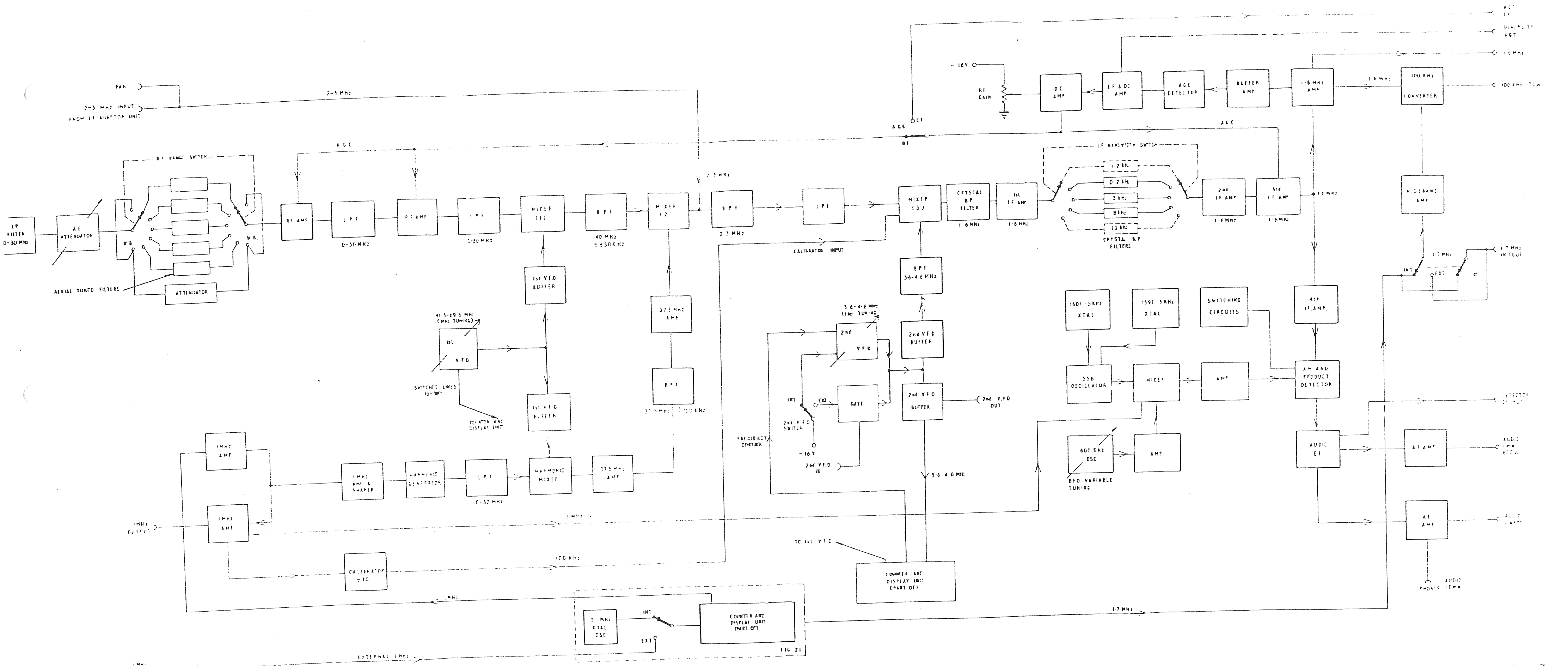


Wadley System – Block Diagram Fig. I



Electronic Band Selection – Explanatory Block Diagram Fig. 2

280/2



Block Diagram: RA.1218

Fig 3

280/3

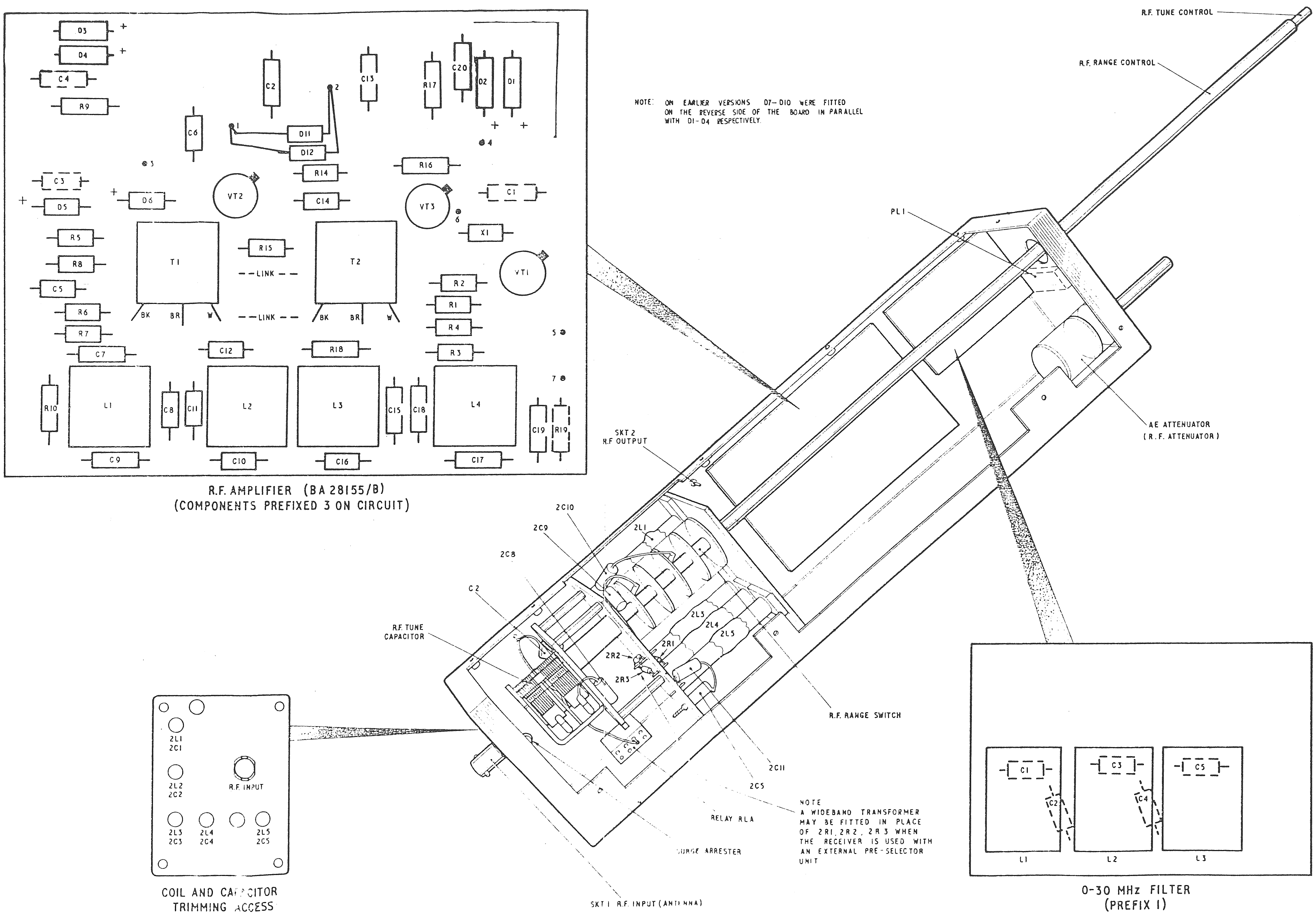
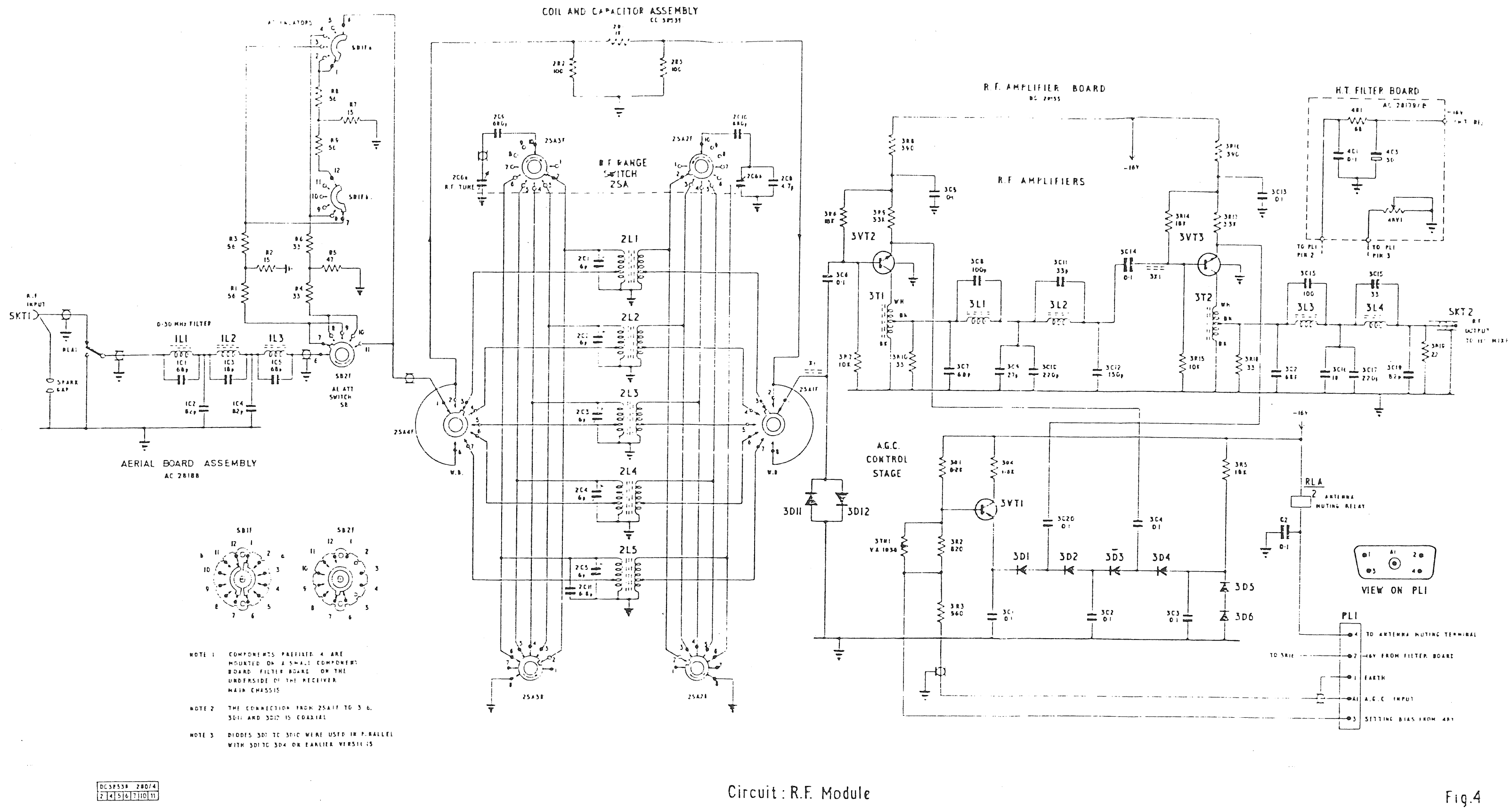


Fig. L-4

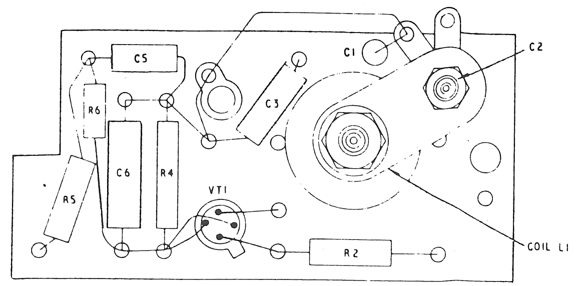
Component Layout : R.F. Module.

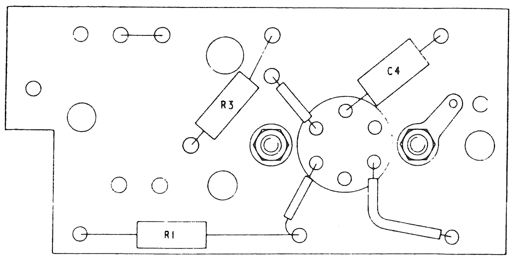
280/L-4



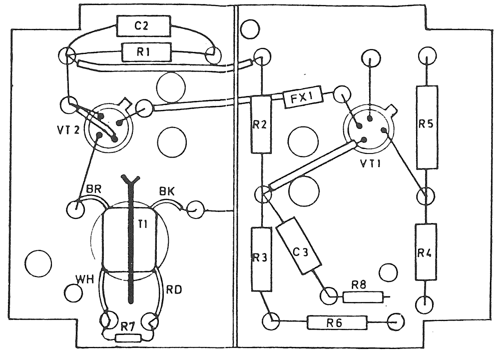
Circuit : R.F. Module

Fig.4

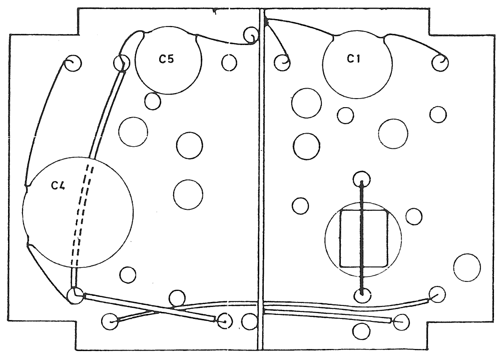




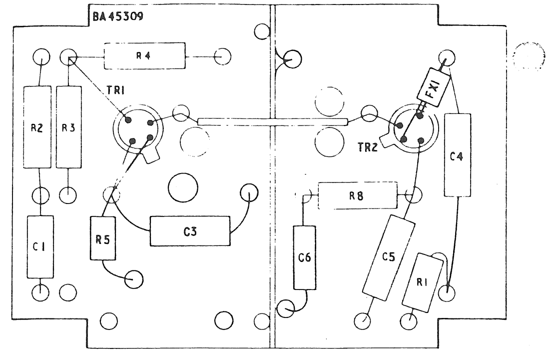
OSCILLATOR
(BA 35195)



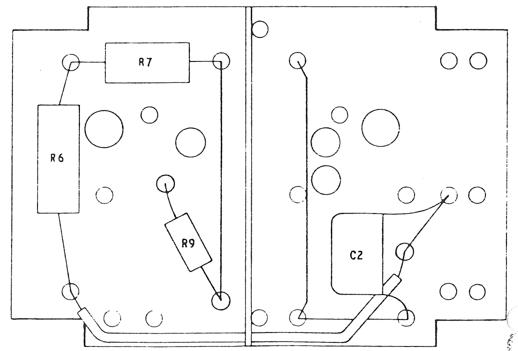
NOTE: THIS BOARD IS CONTAINED IN THE RECTANGULAR BOX



BUFFER AMPLIFIER
(BA 32535/C)



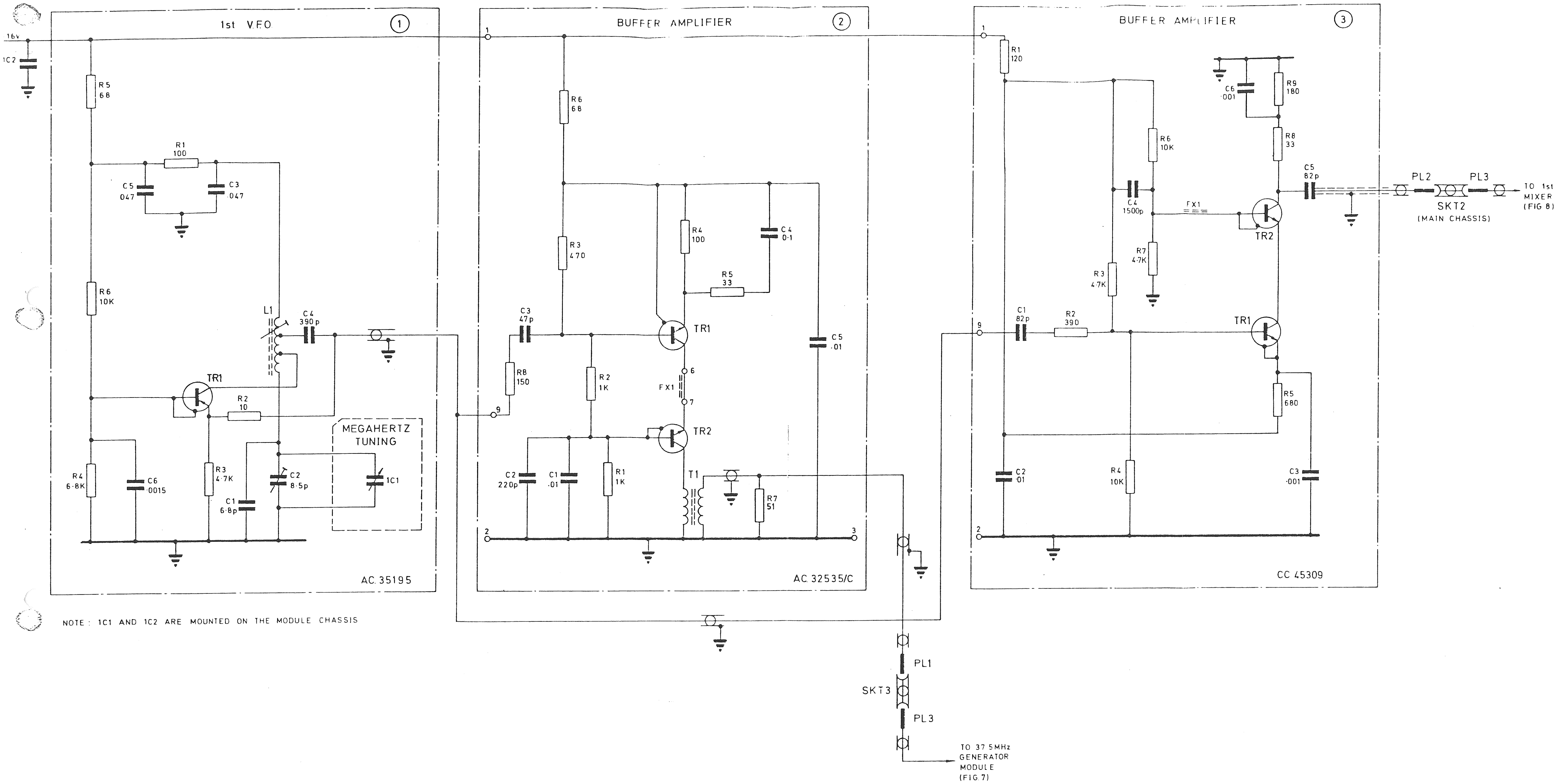
NOTE THIS BOARD IS ATTACHED TO THE UNDERSIDE OF THE 1st VFO CHASSIS



BUFFER AMPLIFIER
(BA 45309)

Fig. L-5

Component Layouts 1st. V.F.O.

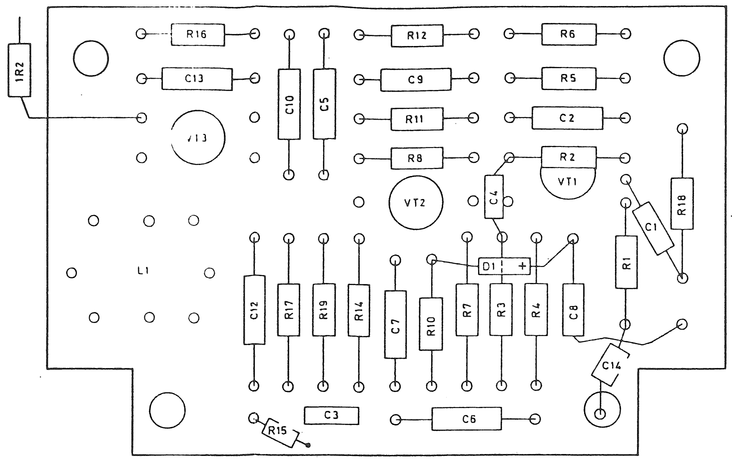


NOTE: 1C1 AND 1C2 ARE MOUNTED ON THE MODULE CHASSIS

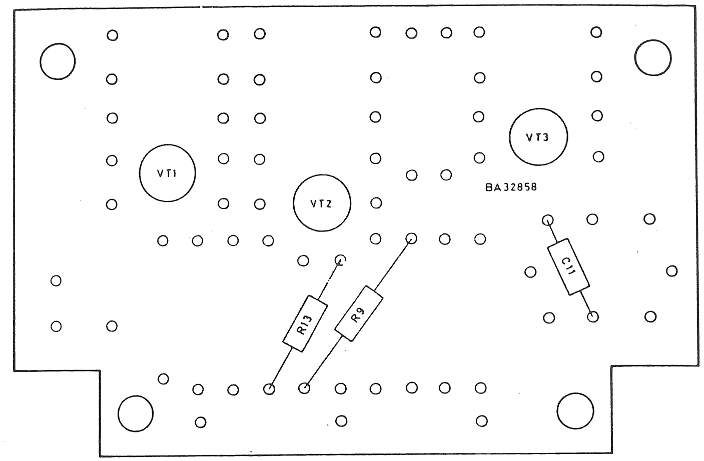
28615 BC 28120/C
1 2 3 4

Circuit : 1st. V.F.O.

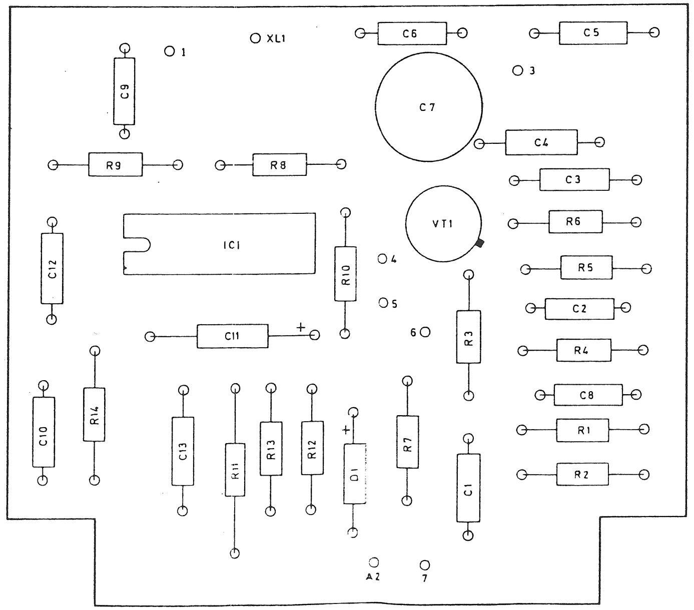
Fig. 5



(REAR OF BOARD)
1 MHz AMPLIFIERS
(BA32858)



(FRONT OF BOARD)
1 MHz AMPLIFIERS
(BA32858)



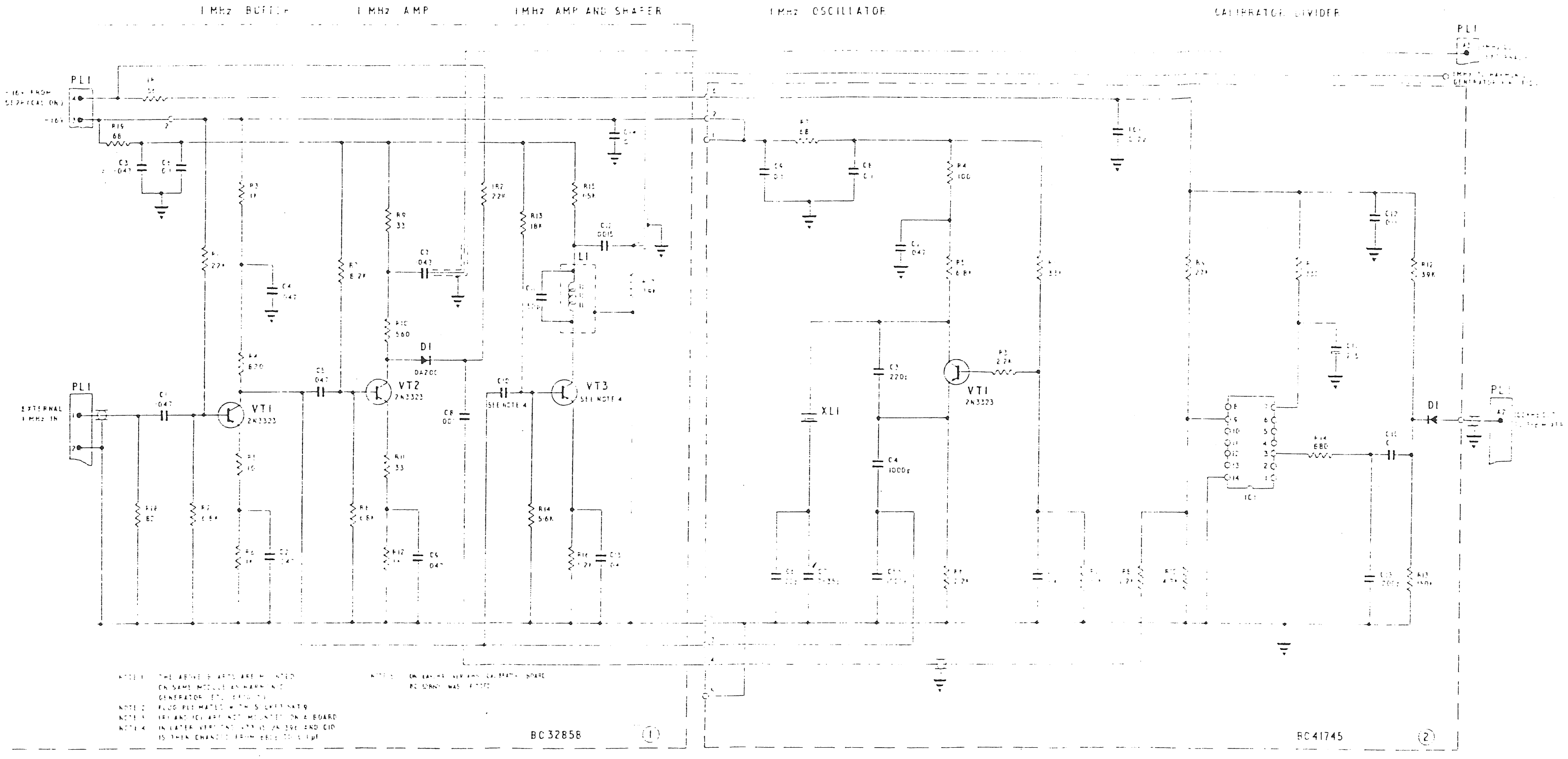
1MHz OSCILLATOR AND CALIBRATOR
(BA41745)

NOTE. 1. IN THE RA.1218 AND RA.1219 RECEIVERS THE OSCILLATOR SECTION IS NOT USED AND THE CRYSTAL XL1 IS REMOVED

NOTE. 2. ON EARLIER VERSIONS CALIBRATOR BOARD BA32860 WAS FITTED

Fig. L-6

Layout : 1MHz Amplifier Oscillator and Calibrator



Circuit : 1MHz Amplifiers,Oscillator and Calibrator

Fig.6

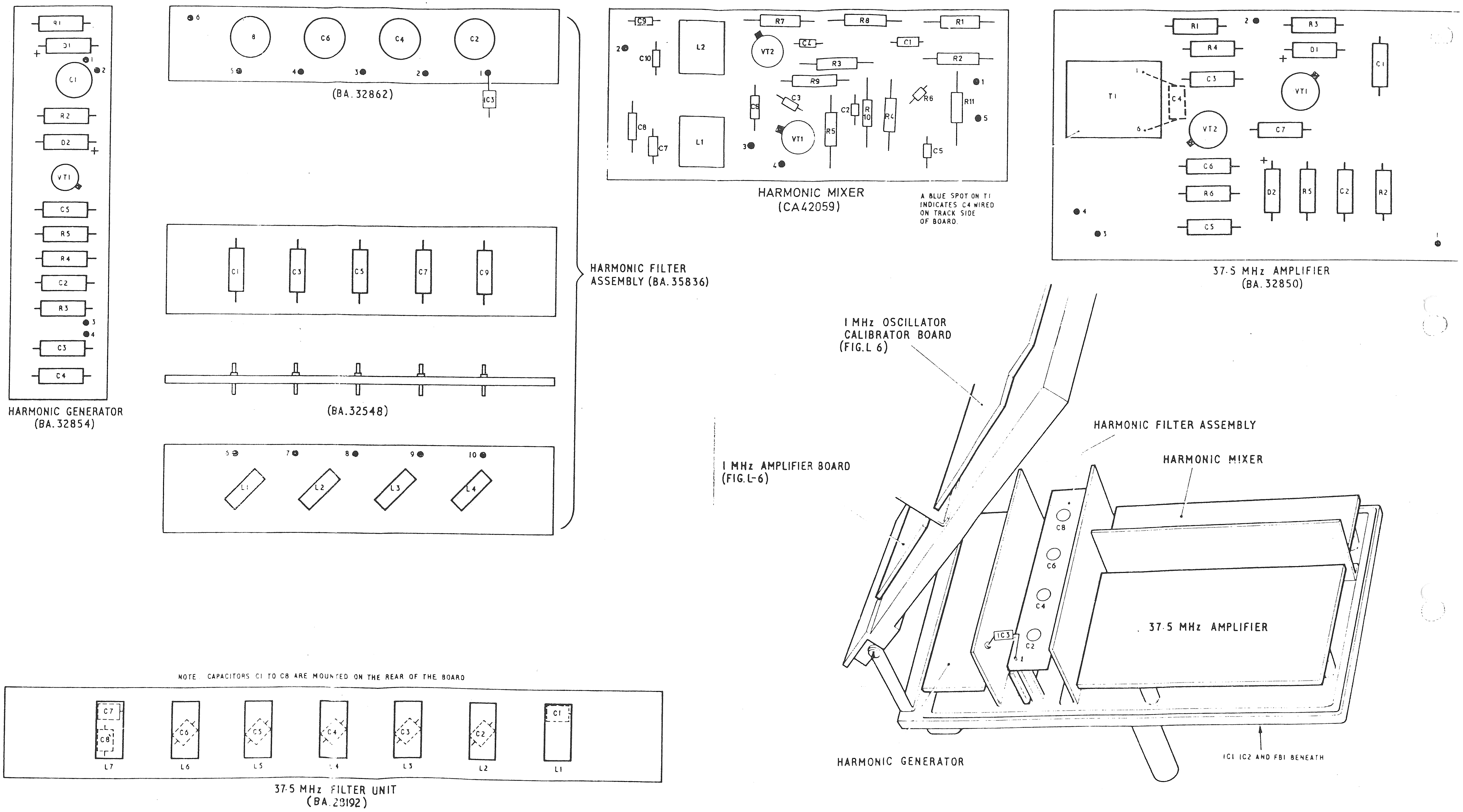
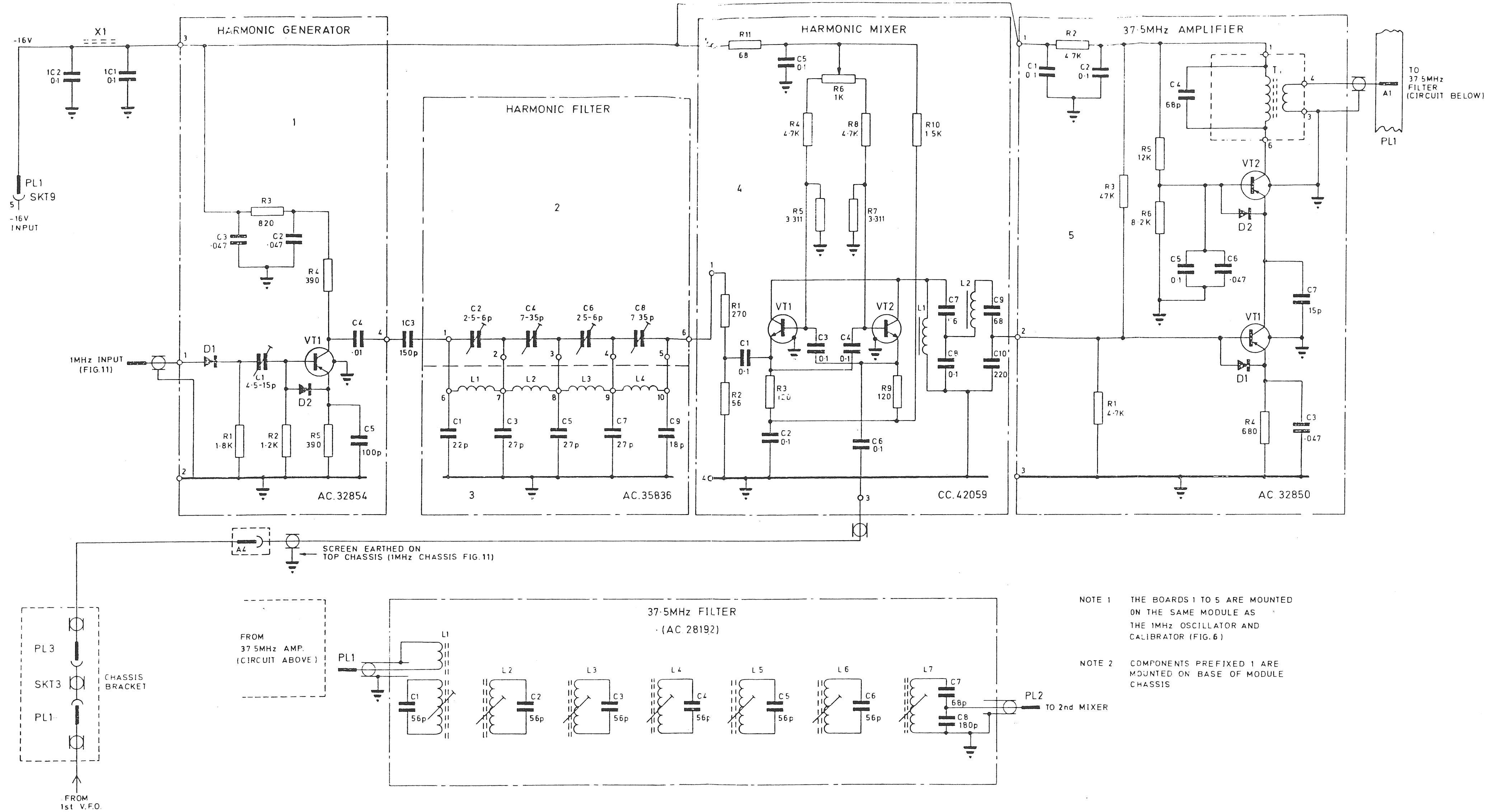


Fig. L-7 Component Layouts: 37·5 MHz Generator and 37·5 MHz Filter Unit



NOTE 1 THE BOARDS 1 TO 5 ARE MOUNTED ON THE SAME MODULE AS THE 1MHz OSCILLATOR AND CALIBRATOR (FIG. 6)

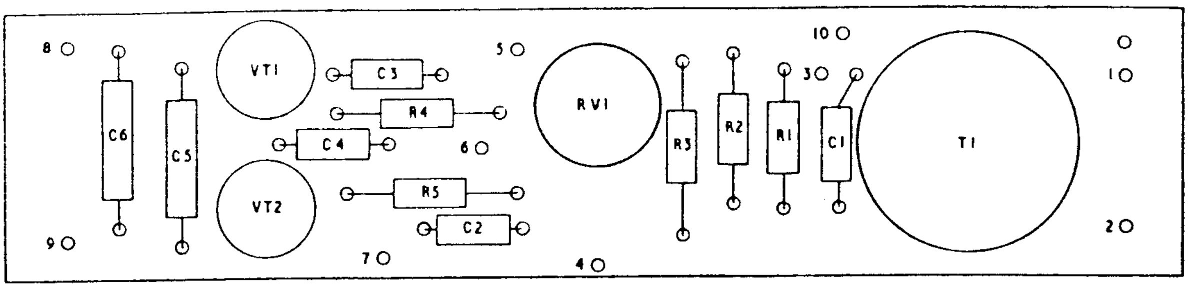
NOTE 2 COMPONENTS PREFIXED 1 ARE MOUNTED ON BASE OF MODULE CHASSIS

Circuits: Harmonic Generator Mixer and 37·5MHz Filter (37·5MHz Generator)

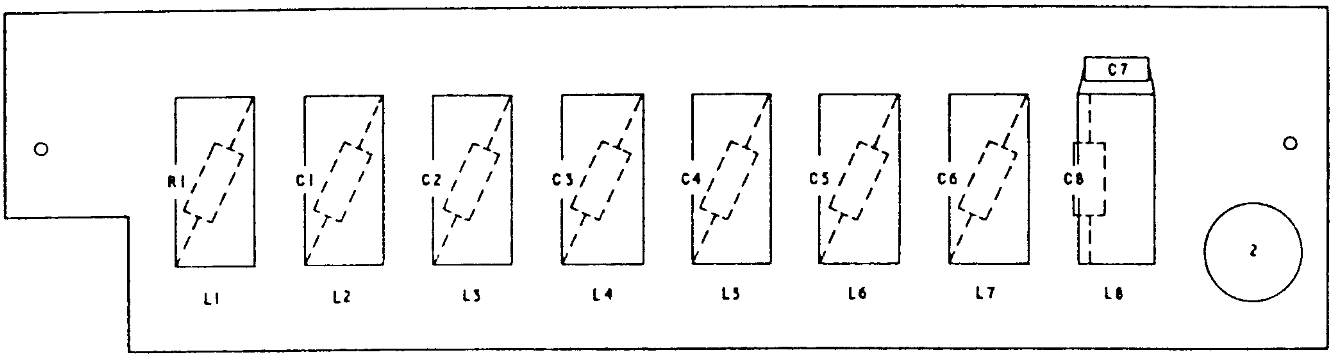
BC28284/C	280/7
1	

AC28192			
3	4	5	6

Fig.7



1st MIXER
(BA.28215)



40 MHz FILTER
(BA.28197)

Fig. L-8 Component Layout: 1st Mixer and 40 MHz Filter

280/L-8

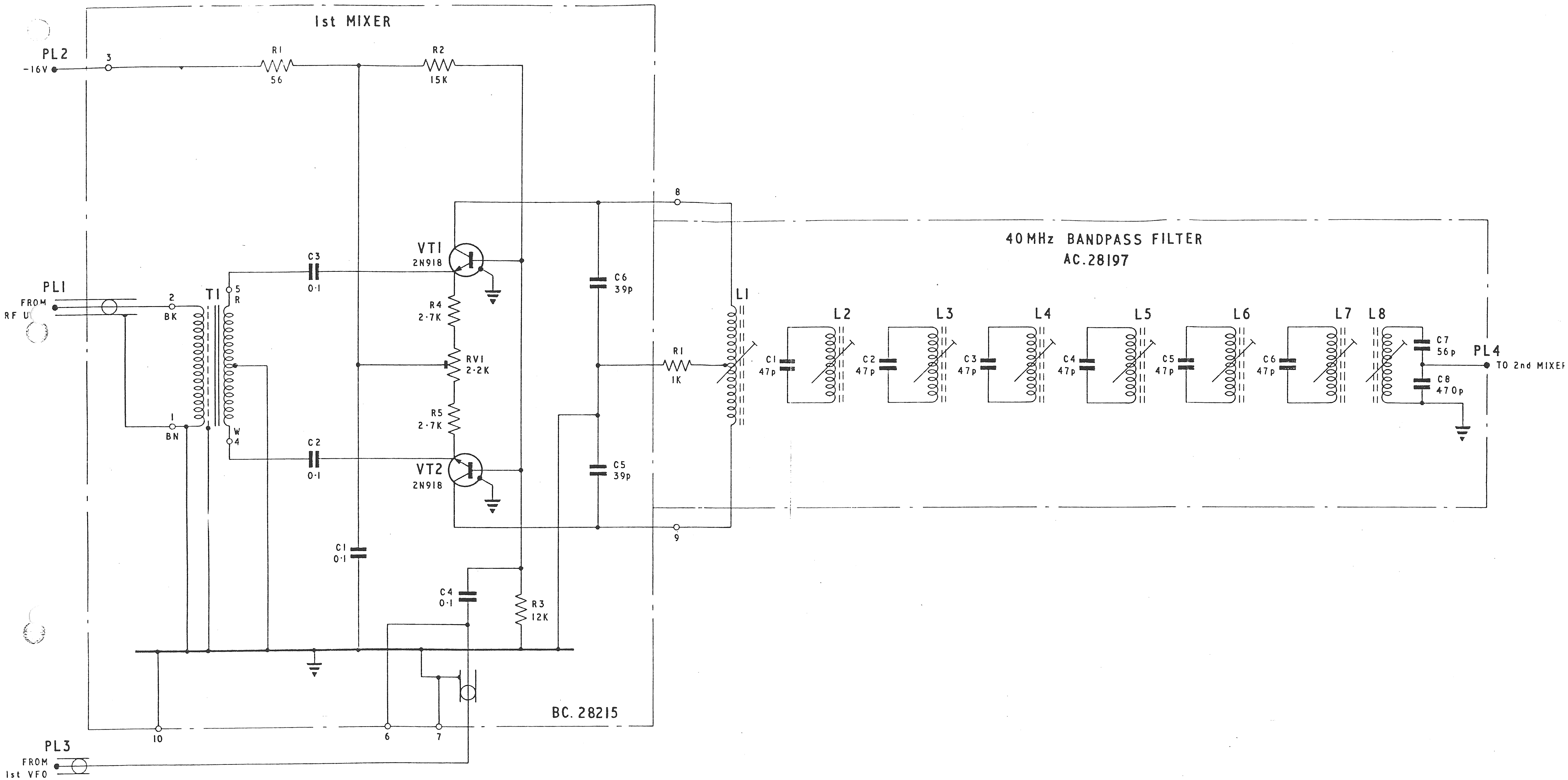
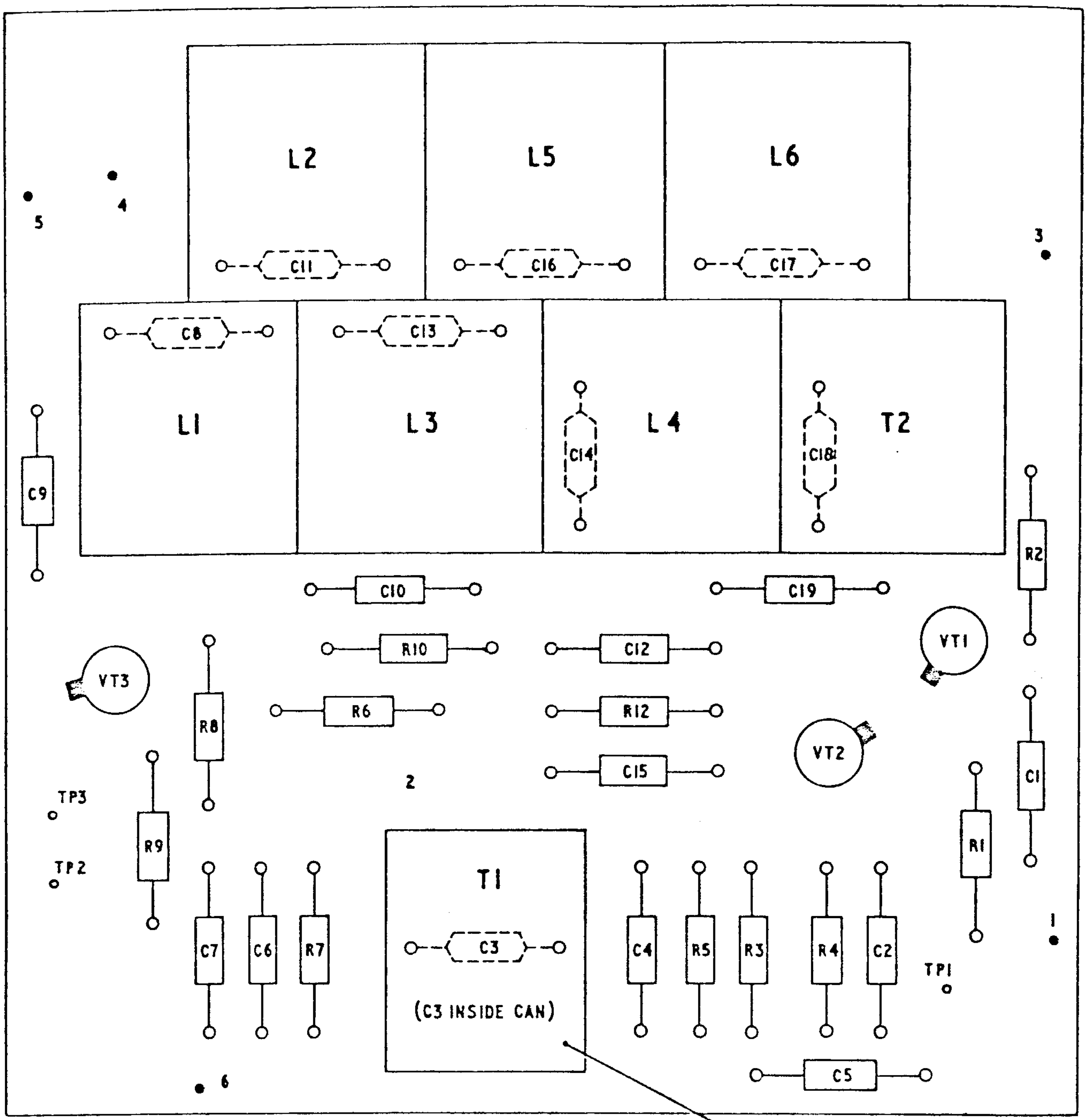


Fig. 8

Circuit : 1st Mixer and 40MHz. Filter

BC28211 280/8
247

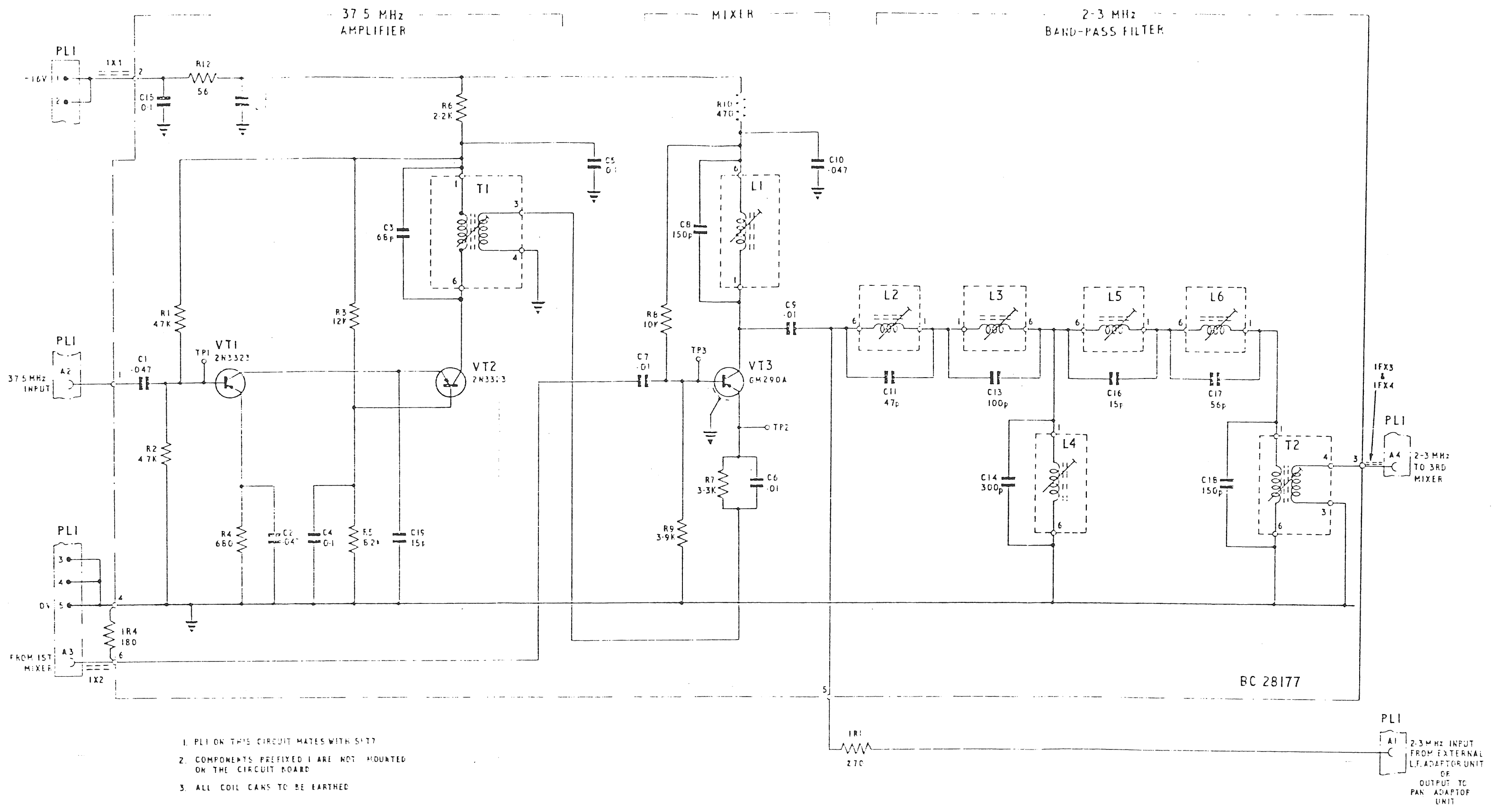
NOTE: CAPACITORS C8, C11, C13, C14, C14, C17 AND C18 ARE WIRED ON REAR OF BOARD



2nd. MIXER
BA. 28177

NOTE:
A BLUE SPOT ON T1 INDICATES THAT C3 IS WIRED ON THE TRACK SIDE OF THE BOARD.

Fig. L-9 Component Layout: 2nd Mixer

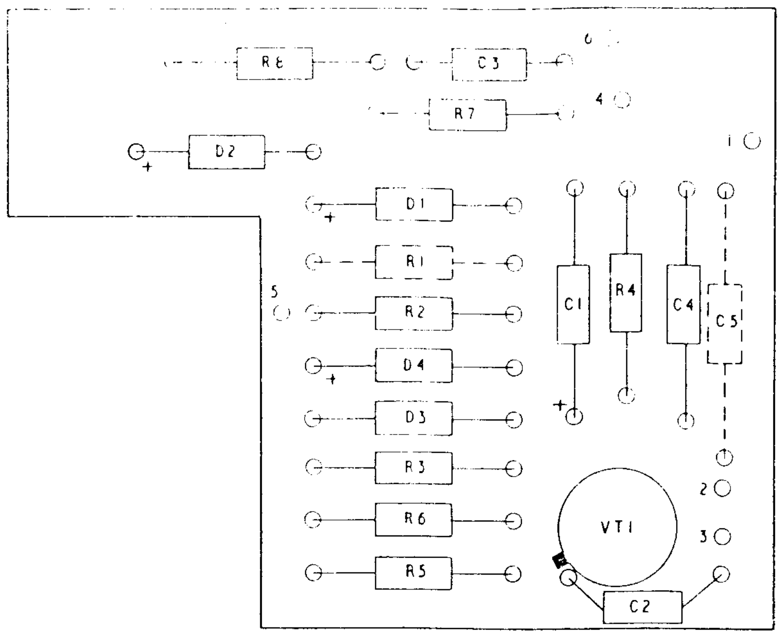


1. PL1 ON THIS CIRCUIT MATES WITH SKT7
2. COMPONENTS PREFIXED I ARE NOT MOUNTED ON THE CIRCUIT BOARD
3. ALL COIL CANS TO BE EARTHED

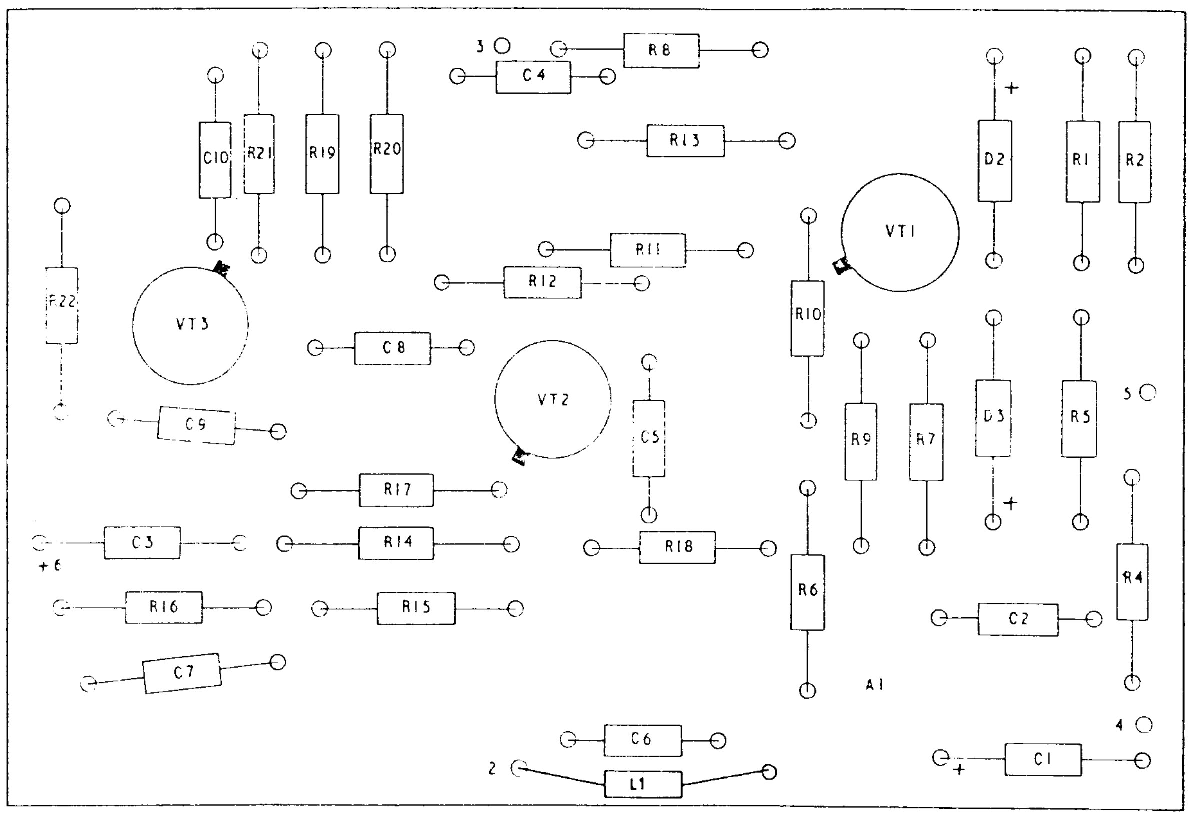
BC30959 280/9
6 9 11 14 15

Circuit : 2nd Mixer

Fig.9

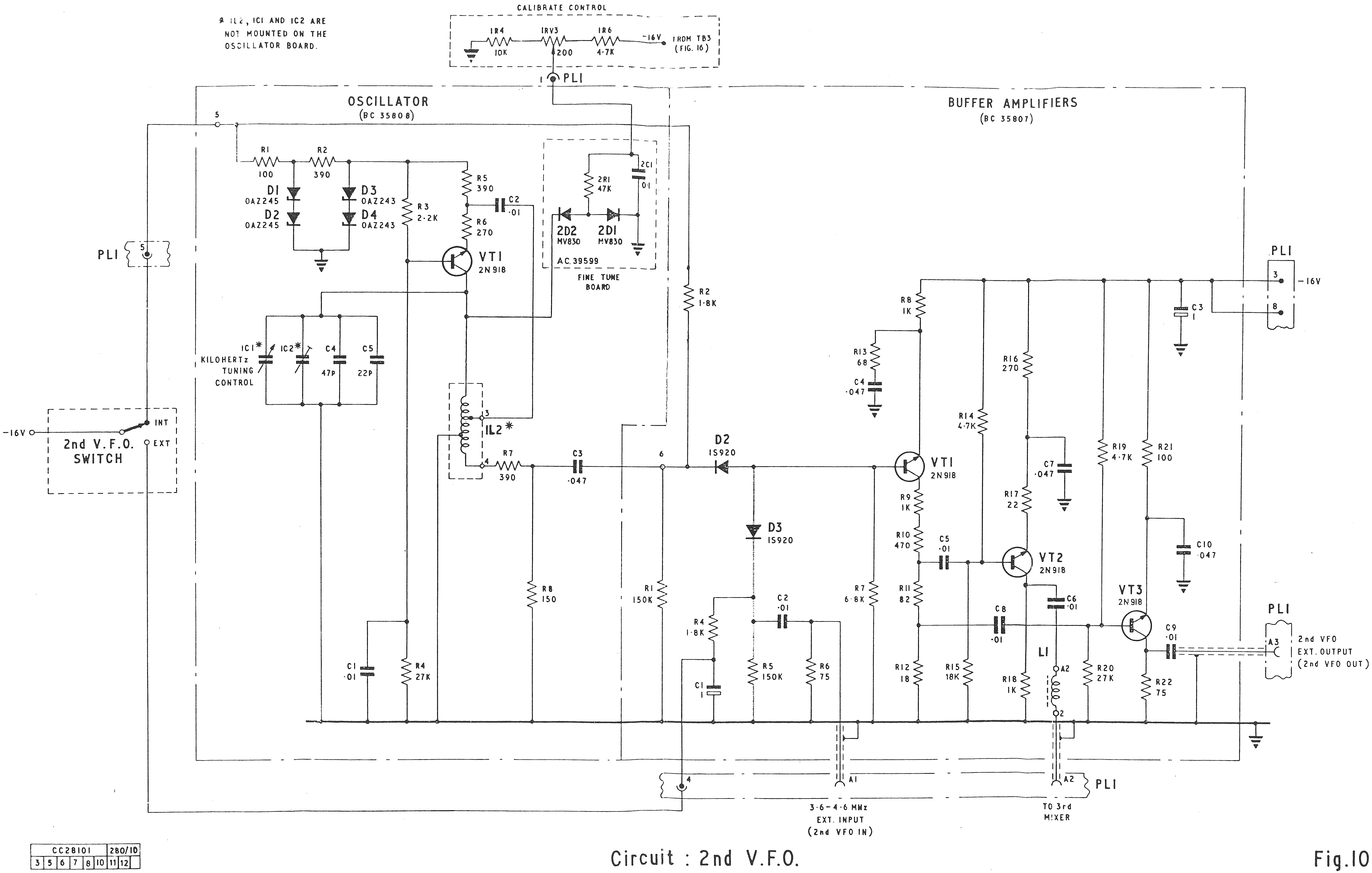


OSCILLATOR BOARD
(BA.35808)



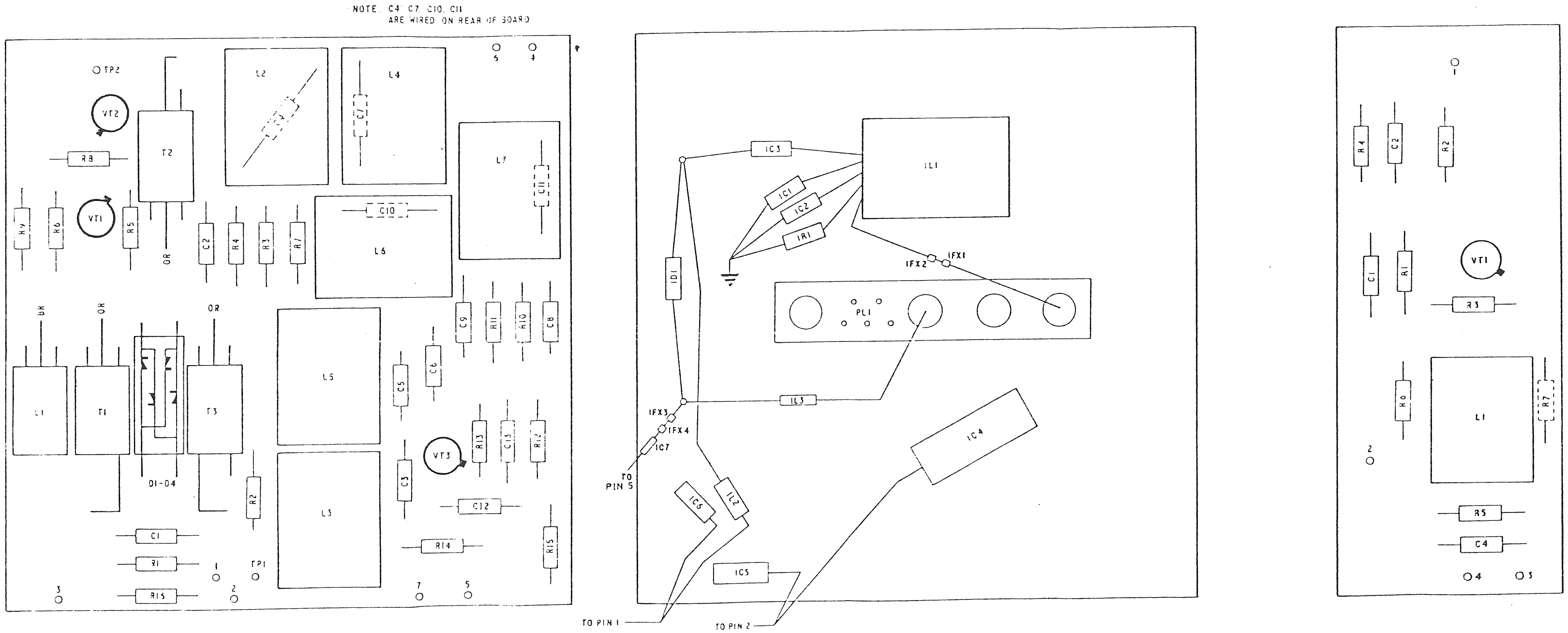
AMPLIFIER BOARD
(BA.35807)

Fig. L-10 Component Layouts: 2nd V.F.O



Circuit : 2nd V.F.O.

Fig.10

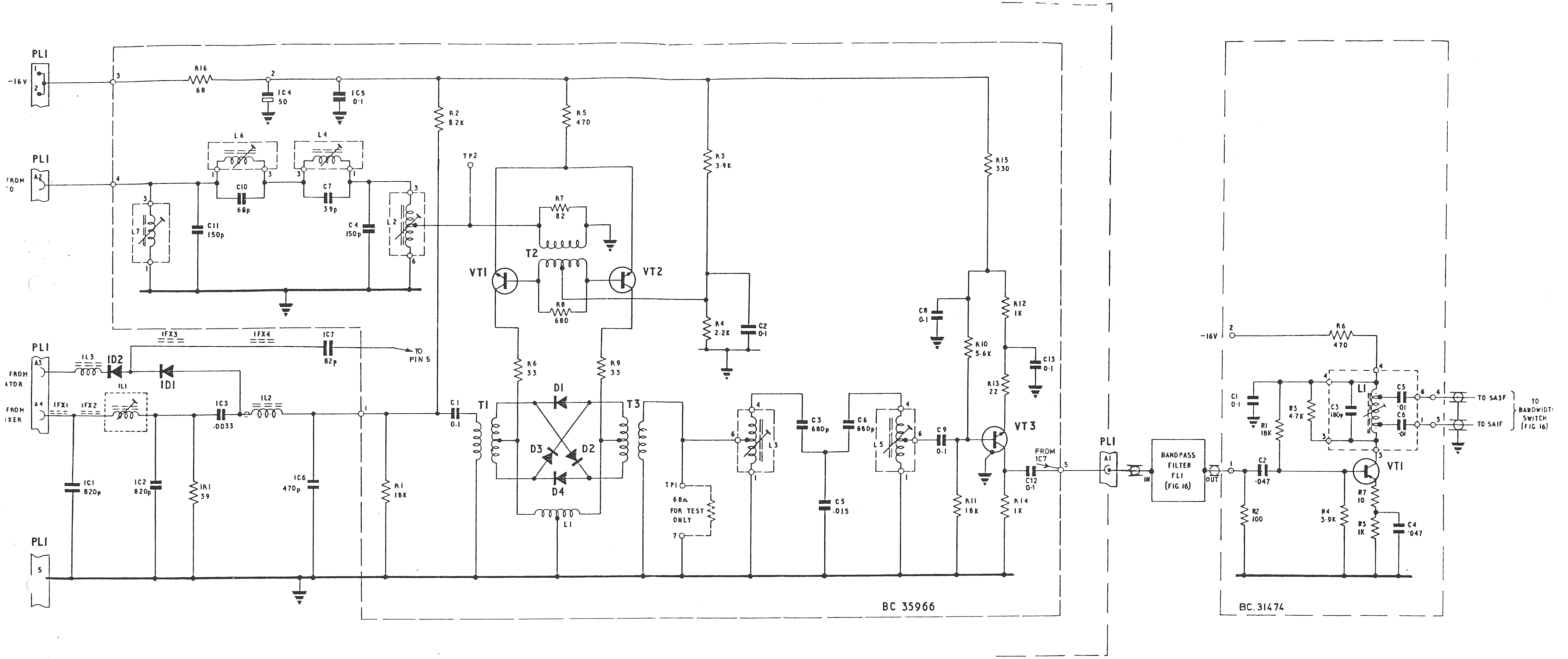


3rd MIXER MODULE
(BA 35956)

1st I.F. AMPLIFIER UNIT
(BA 31474)

Fig. L-11

Component Layout: 3rd Mixer Module and 1st I.F. Amplifier Unit



NOTES:
1 COMPONENTS PREFIXED 'I' ARE MOUNTED ON THE MODULE BUT NOT ON THE CIRCUIT BOARD
2 ALL COIL CANS TO BE EARTHED

3rd Mixer Module

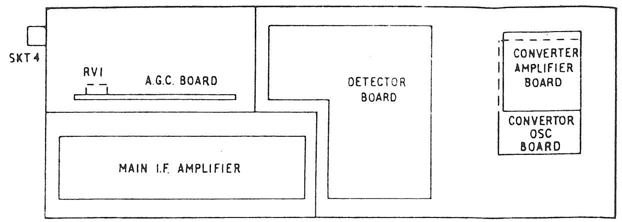
1st I.F. Amplifier Unit

970 | 280/11
5 | 7 | 9 | 10 | 11 | 13

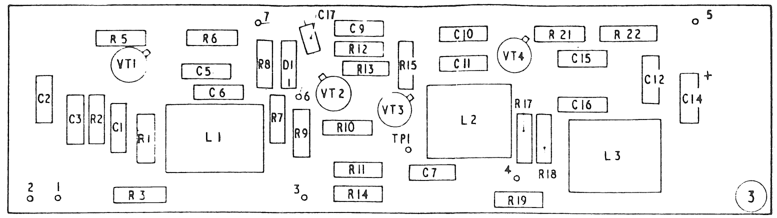
Circuit : 3rd Mixer Module and 1st I.F. Amplifier Unit

DC. 38450 | 280/11
1 | 3 | 6

Fig. 11

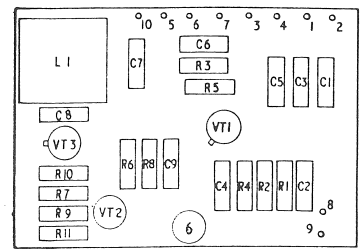


I.F. MODULE KEY DIAGRAM



MAIN I.F. AMPLIFIER BOARD

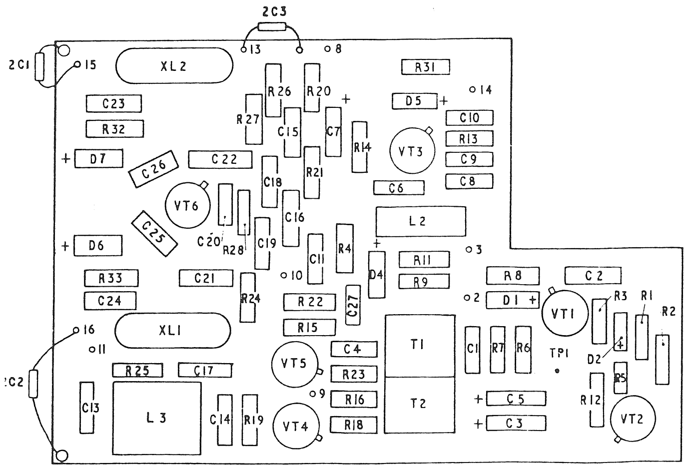
BA 30533



NOTE: C10 MOUNTED ON UNDERSIDE OF BOARD IN PARALLEL WITH R9

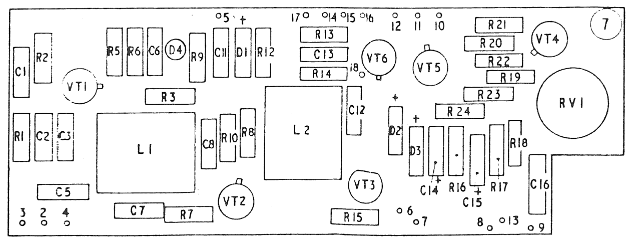
100kHz CONVERTER:AMPLIFIER

BA 34783



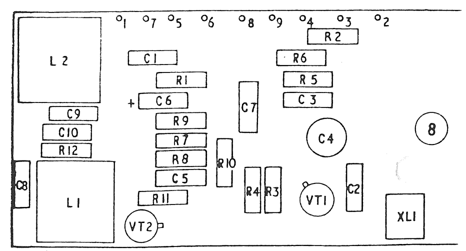
DETECTOR BOARD

BA 28236



A.G.C. BOARD

BA 31466/B

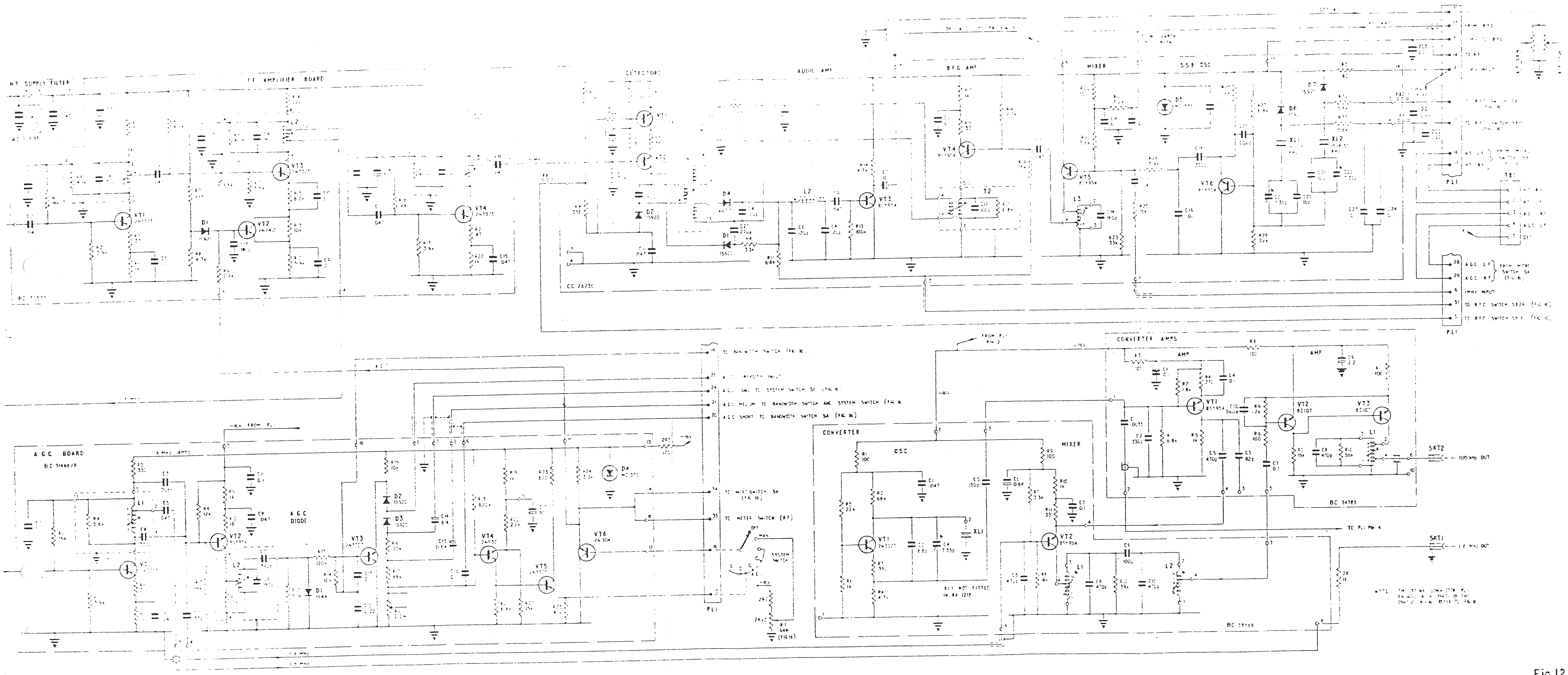


CONVERTER: OSCILLATOR AND MIXER

BA 38568

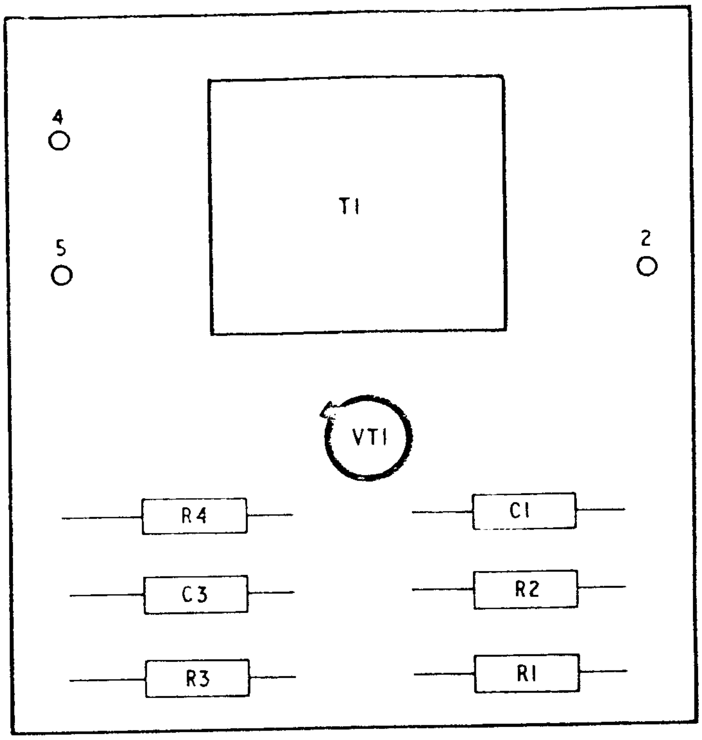
Fig. L-12

Component Layout I.F. Module

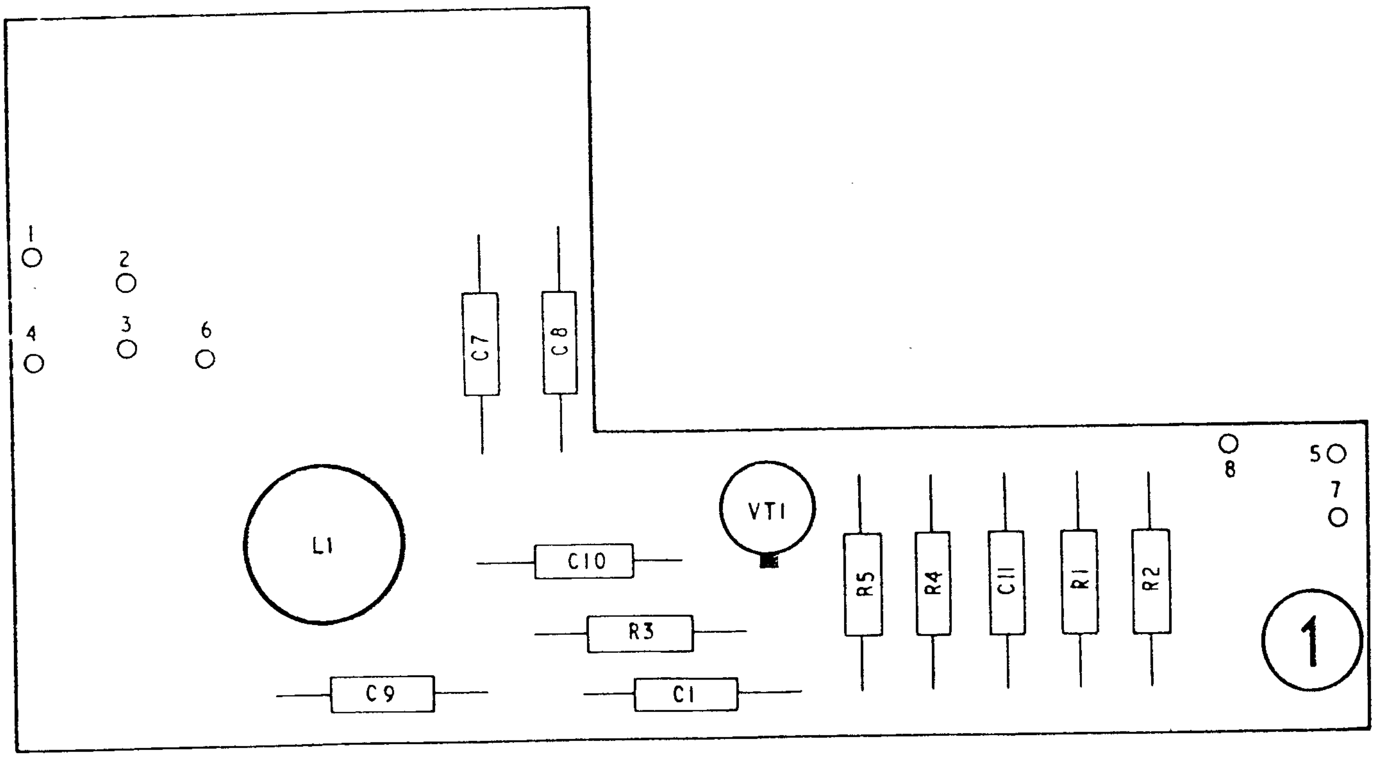


Circuit : I.F. Module

Fig.12



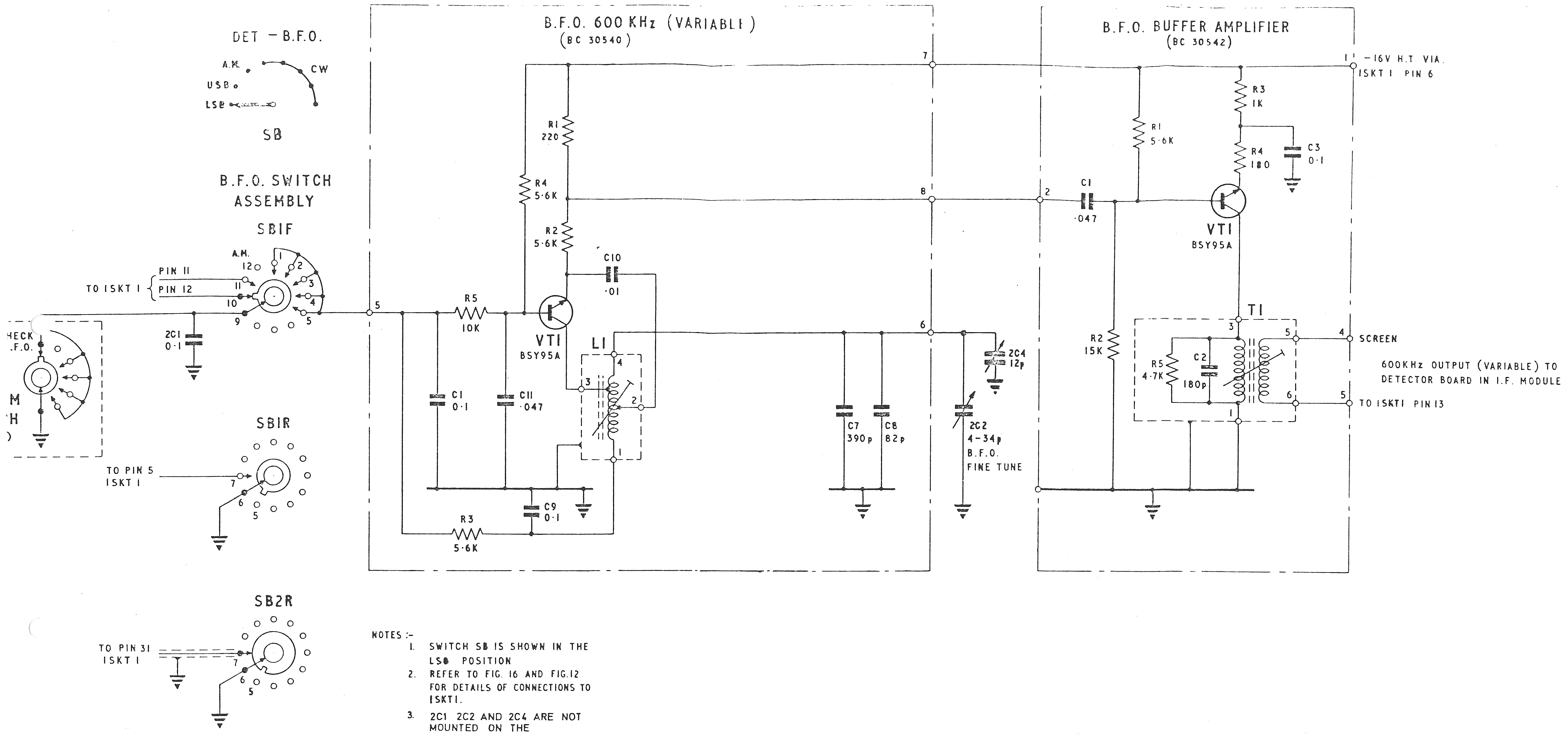
B.F.O. Amplifier
(B.A.30542)



600KHz Oscillator
(B.A30540)

Fig. L-13 Component Layout B.F.O.

280/L-13



NOTES :-

1. SWITCH SB IS SHOWN IN THE LSB POSITION
2. REFER TO FIG. 16 AND FIG.12 FOR DETAILS OF CONNECTIONS TO ISKTI.
3. 2CI 2C2 AND 2C4 ARE NOT MOUNTED ON THE COMPONENT BOARDS.

Circuit : B.F.O. Unit

Fig.13

C39310 | 280/13
3|9

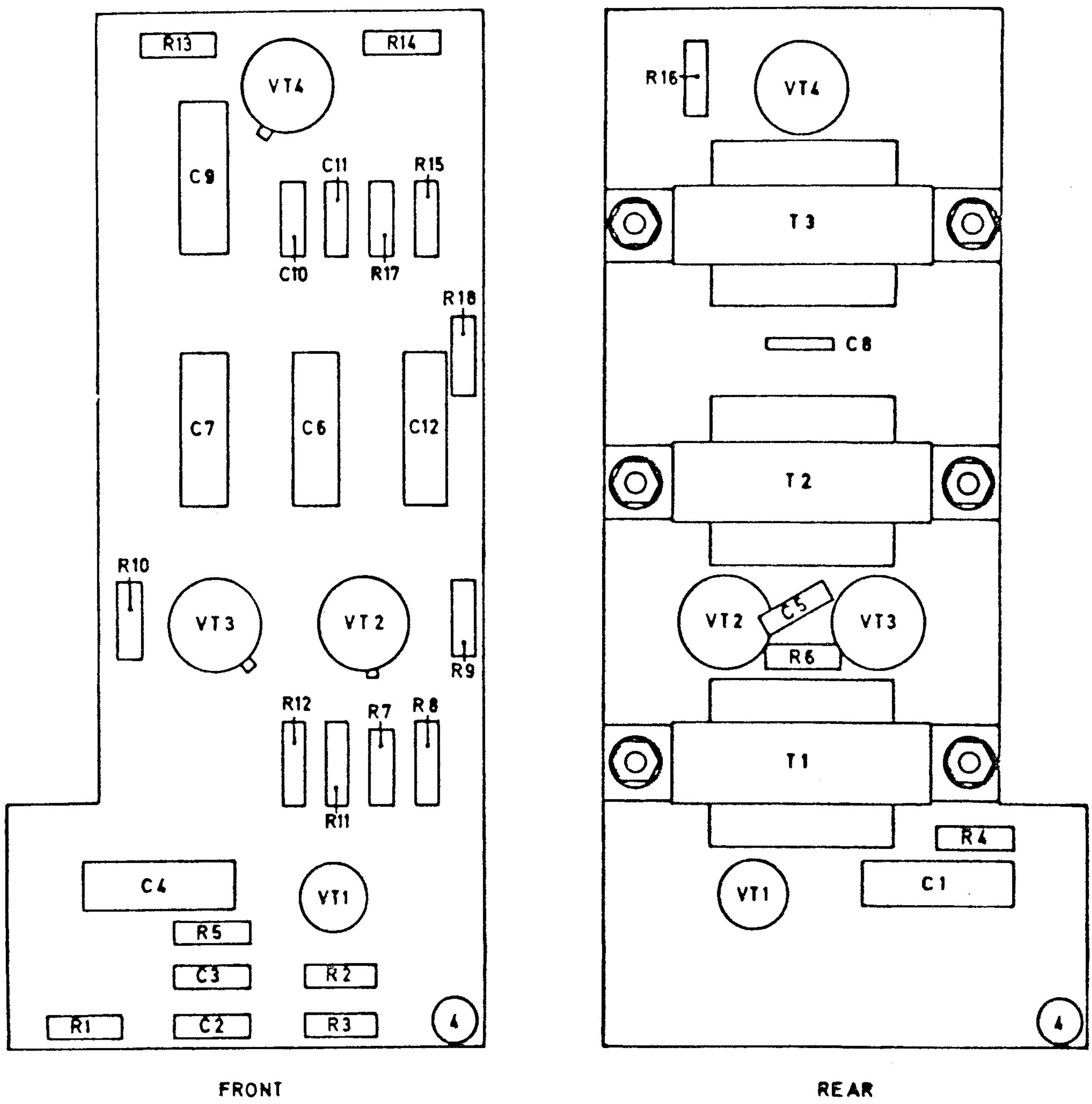
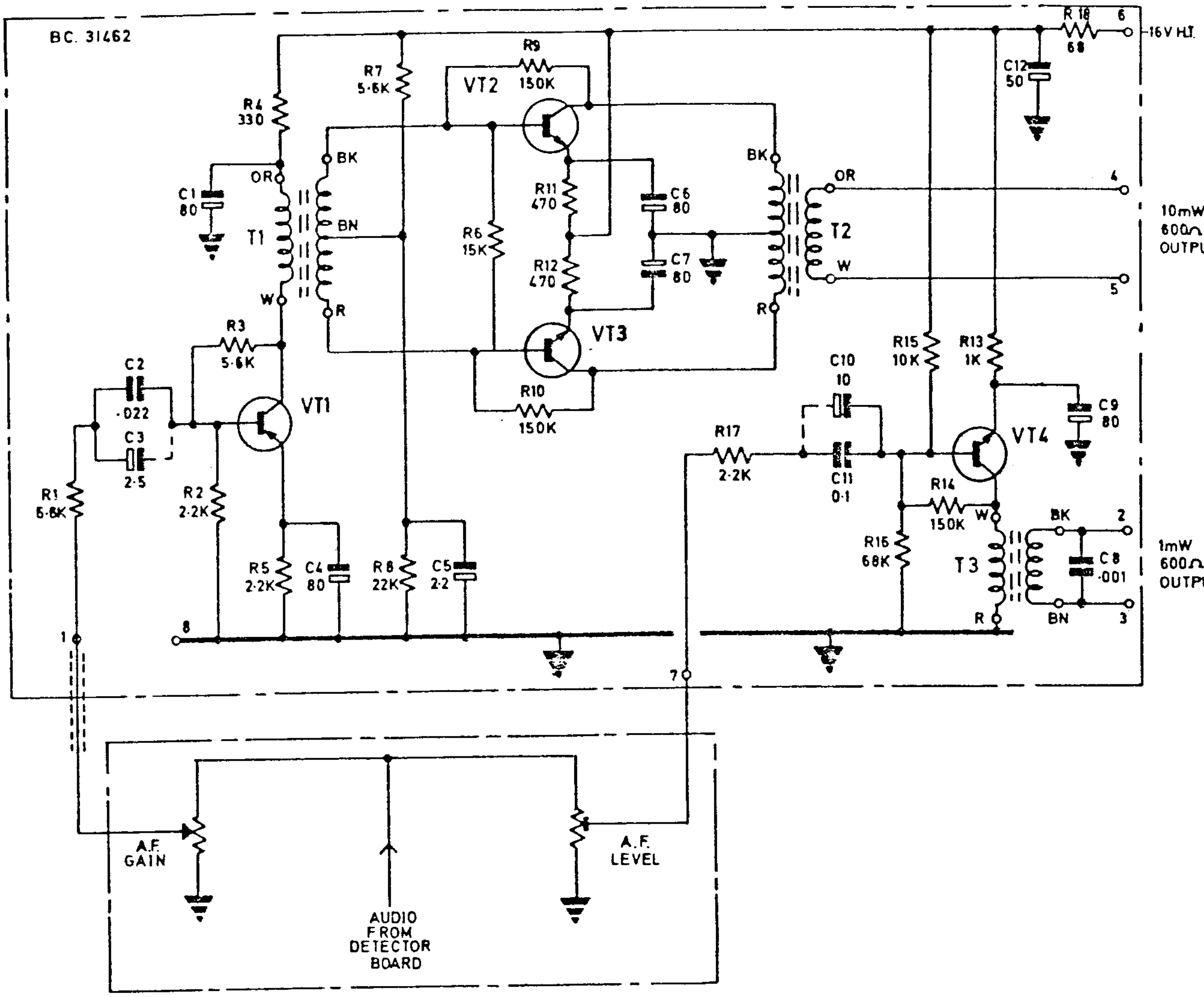


Fig. L-14a

Component Layout
10mW Audio Amplifier Board

C80 / L-14a



NOTE :- C3 AND/OR C10 ARE REMOVED AS SHOWN TO PROVIDE L.F. ATTENUATION IN THE AUDIO AMPLIFIERS.

EC39310/ABCD	280/14a
5 7	

10mW Audio Amplifier Board

Fig. 14a

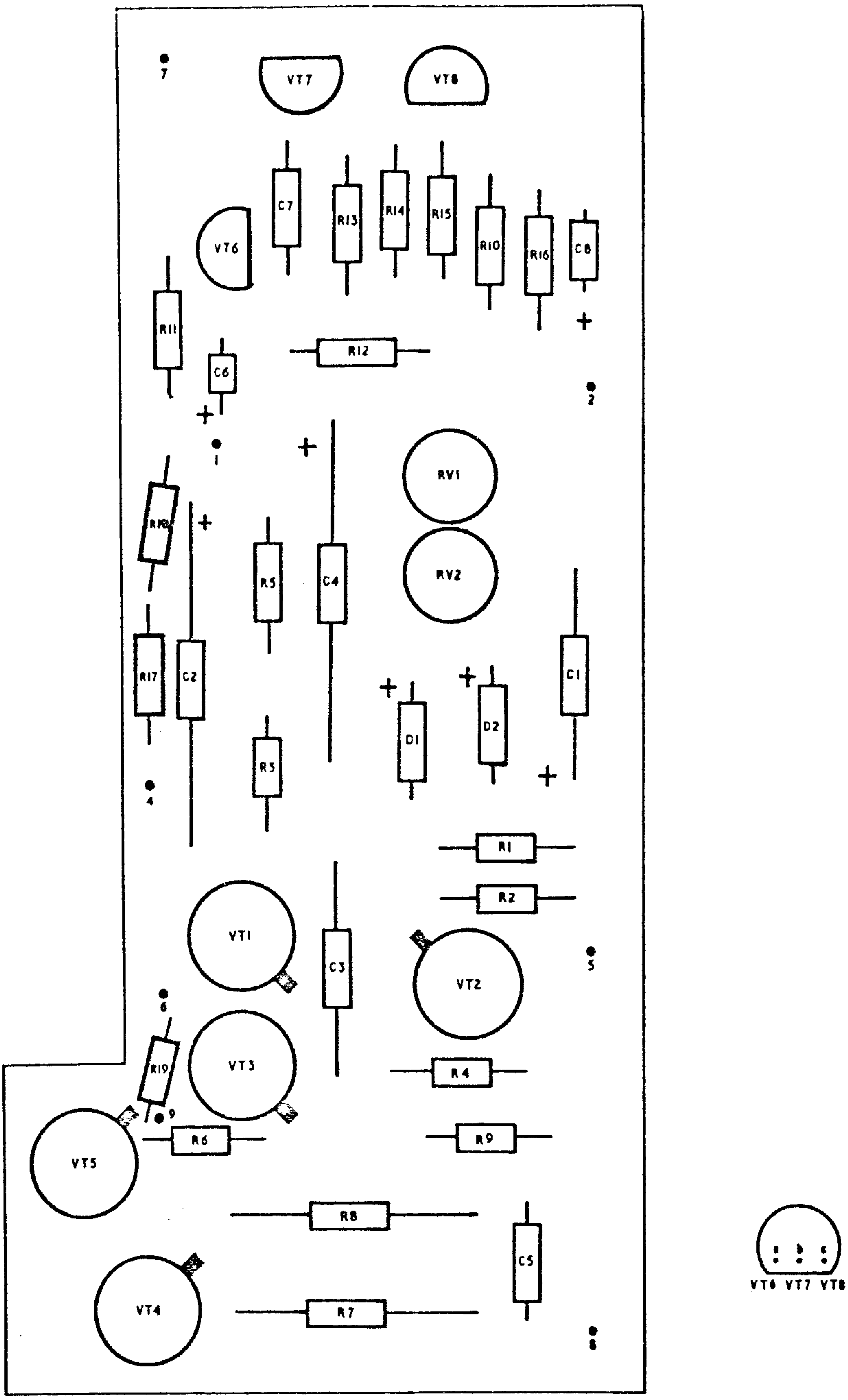
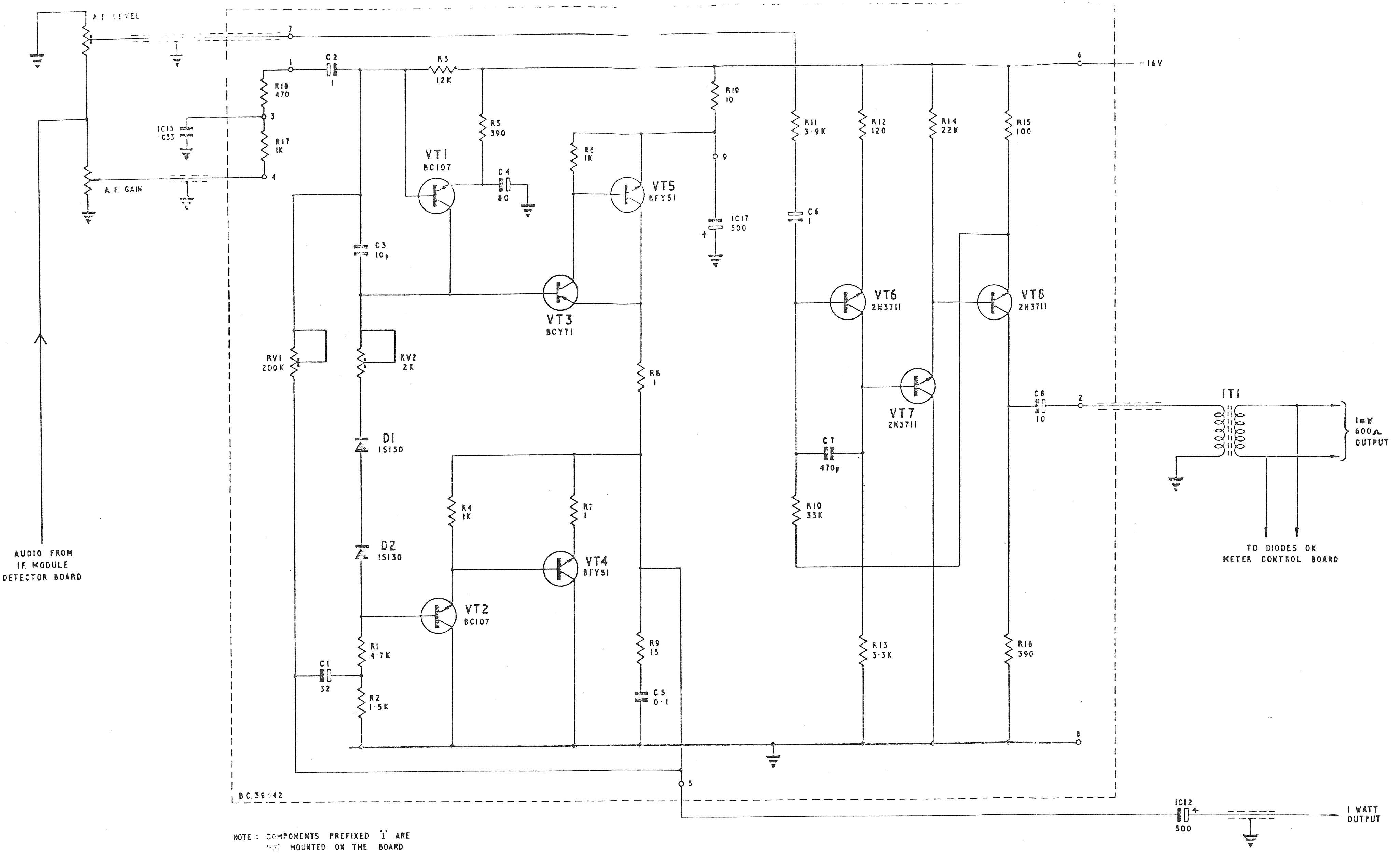


Fig. L-14 b Component Layout: Audio Amplifier Board (1 Watt)

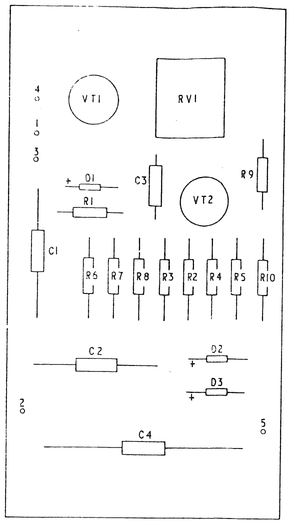
C280/L-14b



DC 38450/FG 280/14b
1 3 7 9

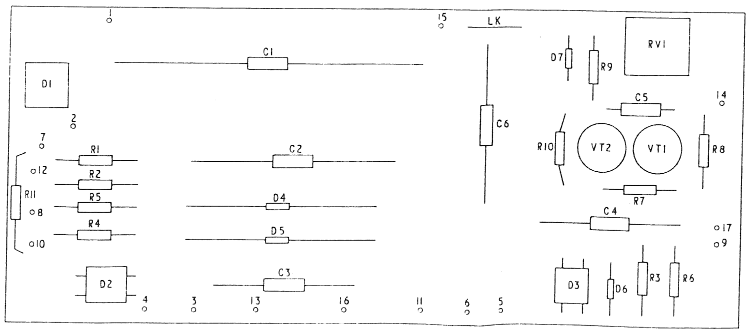
Circuit: Audio Amplifier Board
(1 Watt)

Fig.14b



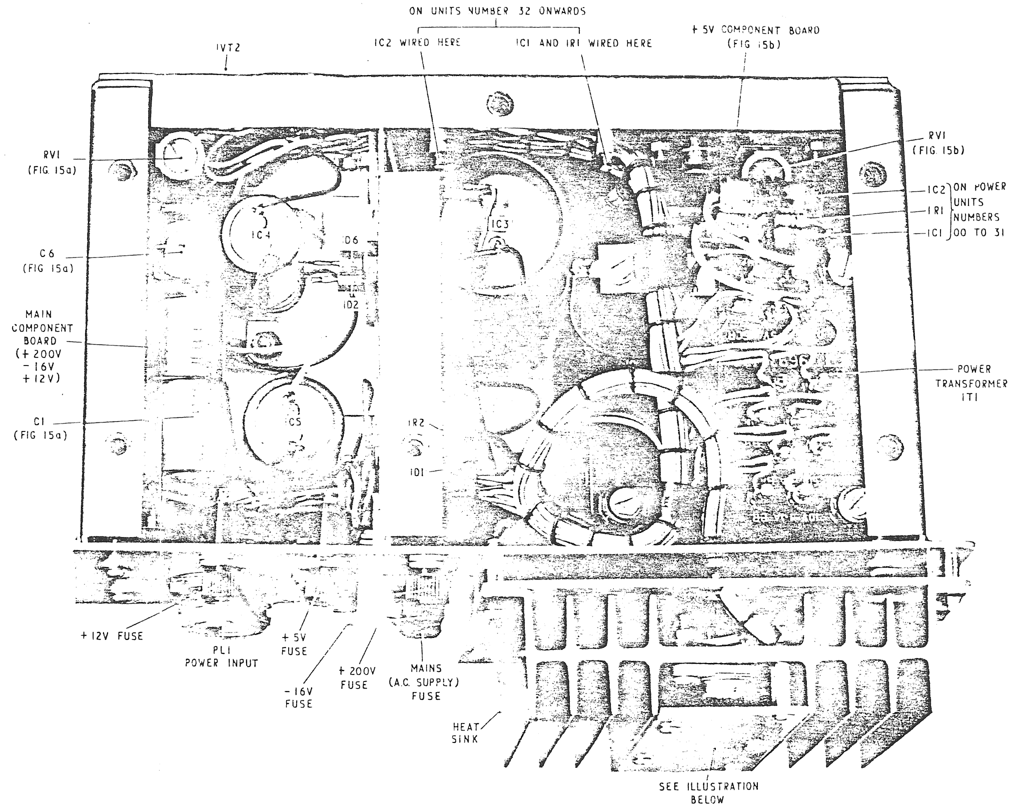
LAYOUT 5-VOLT BOARD

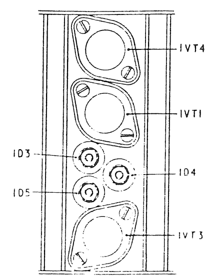
CD39719
2



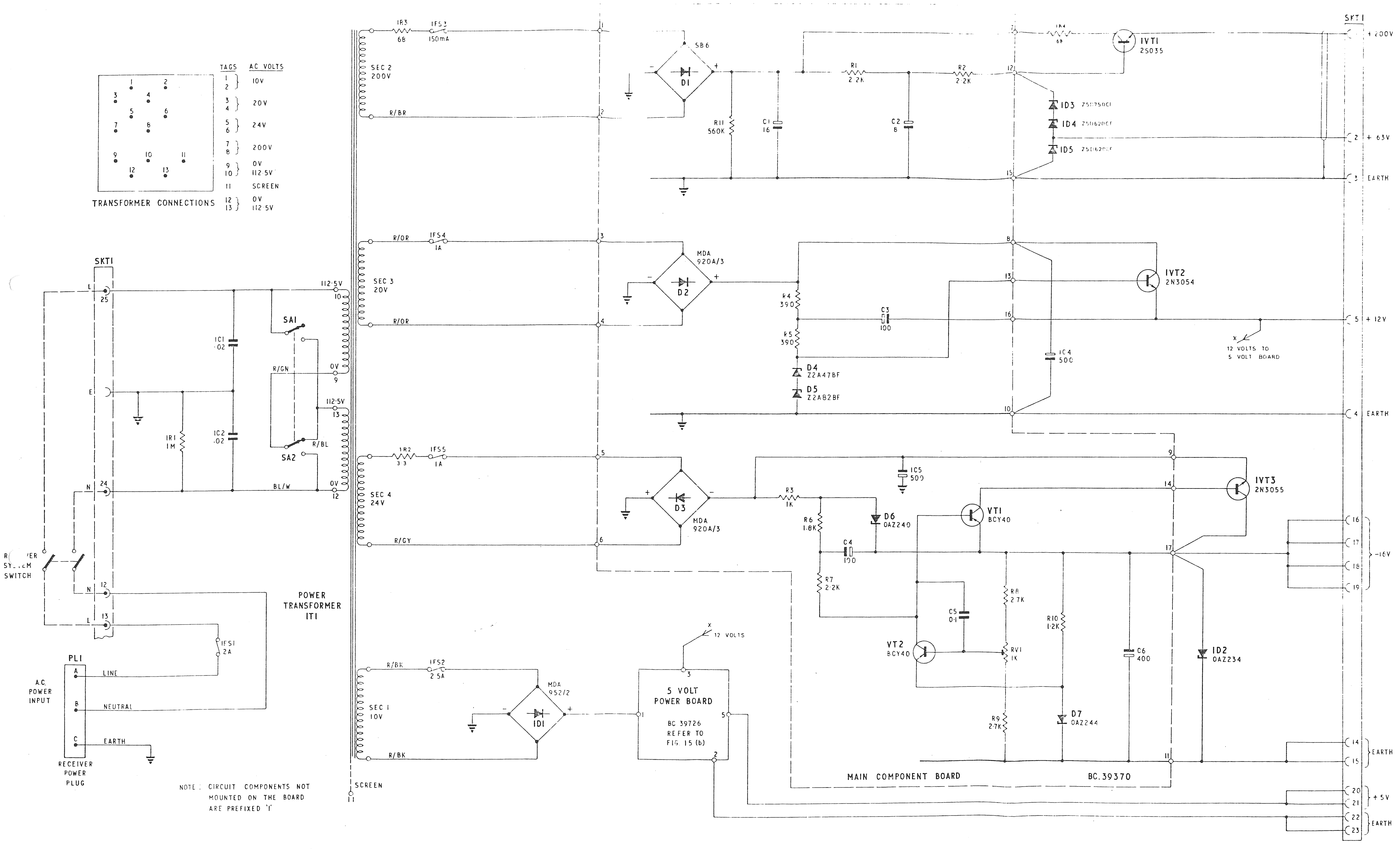
LAYOUT MAIN COMPONENT BOARD

CD39733
2





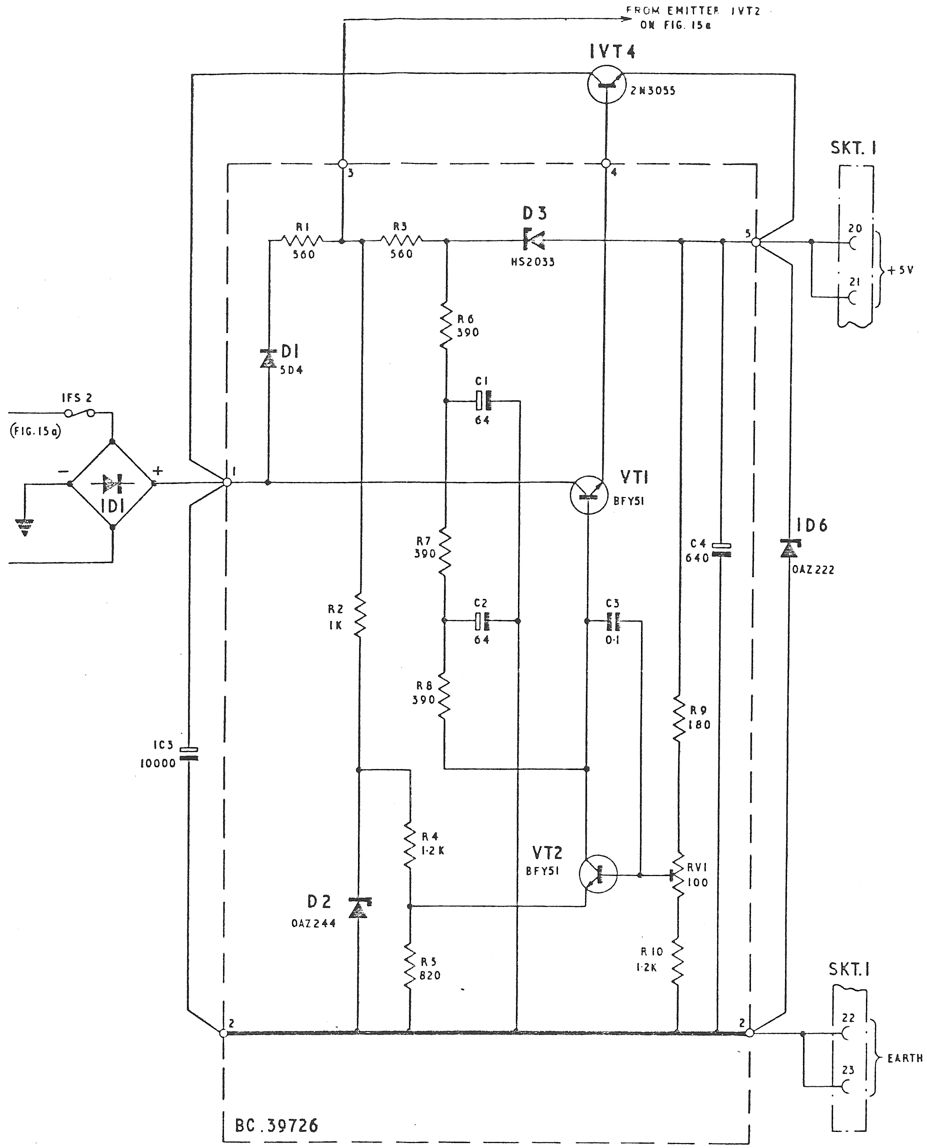
VIEW ON HEAT SINK



DC 39382/280/15a
2 4 5 8

Circuit : Power Unit Type PU.1155

Fig. 15 (a)



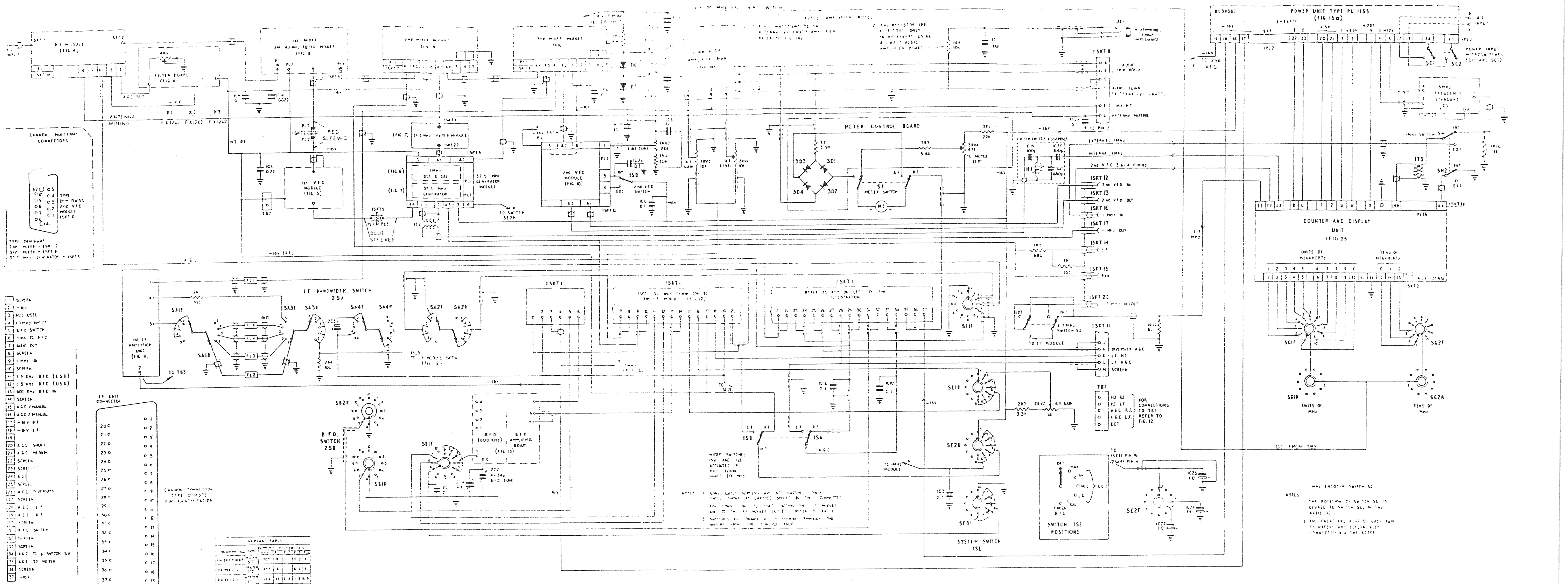
THIS BOARD IS PART OF POWER UNIT P.U.1155: REFER TO FIG. 15(a)

NOTE:- CIRCUIT COMPONENTS NOT MOUNTED ON BOARD ARE PREFIXED 'I'

DC 39382	280/15b
2 3 4 5 6	8

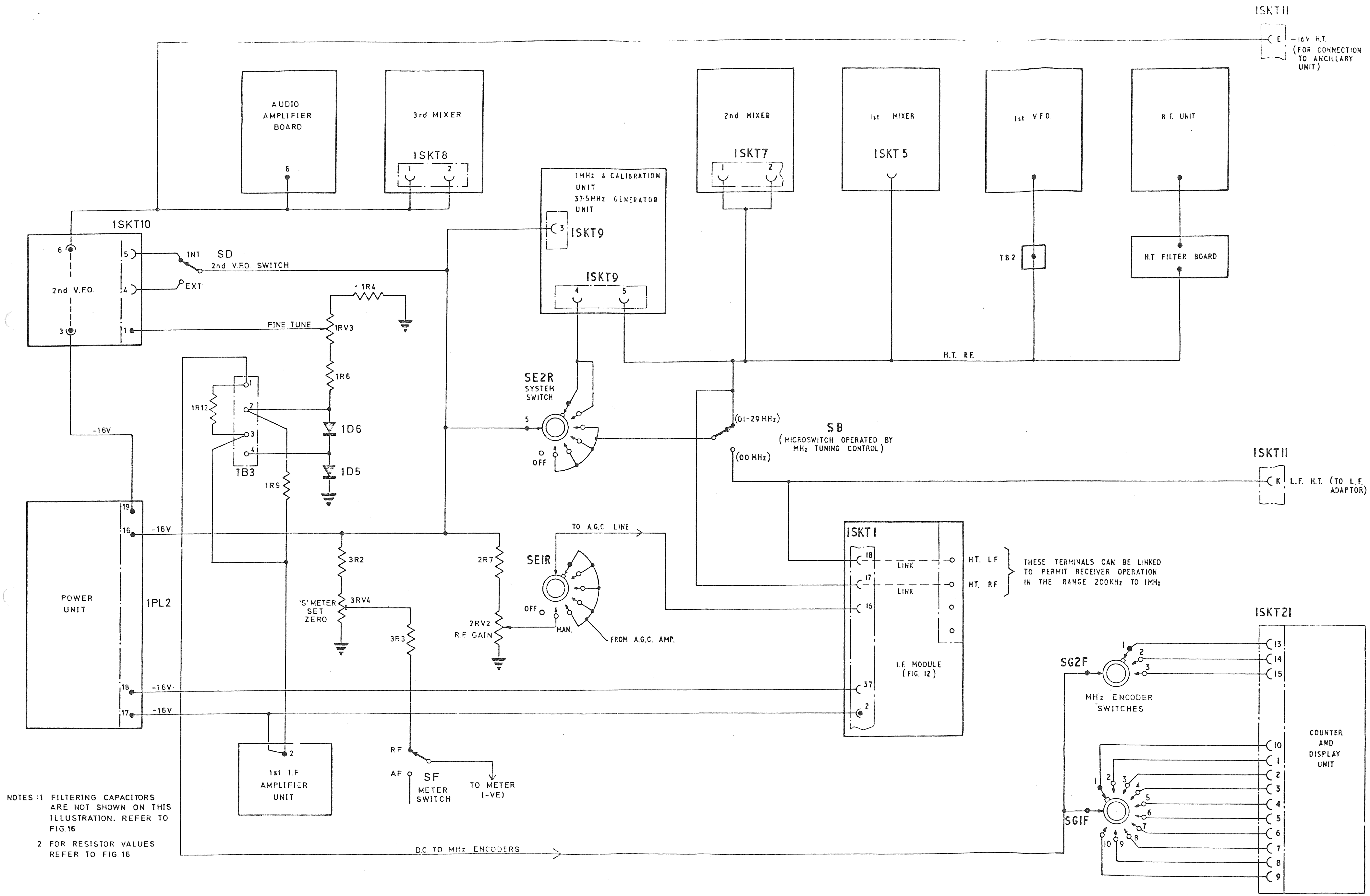
Circuit: 5 Volt Power Board

Fig. 15(b)



Interconnections: RA.1218

Fig.16



NOTES: 1 FILTERING CAPACITORS ARE NOT SHOWN ON THIS ILLUSTRATION. REFER TO FIG.16

2 FOR RESISTOR VALUES REFER TO FIG 16

280/17

Interconnection Diagram : 16 Volt Supplies RA.1218

Fig. 17

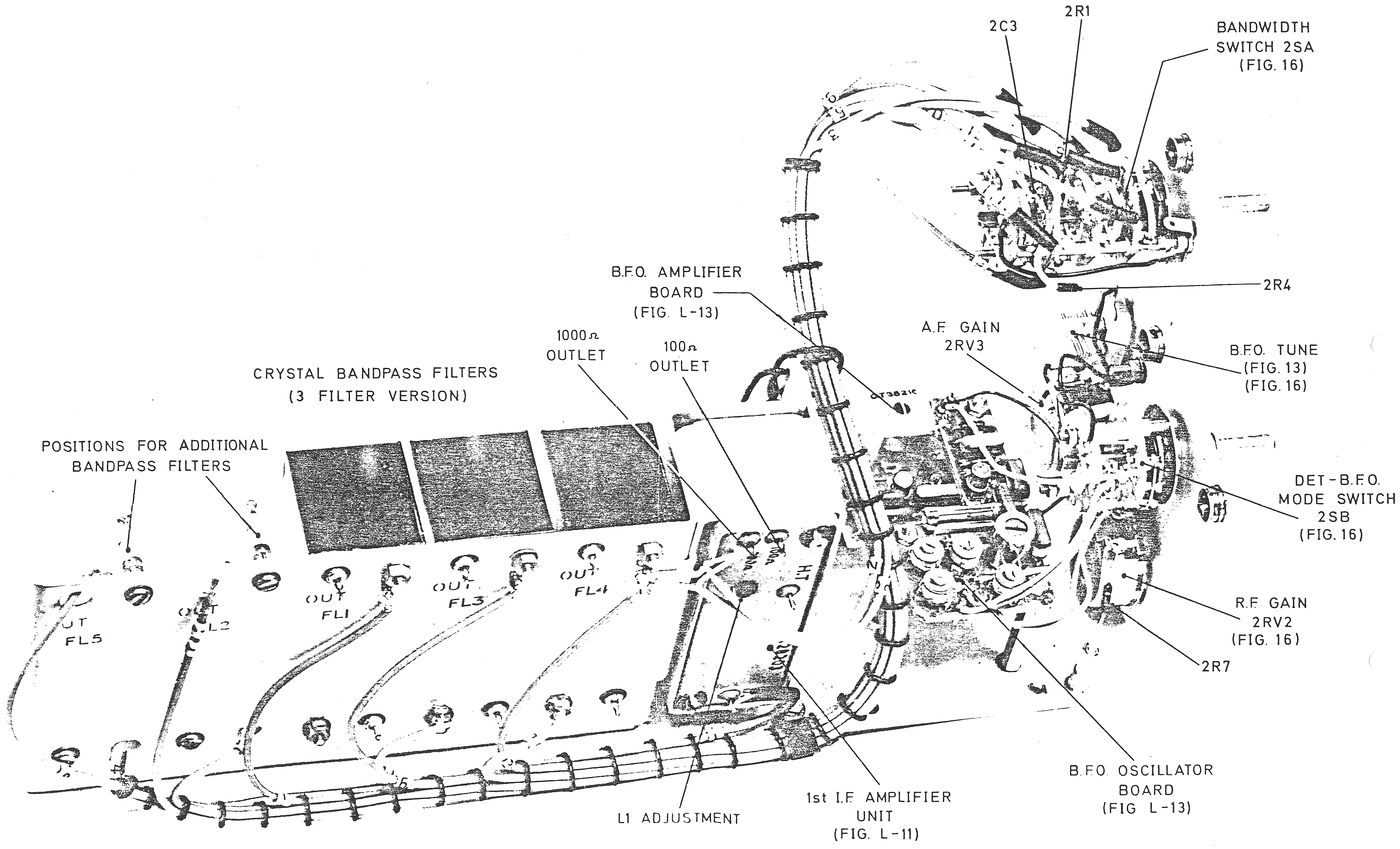
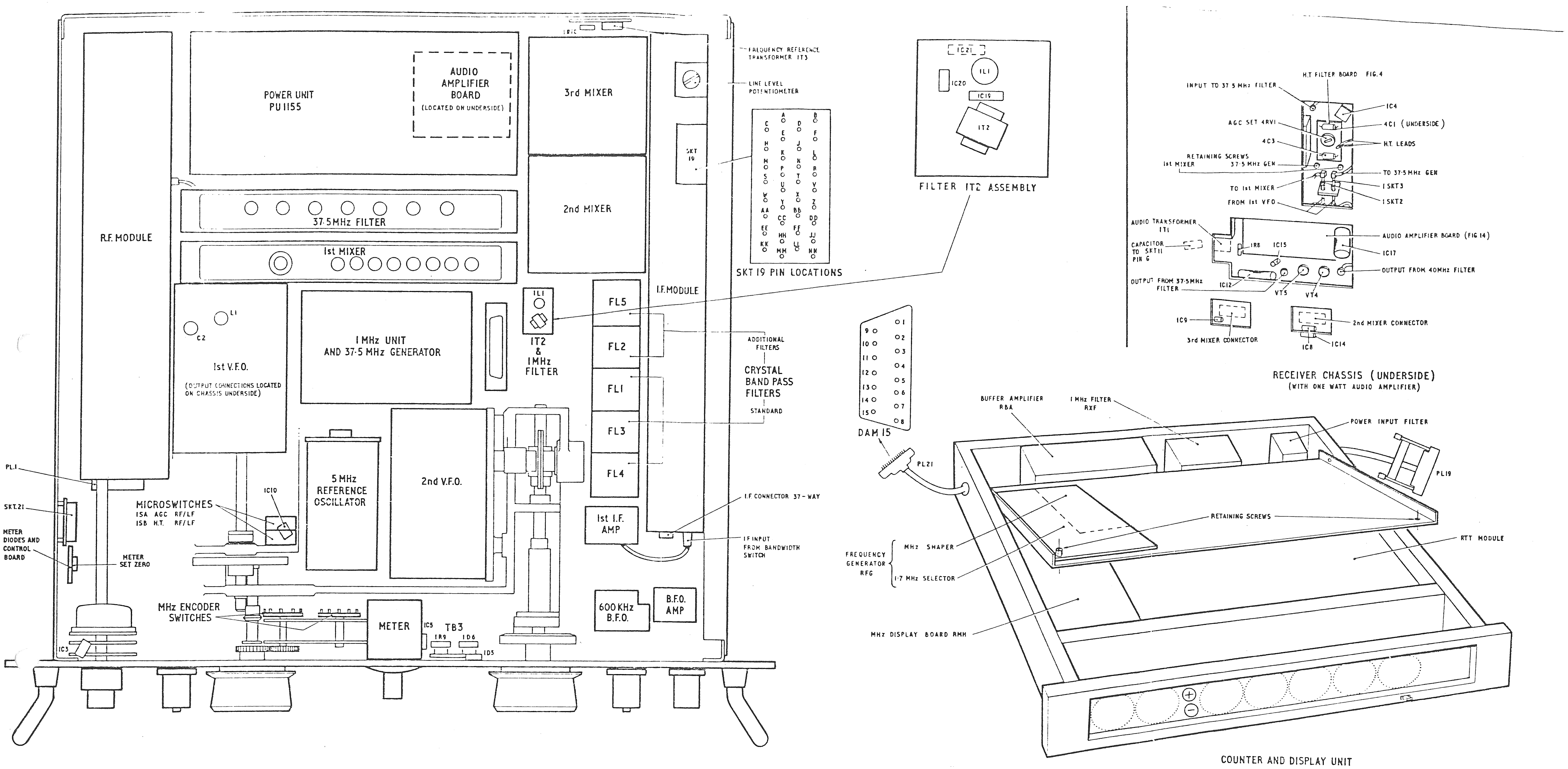


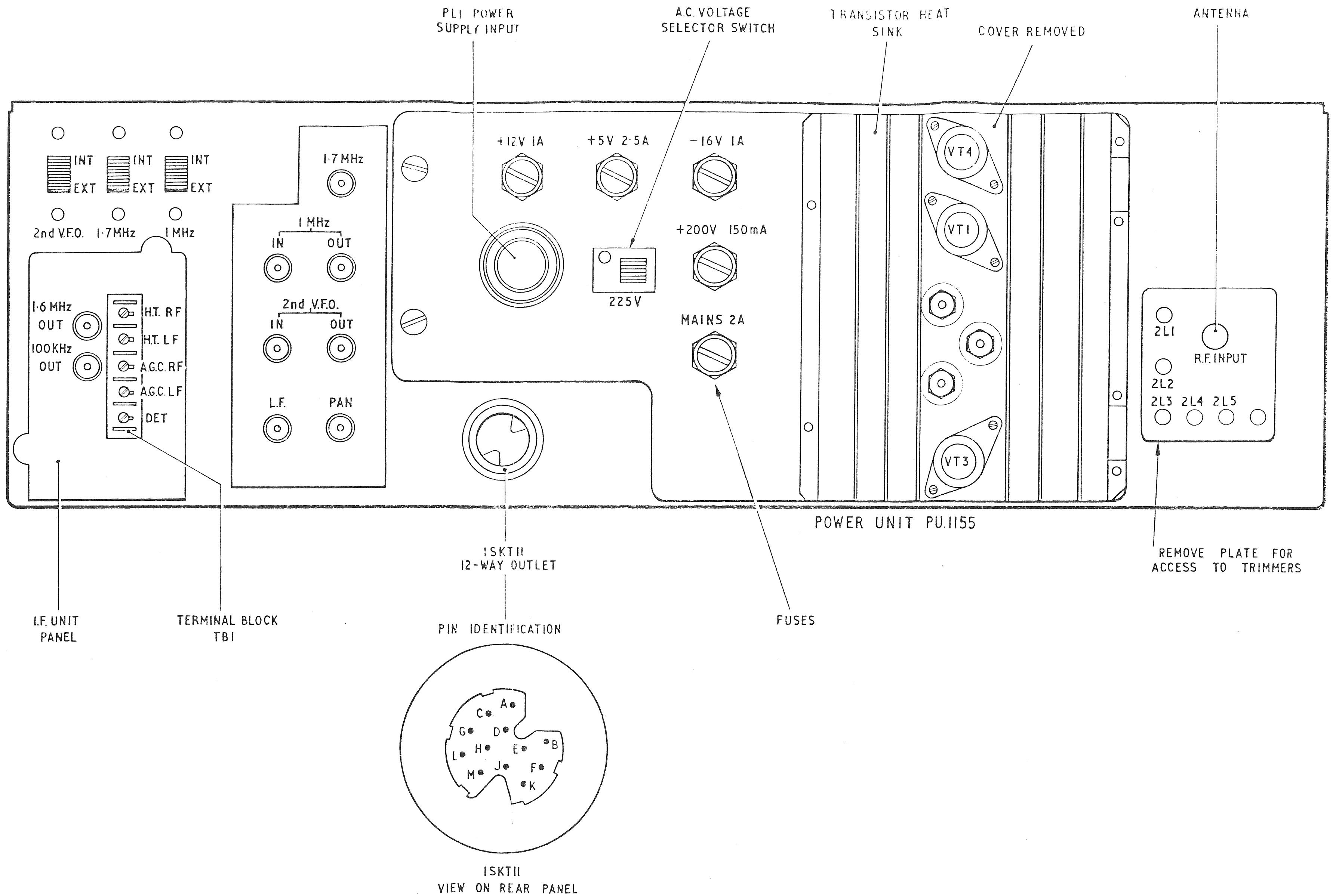
Fig. L-18 1st I.F. Unit, Bandwidth and B.F.O. Assembly : RA.1218



Chassis Layout: RA.1218

Fig. 18

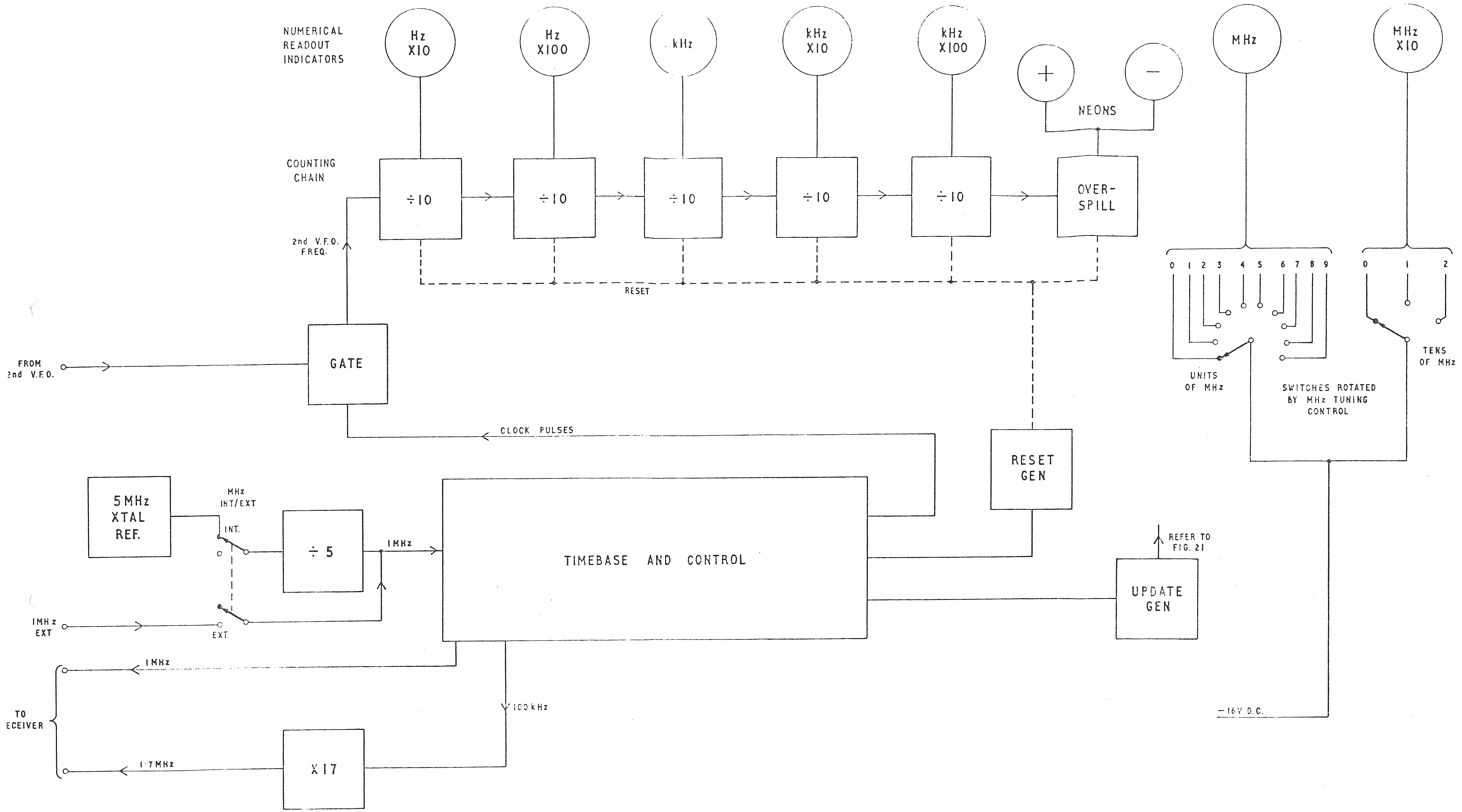
280/18



280/19

Rear Panel : RA.1218

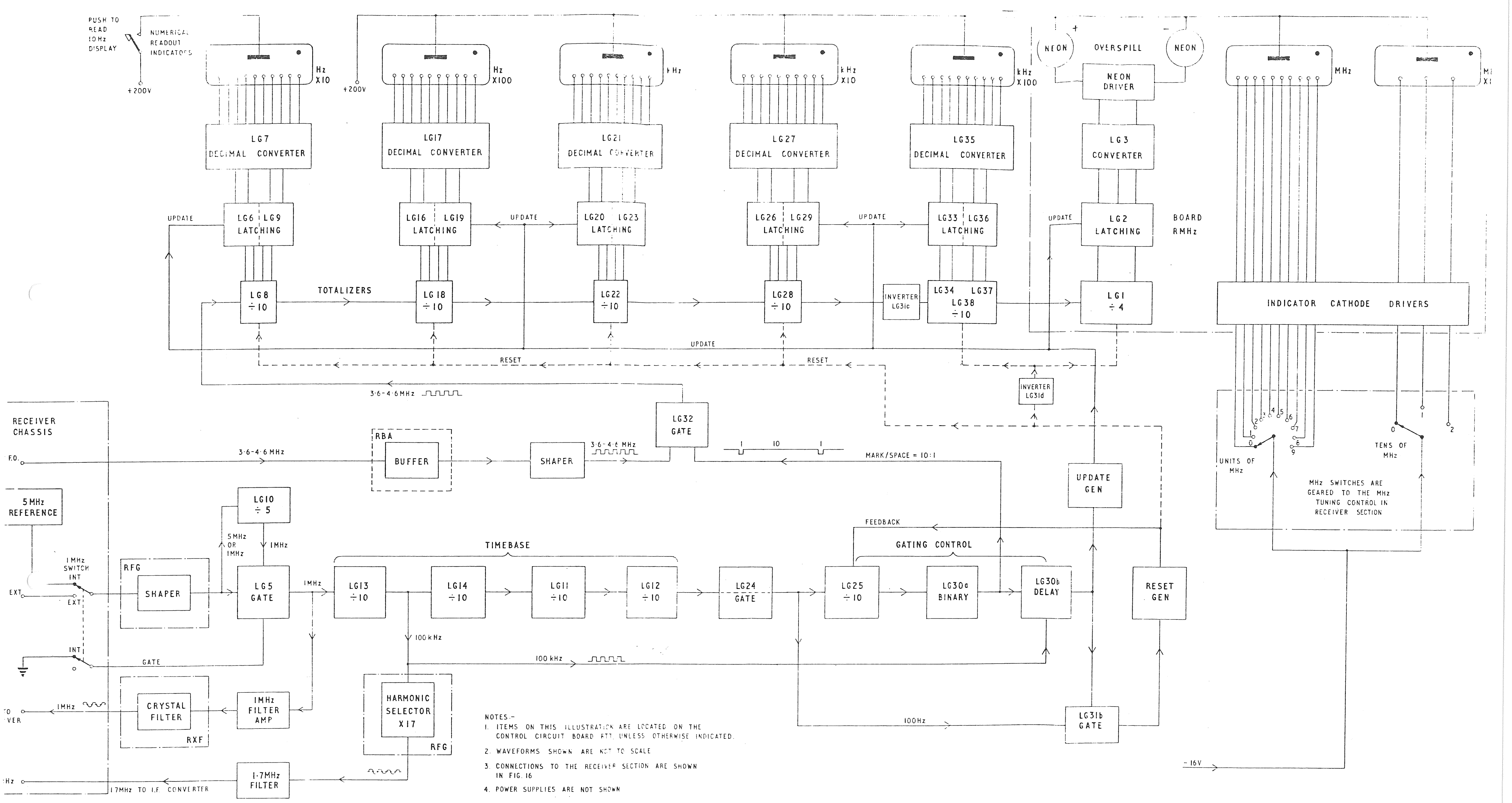
Fig.19



Simplified Block Diagram: Electronic Readout

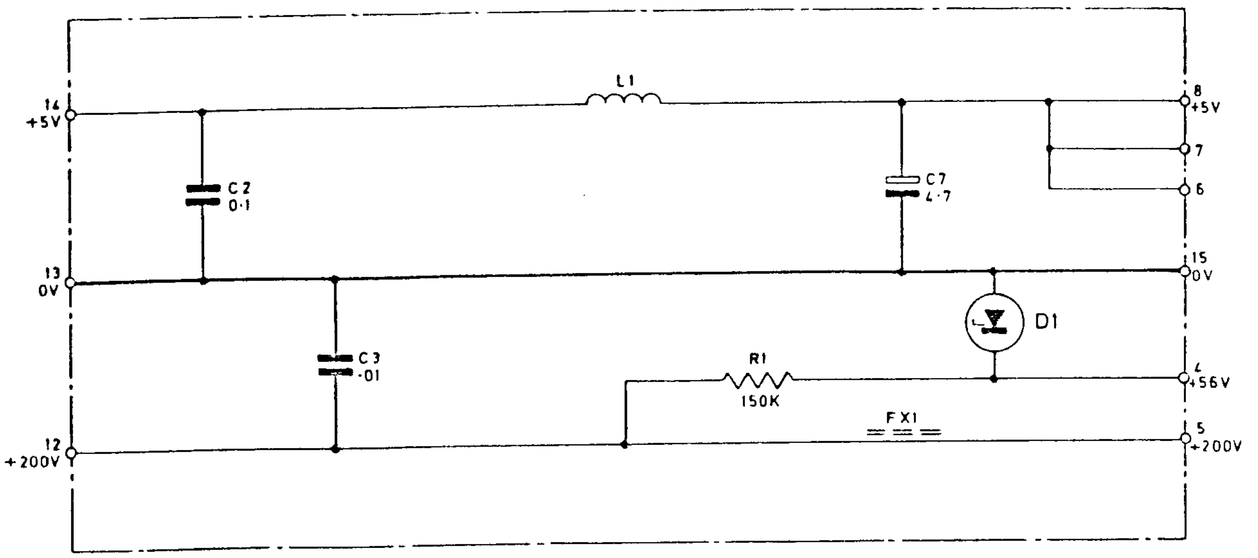
Fig. 20

280/20



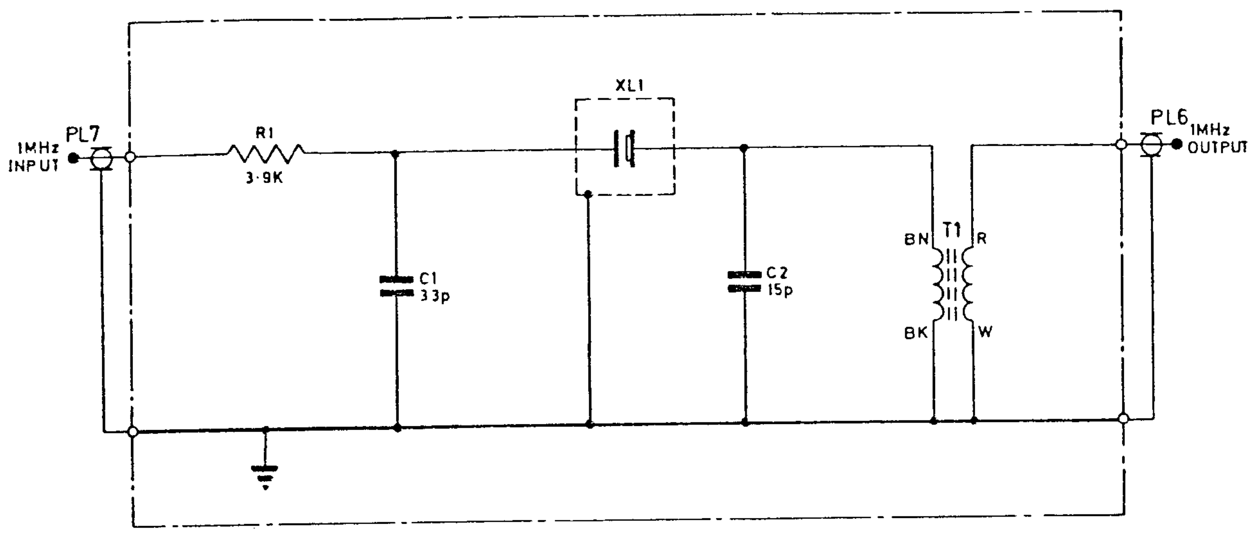
Block Diagram: Electronic Readout Unit

Fig.21



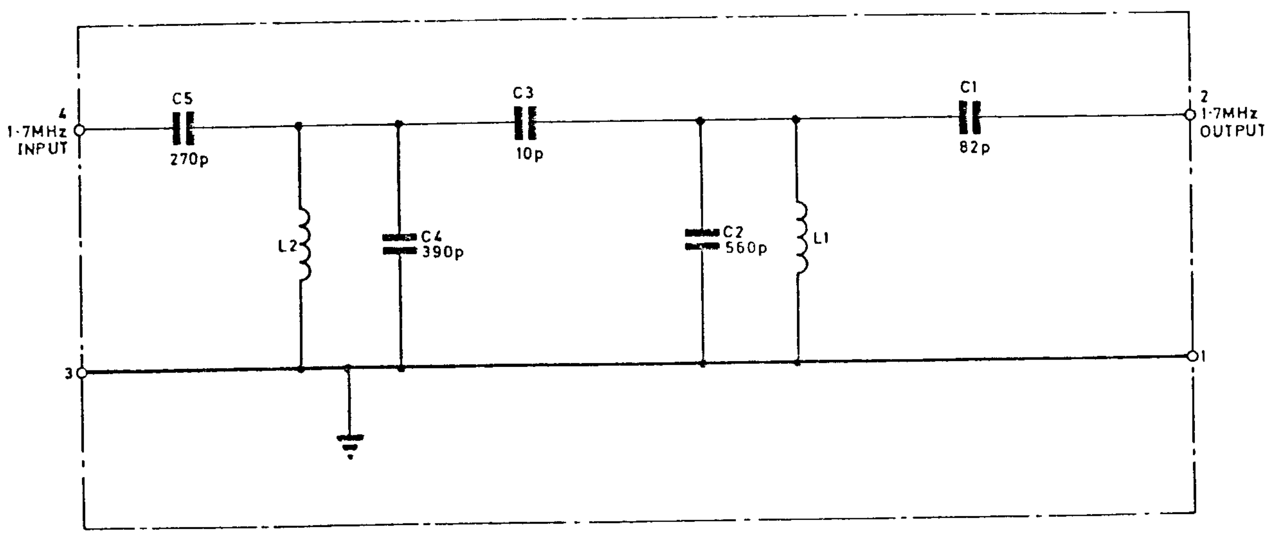
MBC75396
2

Circuit: Power Input Filter



MAC75395
1

Circuit: Crystal Filter RXF



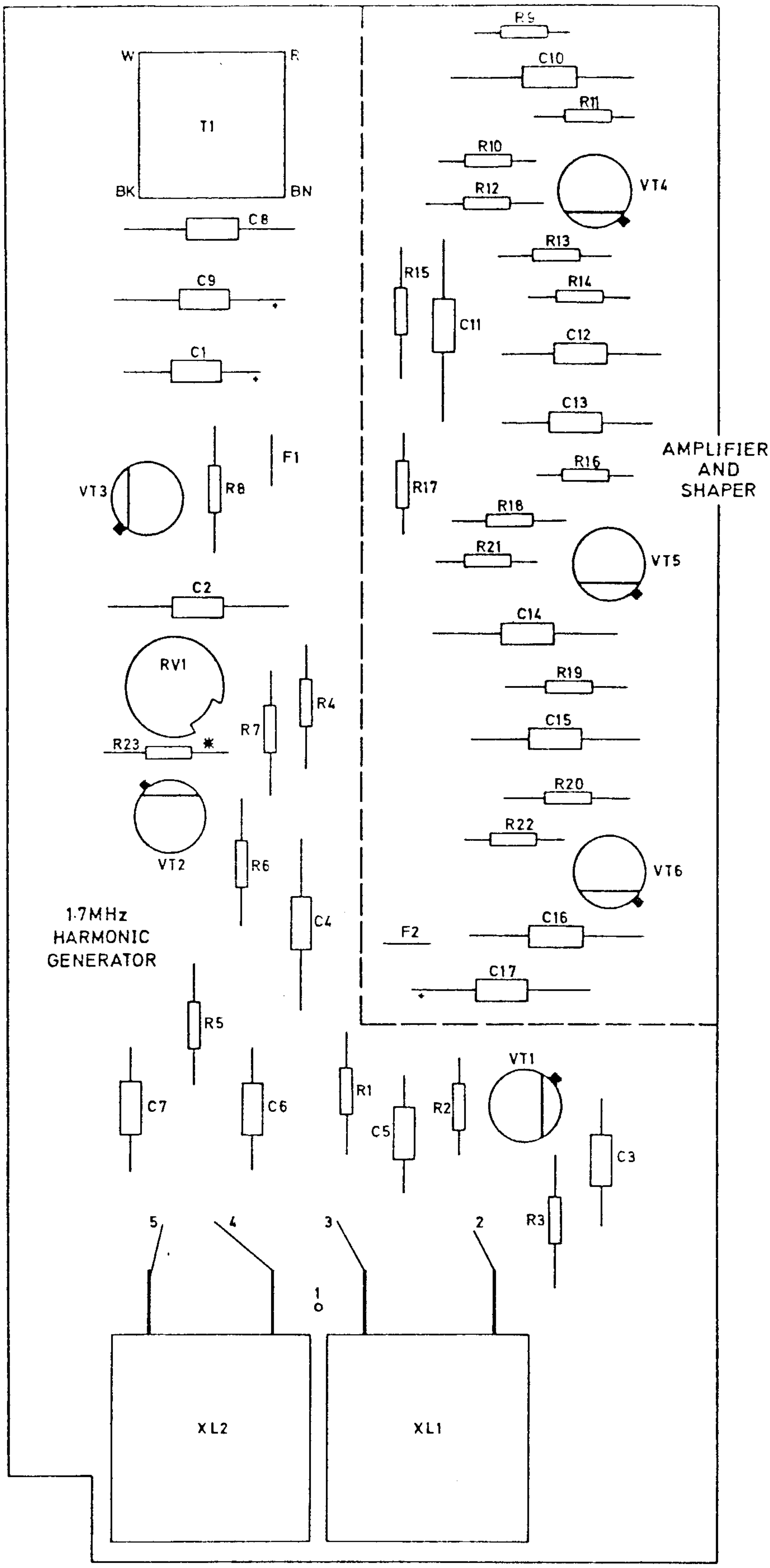
AC41388
1

Circuit: 1·7MHz Filter Board

280/22C

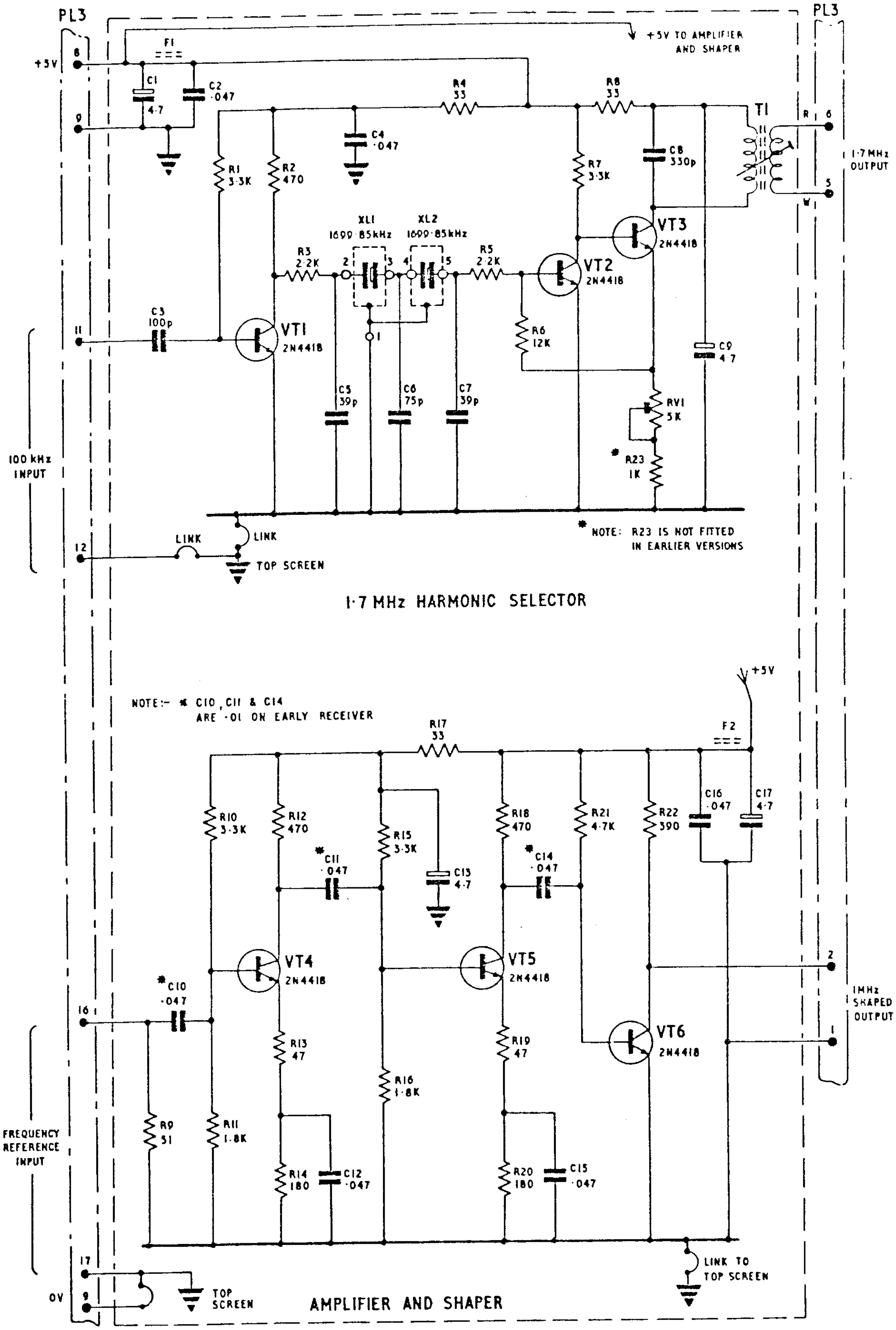
Filter Circuits

Fig. 22



* NOTE : R23 IS NOT FITTED IN EARLIER PRODUCTION OF THE BOARD

Fig. L-23 **Component Layout : RFG Board**



Circuit : Frequency Generator Type RFG

Fig. 23

MCC75220	280/23
2	

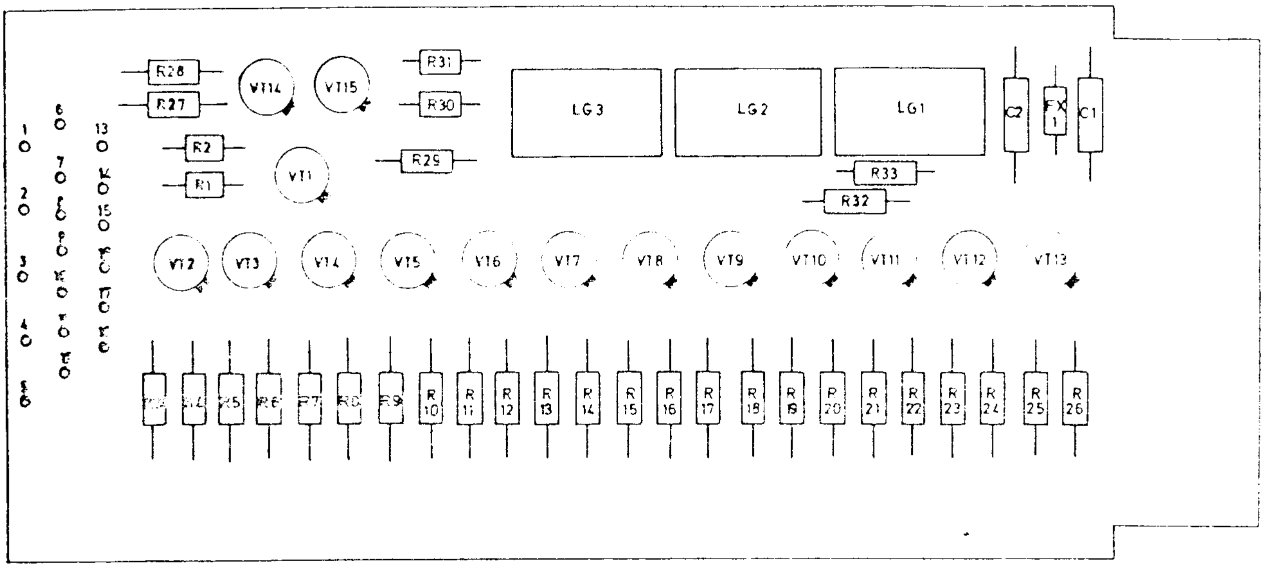
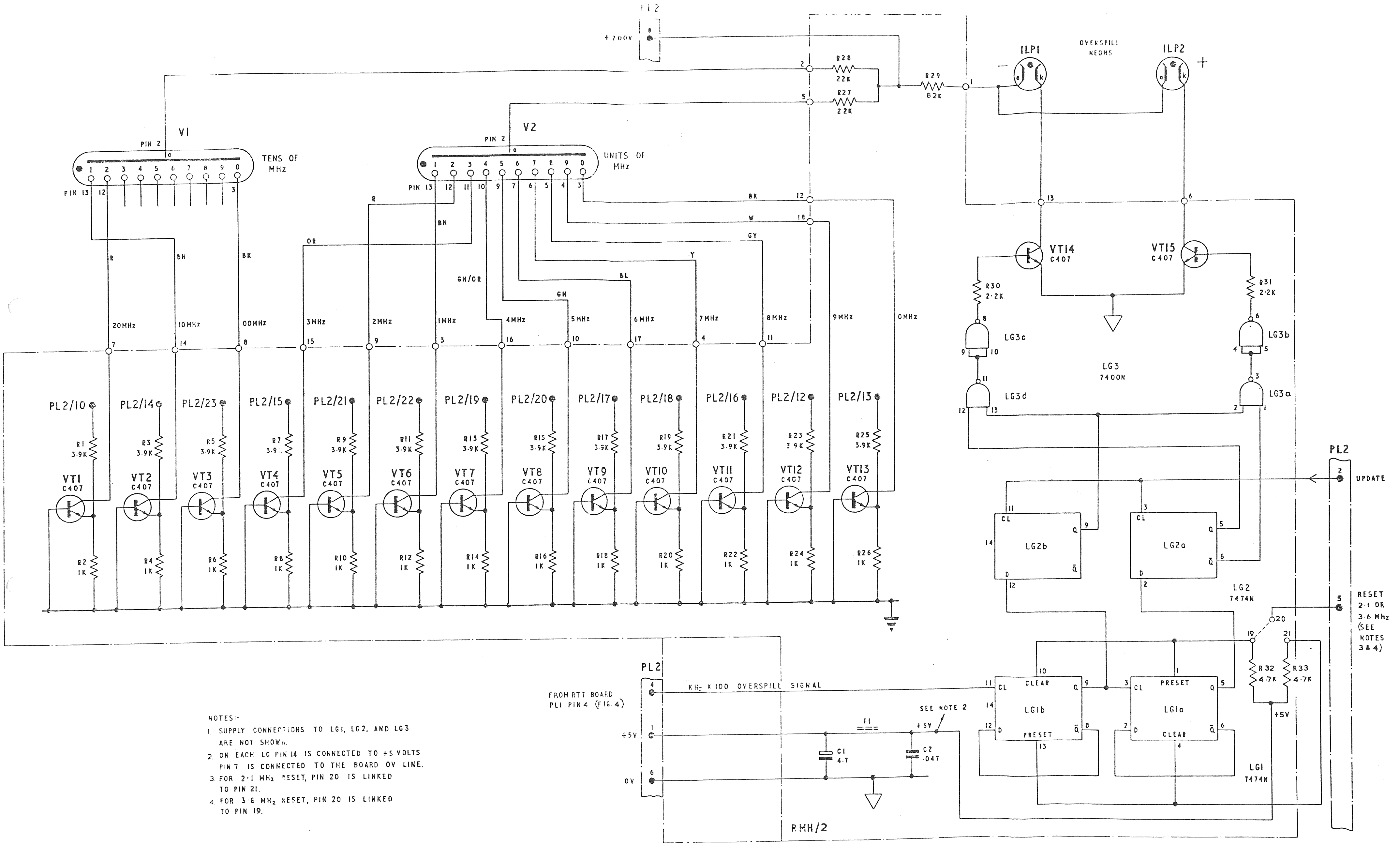


Fig. L-24

Component Layout :
RMH Board

280/L-24



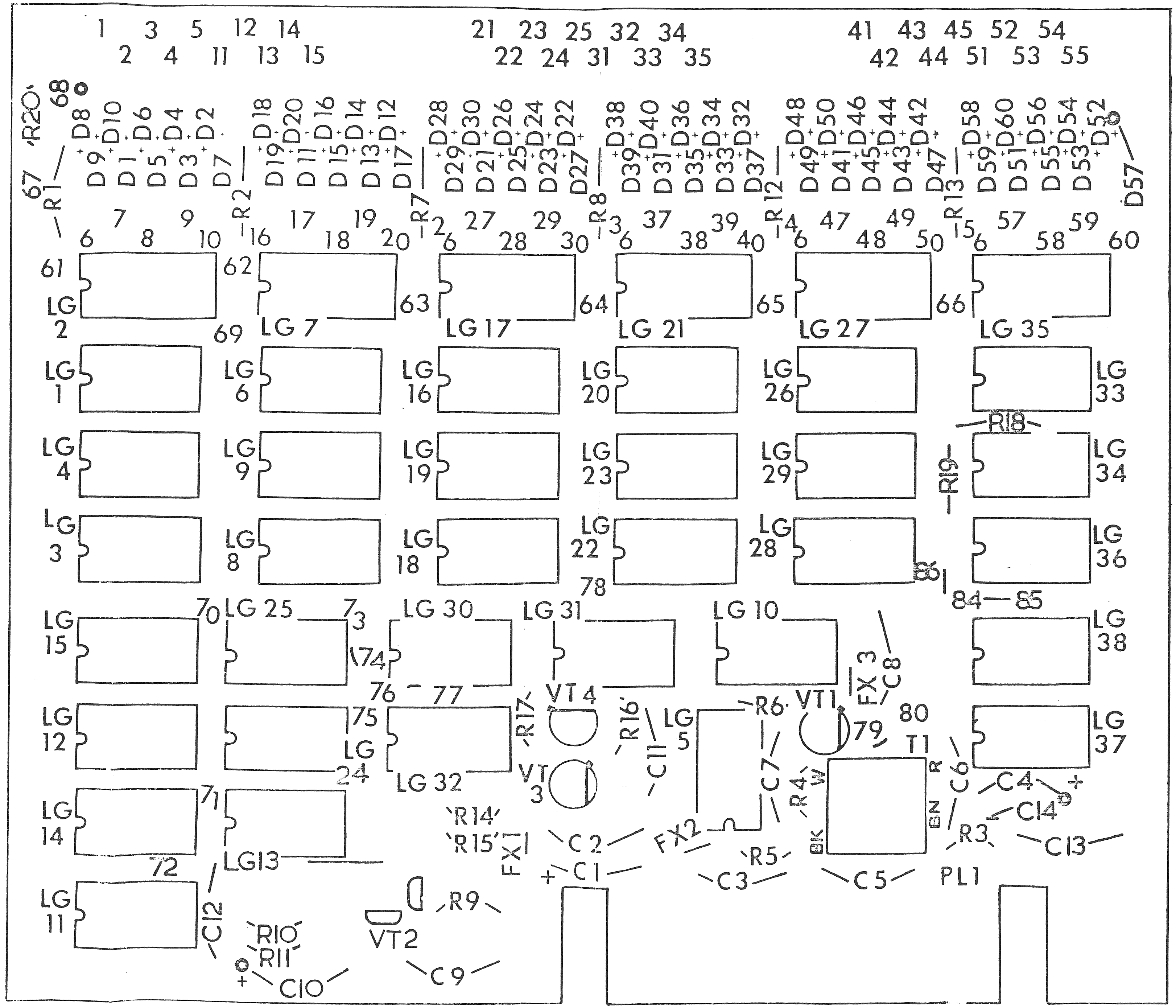
NOTES:-

1. SUPPLY CONNECTIONS TO LG1, LG2, AND LG3 ARE NOT SHOWN.
2. ON EACH LG PIN 14 IS CONNECTED TO +5 VOLTS PIN 7 IS CONNECTED TO THE BOARD OV LINE.
3. FOR 2·1 MHz RESET, PIN 20 IS LINKED TO PIN 21.
4. FOR 3·6 MHz RESET, PIN 20 IS LINKED TO PIN 19.

MCC75255 | 280/24
1 | 2 | 3

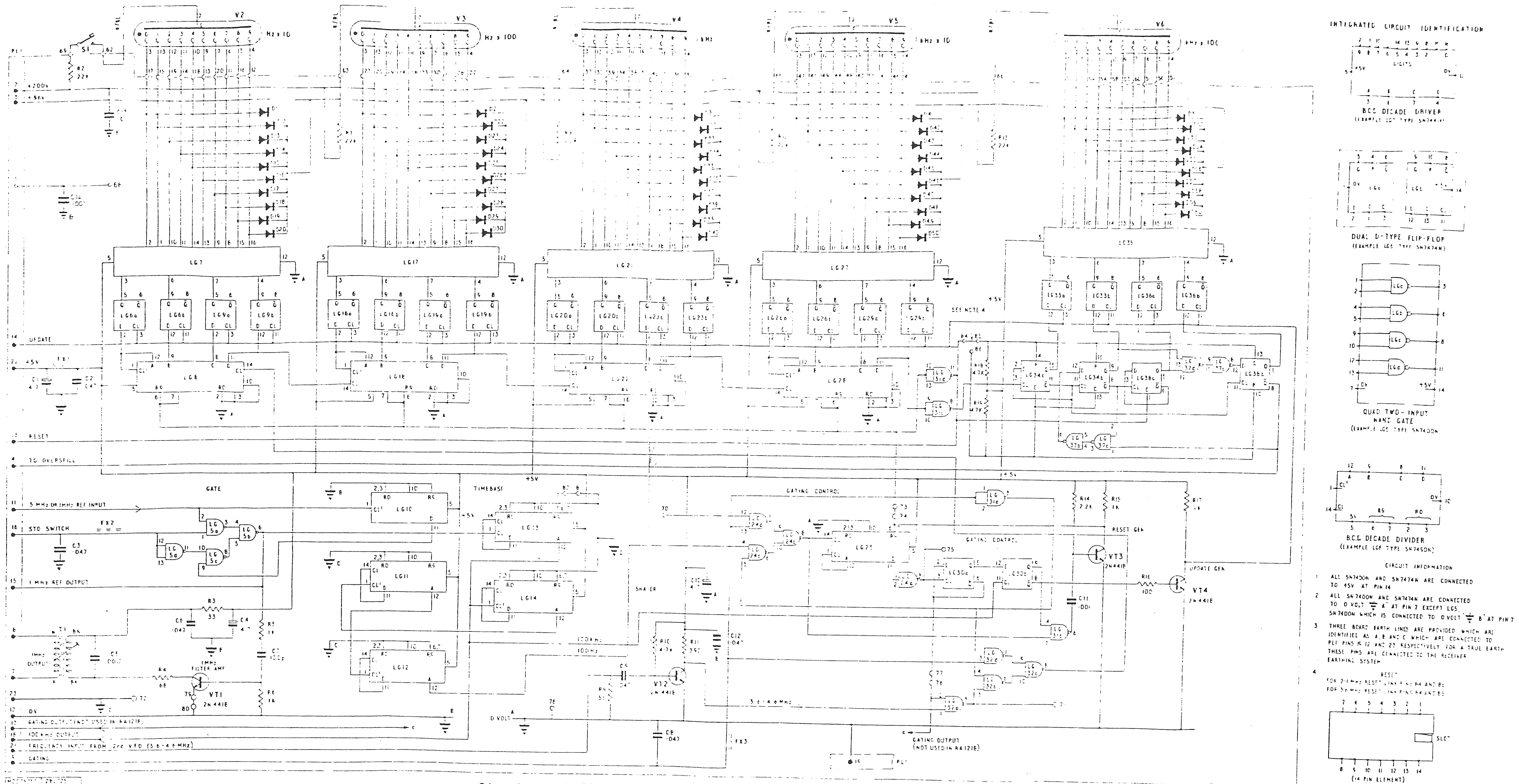
Circuit : MHz Display Assembly Type RMH.

Fig. 24



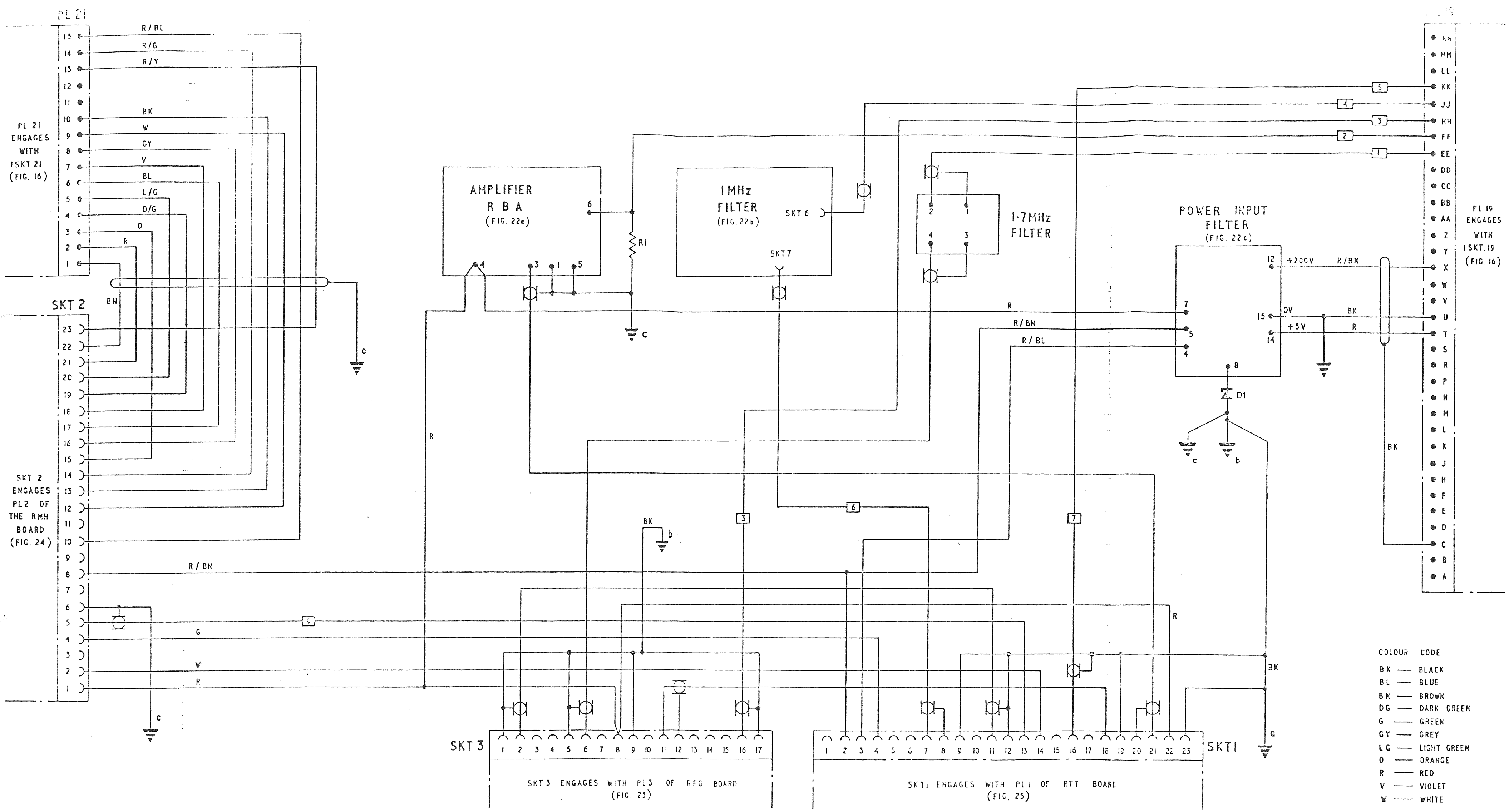
RTT Board

Fig. L-25



Circuit: RTT Module and KHz Display

Fig. 25

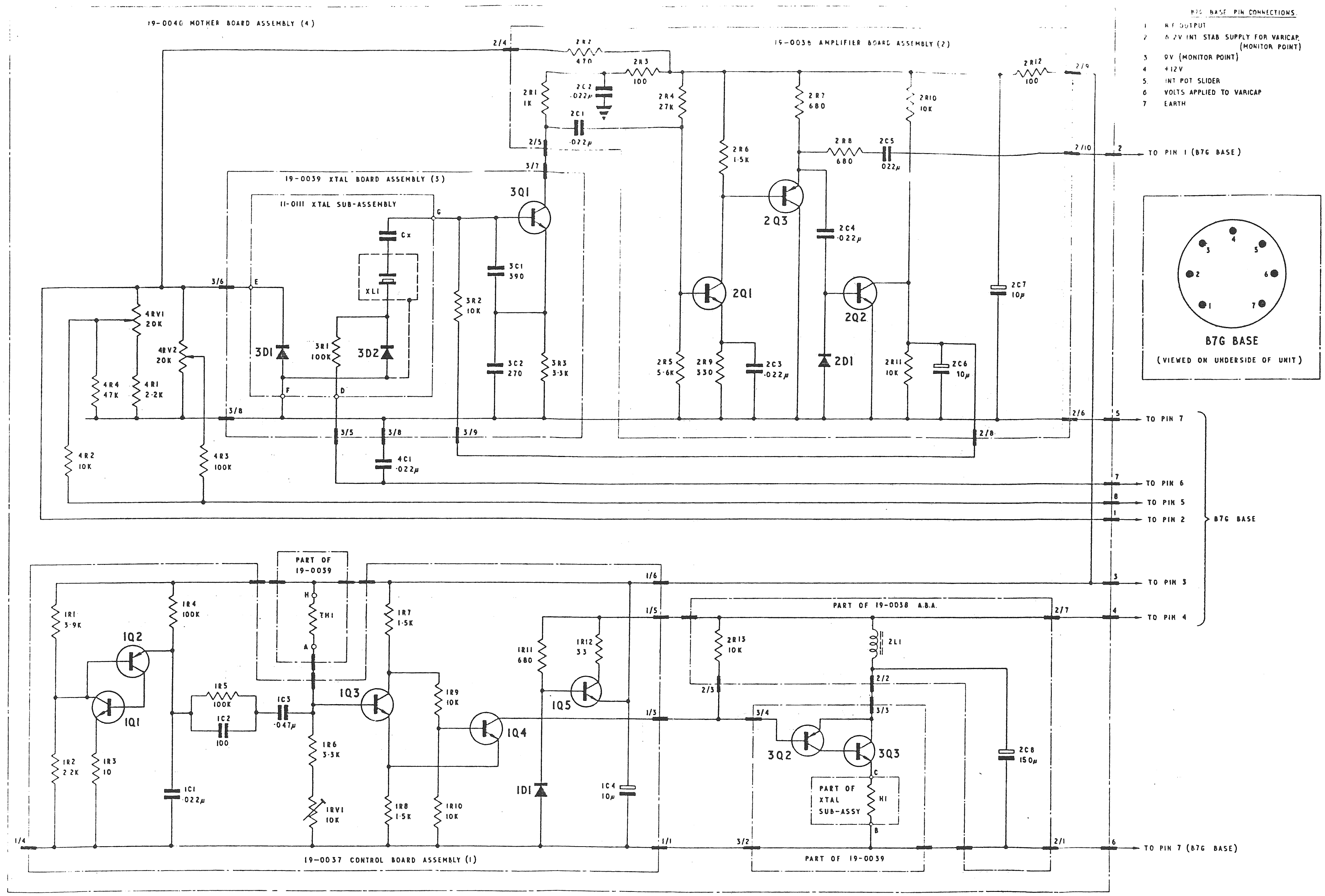


NOTES: 1. CORRECT EARTHING IS IMPORTANT. NOTE THE THREE CHASSIS EARTH SYSTEMS IDENTIFIED BY LETTERS 'a' 'b' AND 'c'.
2. CERTAIN LEADS CARRY NUMBERED SLEEVES INDICATED THUS —[6]—

MBC 75209 | 280/26
2 | 2A | 3 |

Interconnections : Counter and Display Unit RA.1218

Fig. 26



NOTES: 1 TO AVOID AMBIGUITY IN THE COMPONENT CIRCUIT REFERENCES FOR THE SUB-ASSEMBLIES MAKING UP THE 840, PREFIX NUMBERS HAVE BEEN ADDED AS FOLLOWS:

CONTROL BOARD ASSY	19-0037	1
AMPLIFIER BOARD ASSY	19-0038	2
CRYSTAL (5MHz) BOARD ASSY	19-0039	3
MOTHER BOARD ASSY	19-0040	4

2 UNLESS OTHERWISE INDICATED: RESISTORS IN OHMS. CAPACITORS IN PICOFARADS

NOTE 3: THIS CIRCUIT IS FOR GENERAL INFORMATION ONLY. REFER TO THE TYPE 840 TECHNICAL MANUAL FOR SERVICING INFORMATION

280/27

1 2 3

Circuit: Fast Warm Up Oscillator Type 840

Fig. 27