L. F. CONVERTER

TYPE RA. 37A/B

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TECHNICAL SPECIFICATION

TECHNICAL SPECIFICATION

(When used in conjunction with RA. 17 Receiver)

Frequency range	-	12.5 to 980 kc/s
Stability	-	After warm up time of $1\frac{1}{2}$ hours, overall drift less than 150 c/s under conditions of constant supply voltage and ambient temperature.
Input impedance	-	75Ω unbalanced.
Tuning	-	Effective scale length approximately 4'9", i.e. about 6" of scale length corresponds to 100 kc/s.
Sensitivity	-	A1 reception, bandwidth 3 kc/s, 1μV for 20 dB signal/noise ratio. A 3 reception, 30% modulated bandwidth, 3 kc/s, 3μV for 20 dB signal/noise ratio.
Image response	-	With tuned input, external image signals are reduced by at least 60 dB.
Controls	-	Aerial range switch Aerial attenuator Mains on/off Aerial tuning RA. 17/RA. 37 selector switch.
Power supply	-	100-125 and 200-250 volts, 45-65 c/s. Power consumption 11W approximately. H. T. supply from RA. 17 receiver.
Dimensions	-	For rack mounting:

Height	Width	Depth
1.75	19	13 in
4.5	48.25	33 cm

Cabinet containing RA. 17 and RA. 37

Height	Width	Depth
14.25	20.5	21.985 in
36.2	52	55.6 cm

Weight	-	Rack mounted 11 lb. (5 kg) In cabinet with RA. 17, 110 lb (50 kg).

CHAPTER 1

GENERAL DESCRIPTION

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CHAPTER 1

GENERAL DESCRIPTION

Brief Description

1. The L. F. Converter Type RA. 37 is designed primarily to extend the low frequency limit of the RACAL RA. 17 Communications Receiver from 980 kc/s to 12.5 kc/s. The addition of the convertor to the RA. 17 receiver in no way impairs its performance.

2. The equipment, which is basically a frequency convertor for raising the frequency of incoming signals by 2 Mc/s, derives h.t. supplies from the RA. 17 receiver and heater supplies from a built-in mains transformer.

Mechanical details

3. The RA. 37 is assembled on a 19 in. panel for rack mounting. It can be supplied complete with the RA. 17 receiver in a bench mounting cabinet.

4. An alternative version, Type RA. 37B, employs North American valves and aerial connectors. The differences between this version and the RA37 are described in this handbook.

CHAPTER 2

INSTALLATION

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CHAPTER 2

INSTALLATION

Introduction

1. After carefully unpacking the equipment, ensure that all valves and screening cans are firmly in place and that no packing materials remain.

Supply

2. Check that the l.t. transformer taps are set to the correct supply voltage. Connect a mains lead (not provided) to the 3-pin plug already installed in the mains input socket. On North American versions of the RA. 37, a mains lead is already fitted to the equipment which can be connected directly to the available supply.

Fuse

3. Ensure that the rating of the supply fuse (F1) is correct, viz. 250 mA.

Aerial

4. Connect a suitable aerial to the AERIAL input plug on the rear of the unit. The input impedance of the convertor at the coaxial aerial plug is designed to match a 75Ω un balanced transmission line.

Connections to RA. 17

5. The following connections between the RA. 37 and the RA. 17 should be made with the connectors supplied:-

(a) Coaxial connectors

RA. 37	RA. 17
R. F. OUTPUT	R. F.
1 MC/S INPUT	1 MC/S

(b) 3-way connector

RA. 37	RA. 17
HT 1	HT 1
HT 2	HT 2
AVC	AVC

6. The two coaxial connectors are of different length and the correct one to use will be obvious. The 3-way connector consists of two red wires and a white wire coded at either end with coloured sleeves to aid identification. The white wire should be used for the AVC connection.

Installation of RA. 17

7. The RA. 17 receiver should be installed and connected in accordance with the instructions in the RA. 17 handbook.

CHAPTER 3

OPERATION

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CHAPTER 3

OPERATION

Introduction

1. These instructions should be used in conjunction with those for the RA. 17 Receiver, all controls of which remain operative, when operating between 12.5 kc/s and 980 kc/s, with the exception of MEGACYCLES, AE TUNE (ANT TUNE), AE RANGE MC/S (ANT RANGE MC/S) and AE ATTENUATOR (ANT ATTENUATOR). Control designations shown in brackets apply to North American versions of the RA. 17 receiver and RA. 37 convertor.

Preliminary

2. (1) Set the RA. 17 MAINS (POWER) switch to "on") "down" for British.

(2) Set the RA. 37 MAINS (POWER) switch to "on") "up" for North American.

Tuning - 12.5 to 980 kc/s

3. (1) Set RA. 37 OPERATION switch to 12KC/S-980KC/S.

(2) Set RA. 37 AE RANGE (ANT RANGE) to WIDEBAND or to the desired frequency band.

NOTE: The tuned aerial input circuits are intended for use where strong adjacent channel interference is present.

(3) Set the RA. 37 AE ATTENUATOR (ANT ATTENUATOR) to MIN.

(4) Adjust the calibration of the RA. 17 Receiver in accordance with the instructions in the RA. 17 handbook.

(5) Set the RA. 17 system switch to MAN.

(6) Rotate the KILOCYCLES control to the desired setting on the red scale.

(7) If the AE RANGE (ANT RANGE) switch is not set to WIDEBAND, adjust the AE TUNE (ANT TUNE) control on the RA. 37 for maximum signal (or noise).

(8) Set the RA. 17 system switch to A. V. C. if required.

(9) All remaining adjustments on the RA. 17 Receiver are carried out in accordance with the RA. 17 handbook.

Tuning - 980 kc/s to 30 Mc/s

4. (1) Set RA. 37 OPERATION switch to 980KC/S-30MC/S.

(2) Operate the RA. 17 Receiver in accordance with the RA. 17 handbook.

Aerial tuning

5. If maximum sensitivity is not required, the aerial need not be tuned except when strong unwanted signals are present. The presence of very strong signals, anywhere within the spectrum, may cause cross-modulation unless the aerial is tuned. Under these conditions, CARE MUST BE TAKEN TO AVOID TUNING THE INPUT TO THE INTERFERING SIGNALS instead of the signal required. Familiarity with the tuning controls will obviate this possibility.

Aerial attenuator

6. The AE ATTENUATOR (ANT ATTENUATOR) control enables the operator to reduce the level of all incoming signals when very strong unwanted signals are present which cannot be rejected sufficiently by tuning the aerial. It should also be employed if the required signal is causing overloading in the early stages of the receiver.

CHAPTER 4

BRIEF TECHNICAL DESCRIPTION

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CHAPTER 4

BRIEF TECHNICAL DESCRIPTION

Introduction

1. This section describes, with the aid of the block diagram (fig. 1), the basic operation. For a more detailed explanation of the convertor, Section 5 (DETAILED CIRCUIT DESCRIPTION) should be read.

R. F. Amplifier and filter

2. Input signals from the aerial are applied via the aerial attenuator to the R. F. Amplifier. Wide-band or tuned (12.5 to 980 kc/s) amplification can be selected according to reception conditions. The output is passed through a 1 Mc/s low-pass filter to eliminate image signals.

Harmonic generator and filter

3. Output from the 1 Mc/s crystal oscillator of the RA. 17 receiver is fed to the harmonic generator. The band-pass filter in the output circuit selects the 2 Mc/s second harmonic.

Mixer.

4. The output from the low-pass filter is mixed in M5 with the output from the 2 Mc/s band-pass filter. The selected output from the mixer is the sum frequency in the band 2.0125 to 2.98 Mc/s.

Cathode-follower

5. The output from the mixer is applied to a cathode-follower, the low-impedance output of which is applied to the input of the second I. F. amplifier (2-3 Mc/s) stage of the RA. 17 receiver at low impedance. The required signal is finally selected in the interpolation stage of the RA. 17 receiver by tuning the KILOCYCLES scale.

CHAPTER 5

DETAILED CIRCUIT DESCRIPTION

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CHAPTER 5

DETAILED CIRCUIT DESCRIPTION

Aerial circuit. (Fig. 5)

1. An aerial source, normally of 75 ohms impedance, is connected through a five position attenuator switch (S2), covering an attenuation range of 0 to 40 dB, to an r.f. amplifier. Switch S1 selects wide-band amplification or any one of the four aerial coils L2, L4, L6, and L8, for tuned operation. The aerial coils are tuned by C5 for the ranges 100-330 kc/s and 330-980 kc/s. In the 12.5-37 kc/s and 37-110 kc/s ranges, C3 and C5 in parallel make up the tuning capacitor. The resistor R4 is included in the 12.5 -37kc/s tuned circuit (L2) to provide an adequate bandwidth.

R.F. amplifier

2. In the WIDE BAND position, the signal from the aerial attenuator is fed via capacitor C1 and grid stopper R13 to the control grid of the r.f. amplifier (V1). This grid is returned to the a.v.c. line via S1C and R11. When tuned input is employed, one end of the selected tuned circuit is connected to the control grid and the other is returned to the a.v.c. line. There are two stages of filtering in the a.v.c. line, they are C2, R12 and C4, R123; R123 is situated in the RA.17 receiver. The anode load resistor R16 matches the output impedance of the amplifier to the characteristic impedance of the filter. R17 allows the screen potential of V1 to rise when a.v.c is applied, thereby controlling the effectiv a.v.c. action.

1 Mc/s low-pass filter

3. The amplified signal is fed to a low-pass filter consisting of three constant-K sections preceded and terminated by m-derived end-sections. Cut-off takes place at 980 kc/s. The output from the filter is passed through the coupling capacitor C23 to the filter terminating resistor R23.

Harmonic generator and 2 Mc/s band-pass filter

4. The 1 Mc/s crystal-controlled output from the RA.17 receiver is passed via capacitor C10 and grid stopper R21 to the control grid of the harmonic generator (V2). R20, decoupled by C10, provides bias for this valve which operates in a non-linear condition. The anode load consists of a tuned circuit (L16, C17) which is the first stage of a 2 Mc/s band-pass filter. Thesecond tuned circuit of the filter is formed by L17, L18 and C22

coupled by L18 to the third tuned circuit L18, L20, C24 and C27. Inductive coupling is provided to the balanced output winding L21. This filter has a bandpass of 50 kc/s, ensuring that only the 2 Mc/s harmonic is fed to the mixer.

Balanced mixer

5. The signal across the terminating resistor R23 is fed via the grid stopper R35 (omitted in North American versions) to the control grid of V3. V3 and V4 form a balanced mixer in which the incoming signal is mixed with the output of the 2 Mc/s band-pass filter to produce an output lying between 2 and 3 Mc/s. The 2 Mc/s voltage is applied to grid 3 of V3 and V4 in anti-phase. R24 and R26 provide a correctly balanced load for the harmonic generator output. The 2 Mc/s component produced in in the mixer balances out in the common anode load of V3 and V4. This anode load consists of L19 and R27. L19 (adjustable by iron dust core) is tuned by stray capacitance to 2.7 Mc/s and is heavily damped by R27 to provide wide-band tuning covering the frequency range 2-3 Mc/s. The potentiometer RV1 equalises the gains of V3 and V4, and the differential capacitor C28 equalises the phase-shifts in these two valves to enable a precise balance to be achieved. The h.t. supply for the valves is stabilised by V5. The 2-3 Mc/s output from the mixer is fed through C33 and the grid stopper R31 to the control grid of the cathode-follower.

Cathode-follower.

6. The cathode-follower stage (V6) enables the signal to be fed to the low-impedance tapping in the 2-3 Mc/s band-pass filter in the RA.17 reciever. The cathode load is formed by L23 and the input impedance of the band-pass filter. Resistor R33 is included to bias the valve to the correct operating conditions.

Power supplies

7. The h.t. supply is obtained from the RA.17 receiver by setting the OPERATION switch to 12.5-980 kc/s. When the switch is in this position, h.t. is disconnected from the first VFO unit and the 2nd mixer in hte receiver and is applied to the convertor.

8. The heater supply is obtained from a mains transformer contained within the L.F. convertor.

9. The mains input switch is interlocked with the h.t. circuit to prevent h.t. being fed to the convertor when heater voltage is not applied to the valves.

SECTION 2

MAINTENANCE

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CHAPTER 1

TEST EQUIPMENT REQUIRED FOR MAINTENANCE

IMPORTANT NOTE

The RA. 37 convertor is designed for use with the Racal RA. 17 Communications Receiver. The ensuing sections assume that this convertor is connected to a receiver which is operating to the correct specification.

1. The following items of test gear are required to carry out the maintenance described in this part of the handbook:-

(a) Valve-voltmeter reading up to 5.0 volts at frequencies up to 3.0 Mc/s.

(b) Signal Generator capable of operating on fundamental frequencies up to 3.0 Mc/s.

(c) Multi-range meter measuring a.c. and d.c. up to 500 volts with resistance of 20 000 ohms per volt.

(d) Voltage changing auto-transformer, preferably of the continuously variable type, operating up to 250 volts and supplying 120 watts.

(e) Coupling aids: viz. 0.1μF capacitor, 330 ohm resistor, 75 ohm matching pad for the Signal Generator.

CHAPTER 2

VALVE DATA

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CHAPTER 2

VALVE DATA.

Valve connections

1.

Pin No.	CV. 138 EF91	CV454 EF93	CV1832 150C2	CV2209 6F33
1	Grid 1	Grid 1	Anode	Grid 1
2	Cathode	Grid 3	Cathode	Cathode
3	Heater	Heater		Heater
4	Heater	Heater		Heater
5	Anode	Anode	Anode	Anode
6	Grid 3	Grid 2		Grid 3 Diode
7	Grid 2	Cathode	Cathode	Grid 2
Base	B7G	B7G	B7G	B7G

Valve Complement and typical voltages

2.

Cct. Ref	CV No.	Equivalent	Anode	Screen	Cathode
V1	CV454	EF93	155(5)	95 (6)	0.85(7)
V2	CV138	EF91	205(5)	100(7)	-
V3	CV2209	6F33	150(5)	150(7)	2.0 (2)
V4	CV2209	6F33	150(5)	150(7)	2.0 (2)
V5	CV1832	150C2	150(1)	-	-
V6	CV138	EF91	205(5)	195(7)	1.25(2)

3. The above voltage-to-chassis measurements are approximate and are measured with a d.c. meter of 20 000 ohms per volt, the convertor and the receiver being in a quiescent state.

4. RV1 is set to mid-travel and the I.F. GAIN in the receiver is set at MAX.

5. The potential at terminal HT. 1 is +200V.

CHAPTER 3

TYPICAL PERFORMANCE

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CHAPTER 3

TYPICAL PERFORMANCE

Stability

1. After a warm-up time of $1\frac{1}{2}$ hours, overall drift is less than 150 c/s under conditions of constant supply voltage and ambient temperature.

Sensitivity

2. (a) A1 emission, bandwidth 3 kc/s:-
1μV for 20 dB signal-to-noise ratio.

(b) A3 emission 30% modulation, bandwidth 3 kc/s:-
3μV for 20 dB signal-to-noise ratio.

Selectivity

3.

	-6dB	-66dB
Position 1	100 c/s)	
" 2	300 c/s)	Less than 3.5 kc/s
" 3	750 c/s)	
" 4	1.2 kc/s	8 kc/s
" 5	3 kc/s	15 kc/s
" 6	8 kc/s	30 kc/s

4. The centre frequency on the crystal bandwidths does not change by more than 50 c/s when the bandwidth is changed.

Cross modulation

5. Using the aerial attenuator with a tuned input, an i.f. bandwidth of 3 kc/s and a wanted signal amplitude of 1 mV then an unwanted signal, differing by 10 kc/s and modulated 30%, must have a level at least 30 dB greater than the wanted signal in order to produce a cross modulation output equivalent to 1% modulation of the wanted signal.

Image and spurious responses

6. Rejection is greater than 60 dB with a tuned input. Internally generated spurious responses are not greater than 1 dB above noise.

Automatic volume control

7. An increase in signal strength of 20 dB above 1μV improves the signal-to-noise ratio by 18 dB.

8. An increase of 70 dB above the a.v.c. threshold increases the audio output by not more than 6 dB.

CHAPTER 4

FAULT LOCATION

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CHAPTER 4

FAULT LOCATION

Signal input circuits

1. If the R. F. Stage is functioning correctly, a rise of noise will occur when the input circuit is tuned through the frequency to which the kilocycle scale is set. Should this not occur, check the aerial input and the attenuator circuits.

R. F. Stage

2. Should no signal be received, switch on the b. f. o. and set the RED KILOCYCLES scale to zero. A strong 2 Mc/s carrier from the harmonic generator should be heard. If this signal is received, adjust the balanced mixer in accordance with para. 5. If the mixer can be balanced, the fault is in the R. F. stage or low-pass filter.

Mixer stage

3. If the 2 Mc/s signal is not received, carry out the following check:-

(1) Ensure that the stabilizer V5 has ignited.

(2) Check with the valve-voltmeter that at least 2 volts of 1 Mc/s drive is present at SK2.

(3) Remove V3, V4 and V5 and check that 0. 8 volts at 2 Mc/s appears at pin 6 of the valve holders of both V3 and V4.

4. Should this drive be present the fault lies in the balanced mixer, the cathode-follower, or the connection between the R. F. OUTPUT socket and the 2-3 Mc/s band-pass filter in the RA. 17 receiver.

Voltage stabilizer

5. Should V5 fail to function then the balance will drift rapidly.

See over page for Table 1.

TABLE 1

Representative Test Data

Signal Input To	Frequency	Input	Output	Remarks
(a) Grid V6 (1)	2.0 Mc/s	220µV	100µA R.F. level	3 kc/s bandwidth system switch to MAN.
	2.5 Mc/s	225µV	100µA R.F. level	I.F. GAIN MAX; B.F.O. OFF;
	3.0 Mc/s	250µV	100µA R.F. level	1 Mc/s input to PL2 disconnected
(b) Drive to PL2	1.0 Mc/s	2.0V	0.5V at V3 (6) 0.5V at V4 (6)	System switch to MAN; use valve-voltmeter.
(c) Grid V3 (1)	12 kc/s	200µV	100µA R.F. level	3 kc/s bandwidth; system switch to MAN;
	500 kc/s	150µV	100µA R.F. level	I.F. GAIN MAX; B.F.O. OFF;
	980 kc/s	200µV	100µA R.F. level	1 Mc/s input to PL2.
(d) Aerial socket PL1	12 kc/s	20µV	100µA. R.F. level	3 kc/s bandwidth; system switch to MAN;
	500 kc/s	15µV	100µA R.F. level	I.F. GAIN MAX; B.F.O. OFF;
	980 kc/s	20µV	100µA R.F. level	1 Mc/s input to PL2; RA.37 AE RANGE (ANT RANGE) to WIDEBAND; RA.37 AE ATTENUATOR (ANT ATTENUATOR) TO MIN.

Note...

The numerals in brackets indicate the valve pin number.

CHAPTER 5

ALIGNMENT PROCEDURE

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CHAPTER 5

ALIGNMENT PROCEDURE

Standardization of RA. 17 sensitivity

1. (1) Connect the signal generator (matched to 75 ohms) via a 0.1μF capacitor to the R. F. socket of the RA 17 receiver.

(2) Set the I. F. GAIN to maximum.

(3) Set the BANDWIDTH to 3 kc/s.

(4) Set the meter switch to R. F. LEVEL.

(5) Set the System switch to MAN.

(6) Record the c. w. input required to produce 100μA of diode current in the R. F. LEVEL meter at 2.0 Mc/s, 2.5 Mc/s and 3.0 Mc/s (i. e. with the RED scale set to 0 kc/s, 500 kc/s and 1,000 kc/s respectively).

(7) Connect the RA. 37 convertor correctly to the RA. 17 receiver, but do not connect the aerial.

NOTE: The above results should be used as standards during subsequent measurements described below.

Harmonic generator

2. (1) Ensure that the dust covers are fitted to the harmonic generator.

(2) Set C28 to the mid- position.

(3) Connect the valve-voltmeter between grid 3 of V3 (Pin 6) and earth.

(4) Adjust L16, L17, C27 in turn to obtain maximum output. With the correct adjustment this output should not be less than 0.5V.

(5) Remove the valve-voltmeter from V3 and connect it to grid 3 of V4 (pin 6). This reading should be within 0.05V of the previous reading.

Balanced Mixer anode circuit

3. (1) Disconnect the coaxial lead between the R. F. OUTPUT socket of the RA. 37 and the R. F. socket of the RA. 17.

(2) Connect the valve-voltmeter in parallel with a 330 ohm resistor across the R. F. OUTPUT socket of the RA. 37.

(3) Connect the signal generator (set to C. W.) via a 0. 1μF capacitor to grid 7 of V3 (pin 1).

(4) Set the valve-voltmeter to the 1. 5V range.

(5) Observe that the frequency response is sensibly level as the signal generator frequency is swept over the range of 2-3 Mc/s.

(6) Adjust L19 to obtain maximum output at 2. 7 Mc/s.

(7) Disconnect the valve-voltmeter and replace the coaxial lead between the R. F. OUTPUT socket of the RA37 and the R. F. socket of the RA. 17.

4. With correct alignment the inputs required to produce 100μA of diode current should be approximately those stated in the table below:-

Sig. Gen. Frequency	RED scale setting	Max, input relative to that obtained in para. 1	
		RA. 37	RA. 37B
2.0 Mc/s	0 kc/s	-6 dB	-8 dB
2.5 Mc/s	500 kc/s	-10 dB	-12 dB
3.0 Mc/s	1000 kc/s	-10 dB	-12dB

Balanced mixer adjustment and drift measurements.

5. (1) Set the RED KILOCYCLES scale on the RA. 17 receiver to zero.

(2) Set the I. F. GAIN control to MIN.

(3) Set the meter switch to R. F. LEVEL.

(4) Connect the mains supply to the RA. 17 and RA. 37 via a voltage changing auto-transformer and set this transformer to supply the voltage to which the tappings of the receiver and convertor transformers are set.

(5) With no signal input, adjust RV1 and C28 alternately to minimum diode current, increasing the setting of the I. F. GAIN control as necessary.

(6) Reduce the input voltage by 10% and allow sufficient time for the heater temperature to stabilize.

(7) Adjust the I. F. GAIN to provide a suitable reference reading on the R. F. LEVEL meter.

(8) Disconnect the coaxial lead from the R. F. OUTPUT socket of the RA. 37 and connect the lead via a 0. 1μF capacitor to the signal generator.

(9) Tune the signal generator to 2 Mc/s (C. W.). The output required to produce the reference R. F. LEVEL current should not exceed 50 mV.

(10) Repeat the above with the mains input voltage set to 10% above the nominal supply voltage.

(11) The output required from the signal generator should not exceed 50mV as above.

(12) Replace the coaxial lead to the R. F. OUTPUT socket.

Low-pass filter.

6. (1) Set I. F. GAIN to MAX.

(2) Set the System switch to STANDBY.

(3) Connect the 1 MC/S output plug (RA. 17) to the 1 MC/S INPUT plug (RA. 37)

(4) Connect the signal generator (75 ohms output impedance) to the RA. 37 AERIAL plug (ANTENNA socket).

(5) Set the AE ATTENUATOR (ANT ATTENUATOR) to MIN.

(6) Set the RA. 37 AE RANGE switch (ANT RANGE) to WIDEBAND.

(7) Remove V3 and connect a valve-voltmeter to grid 1 (pin 1) of the valveholder.

(8) Remove V4 and V5.

(9) Set the System switch to MAN.

(10) Adjust the frequency of the signal generator to precisely 1030 kc/s (C W.)

(11) Tune the RA. 17 receiver and adjust the signal generator output until the valve-voltmeter reads 2V approximately.

(12) Increasing the signal generator output as necessary to a limit of 800mV, adjust L13 to obtain a minimum indication on the valve-voltmeter.

(13) Repeat the above procedure with the signal generator frequency set precisely to 1080 kc/s, adjusting L9 to obtain minimum output.

(14) Set the signal generator to 500 kc/s with an output of 100 mV. Ensure that the valve-voltmeter reading is not less than 0.8V.

(15) Explore the passband from 12 kc/s to 980 kc/s. The response obtained should be within the limits of +1dB and -3dB relative to the level at 500 kc/s.

(16) Adjust L10, L11 and L12 as necesary to correct the response in the region of 900-980 kc/s.

(17) With an input level of 800mV, ensure that no indication is obtained, on the 1.5V range of the valve-voltmeter, above 1020 kc/s.

(18) Remove the valve-voltmeter and signal generator.

(19) Replace V3, V4 and V5.

R. F. Tuned circuit

7. (1) Remove V1 and connect the valve-voltmeter to grid 1 (pin 1) of the valveholder.

(2) Connect the signal generator to the RA. 37 AERIAL plug (ANTENNA socket).

(3) Set the AE RANGE (ANT RANGE) switch to 330-980 kc/s.

(4) Set the signal generator to 315 kc/s and tune the RA. 17 receiver.

(5) Rotate the AE TUNE (ANT TUNE) control (capacitor C5) fully clockwise.

(6) Adjust L8 to obtain maximum output.

(7) Set the signal generator to 990 kc/s and ensure that the aerial (antenna) tuning capacitor C5 can be tuned through resonance.

(8) Repeat the above procedure at ranges and frequencies stated in the table below:-

Range.	Frequency	Adjustment
330-980 kc/s	315 kc/s 990 kc/s	L8
110-330 kc/s	105 kc/s 350 kc/s	(a)
37-110 kc/s	34 kc/s 120 kc/s	L4
12-37 kc/s	12 kc/s 40 kc/s	(a)

Note (a) Fixed inductors are used on the 12-37 kc/s and 100-330 kc/s ranges. Ensure that the frequencies are fully covered on these ranges.

(9) Ensure that the input required to produce 1.0 V deflection on the valve-voltmeter does not exceed the value stated in the table below:-

Range	Frequency	Adjustment
12-37 kc/s	12 kc/s	88 dB relative to 1μV
	37 kc/s	84 dB relative to 1μV
37-110 kc/s	37 kc/s	94 dB relative to 1μV
	110 kc/s	89 dB relative to 1μV
110-330 kc/s	110 kc/s	94 dB relative to 1μV
	330 kc/s	91 dB relative to 1μV
330-980 kc/s	330 kc/s	103 dB relative to 1μV
	980 kc/s	98 dB relative to 1μV

(10) Remove the valve-voltmeter and signal generator.

(11) Replace V1 and balance the mixer by adjusting RV1 and C28 for minimum current in the R. F. LEVEL meter in accordance with para. 5 above.

CHAPTER 5

LIST OF COMPONENTS

Note: Components marked + are omitted from the North American version of the adaptor. Components marked * are fitted only in the North American version.

Cct. Ref.	Value	Description	Rat.	Tol. %	N.A.T.O. No.	Manufacturer
Resistors					5905-99-	
R1	100Ω	Carbon	¼W	10	022-1109	Erie-16
R2	150Ω	Carbon	¼W	10	022-1130	Erie-16
R3	150Ω	Carbon	¼W	10	022-1130	Erie-16
R4	56Ω	Carbon	¼W	10	022-1080	Erie-9
R5	150Ω	Carbon	¼W	10	022-1130	Erie-16
R6	150Ω	Carbon	¼W	10	022-1130	Erie-16
R7	150Ω	Carbon	¼W	10	022-1130	Erie-16
R8	150Ω	Carbon	¼W	10	022-1130	Erie-16
R9	150Ω	Carbon	¼W	10	022-1130	Erie-16
R10	100Ω	Carbon	¼W	10	022-1109	Erie-16
R11	100kΩ	Carbon	¼W	10	022-3038	Erie-9
R12	82kΩ	Carbon	¼W	10	022-3029	Erie-9
R13	68Ω	Carbon	¼W	10	022-1089	Erie-9
R14	68Ω	Carbon	¼W	10	022-1089	Erie-9
R15	2.2kΩ	Carbon	½W	10	022-2048	Erie-8
R16	4.7kΩ	Carbon	½W	10	022-2090	Erie-8
R17	33kΩ	Carbon	½W	10	022-2195	Erie-8
R18+	33kΩ	Carbon	½W	10	022-2195	Erie-8
R18*	47kΩ	Carbon	½W	10	022-2216	Erie-8
R19	33kΩ	Carbon	½W	10	022-2195	Erie-8
R20	330kΩ	Carbon	¼W	10	022-3101	Erie-9
R21	68Ω	Carbon	¼W	10	022-1089	Erie-9
R22	2.2kΩ	Carbon	½W	10	022-2048	Erie-8
R23	4.7kΩ	Carbon	¼W	10	022-2089	Erie-9
R24	220Ω	High stab.	1/8W	1	021-9458	Erie-109
R25+	82Ω	High stab.	1/8W	5	011-9732	Erie-109
R25*	33Ω	Carbon	½W	5	022-1045	Erie-8
R26	220Ω	High stab.	1/8W	1	021-9458	Erie-109
R27	10kΩ	Carbon	¼W	10	022-2131	Erie-9
R28	4.7kΩ	Carbon	¼W	10	022-2089	Erie-9
R29	1.8kΩ	Wirewound	4.5W	5	011-3493	Welwyn-AW3111
R30	470kΩ	Carbon	¼W	10	022-3122	Erie-9
R31	68Ω	Carbon	¼W	10	022-1089	Erie-9
R32	2.2kΩ	Carbon	½W	10	022-2048	Erie-8
R33+	82Ω	High stab.	1/8W	5	011-9732	Erie-109
R33*	39Ω	High stab.	1/8W	5	011-9708	Erie-109
R34+	4.7kΩ	Carbon	½W	10	022-2090	Erie-8
R34*	15kΩ	Carbon	½W	10	022-2153	Erie-8
R35+	180Ω	Carbon	¼W	10	022-1142	Erie-16
R36+	180Ω	Carbon	¼W	10	022-1142	Erie-16
R37+	180Ω	Carbon	¼W	10	021-1142	Erie-16

Cct. Ref.	Value	Description	Rat.	Tol. %	N.A.T.O. No.	Manufacturer
Resistors continued.....					5905-99-	
R38+	180Ω	Carbon	¼W	10	021-1142	Erie-16
R39*	6.8kΩ	Carbon	½W	10	022-2111	Erie-8
Potentiometers						
RV1	100	Wirewound		10	972-8313	Colvern-CLR 3001/115
Capacitors					5910-99-	
C1	0.001µF	Ceramic		20		F.E.c-310K
C2	0.1µF	Paper	150V	20	011-5560	Hunt-W49 B 500KY
C3) C5)	523pF	Variable air (2-gang)			972-8331	Wingrove & Rogers C73-02/101
C4	0.1µF	Paper	150V	20	011-5560	Hunt-W49 B 500KY
C6	10µF	Electrolytic	25V		014-5098	Hunt-JB 59KY
C7	0.1µF	Paper	150V	20	011-5560	Hunt-W49 B 500KY
C8	0.05µF	Paper	350V	20	011-5559	Hunt-W49 B 511KZ
C9	68pF	Ceramic		5	013-2294	Erie-N750L
C10	68pF	Ceramic		10	013-2295	Erie-N750K
C11	0.05µF	Paper	350V	20	011-5559	Hunt-W49 B 511KZ
C12	0.01µF	Paper	400V	20	011-5827	Hunt-BM21KZ
C13	47pF	Ceramic		5	013-2288	Erie-N750K
C14	0.1µF	Paper	150V	20	011-5560	Hunt-W49B 500KY
C15	2µF	Electrolytic	350V	20	014-5010	Hunt-JB570Z
C16	68pF	Ceramic		5	013-2294	Erie-N750L
C17	100pF	Silv'd mica	350V	2	012-3923	Lemco-CMMIG
C18	68pF	Ceramic		5	013-2294	Erie-N750L
C19	0.05µF	Paper	350V	20	011-5559	Hunt-W49 B 511KZ
C20	47pF	Ceramic		5	013-2288	Erie-N750K
C21	120pF	Ceramic		5	013-2302	Erie-N750L
C22	100pF	Silv'd mica	350V	2	012-3923	Lemco-CMMIG
C23	0.01µF	Paper	400V	20	012-5827	Hunt-BM21KZ
C24	100pF	Silv'd mica	350V	2	012-3923	Lemco-CMMIG

Cct. Ref.	Value	Description	Rat.	Tol. %	N. A. T. O. No.	Manufacturer
Capacitors continued.....					5910-99-	
C25	10µF	Electrolytic	25V	+100 - 20	014-5097	Hunt-JB59 Z
C26	0.1µF	Paper	150V	20	011-5560	Hunt-W49 B 500KY
C27	33pF	Variable air			C16-0047	Wingrove & Rogers C31-01/1
C28	34.5pF	Differential Trimmer	1000V			Oxley
C29	0.1µF	Paper	150V	20	011-5560	Hunt-W49 B 500KY
C30	15pF	Ceramic		10	911-5481	Erie-NPOK
C31	0.05µF	Paper	350V	20	011-5559	Hunt-W49 B 511KZ
C32	0.1µF	Paper	150V	20	011-5560	Hunt-W49 B 500KY
C33	120pF	Ceramic		5	013-2302	Erie-N750L
C34	2µF	Electrolytic	350V	+50 -20	014-5010	Hunt-JB570Z
C35	8µF	Electrolytic	350V	+50 -20	014-5503	Hunt-JB403KZ
C36	0.1µF	Paper	350V		011-5562	Hunt-W49B512 KZ
C37	0.01µF	Paper	400V	20	011-5827	Hunt-BM21KZ
C38	0.01µF	Ceramic	750V	20	972-8307	Lemco-420K
C39	0.01µF	Ceramic	750V	20	972-8307	Lemco-420K
C41	0.01µF	Paper	400V	20	011-5827	Hunt-BM21KZ
C42	0.01µF	Paper	400V	20	011-5827	Hunt-BM21KZ
C43	0.05µF	Paper	350V	20	011-5559	Hunt-W49-B 511KZ
Switches					5930-99-	
S1		Aerial(Ant) range switch			972-8854	Racal-BS8035
S2		Aerial(Ant) attenuator			972-9328	Racal-AA8034
S3		Mains and HT Interlock			051-0554	NSF-DPDT
S4		Operation switch			051-0554	NSF-DPDT
Plugs and Sockets					5935-99-	
PL1+		AERIAL			054-0101	Films & Equipment

Cct. Ref.	Value	Description	Rat.	Tol. %	N. A. T. O. No.	Manufacturer
Plugs and Sockets continued....					5935-99-	
PL1 *		AERIAL				Films & Equipment
SK1 +		AERIAL			054-0104	Films & Equipment
SK1 *		AERIAL				Films & Equipment
PL2 +		1MC/S INPUT			054-0151	Power Controls
PL2 *		1MC/S INPUT				Amphenol UG260B/U
SK2 +		1MC/S INPUT			054-0155	Power Controls
SK2 *		1MC/S INPUT				Amphenol UG-1094/U
PL3 +		R. F. OUTPUT			054-0152	Power Controls
PL3 *		R. F. OUTPUT				Amphenol UG260B/U
SK3 +		R. F. OUTPUT			054-0155	Power Controls
SK3 *		R. F. OUTPUT				Amphenol UG-1094/U
PL4 +		MAINS Fixed 3-pin			056-0060	Plessey-CZ48993
SK4 +		MAINS Free 3-pin			056-0100	Plessey-CZ49015
Valves - American valve types are those shown in brackets.						
V1		R. F. amplifier				Mullard-EF93 (6BA6)
V2		Harmonic generator				Mullard EF91 (6AU6)
V3		Balanced mixer				Mazda-6F33(6AS6)
V4		Balanced mixer				Mazda-6F33(6AS6)
V5		Stabilizer				Mullard-150C2 (OA2)
V6		Cathode-follower				Mullard-EF91 (6AU6)
Valveholders and Screening Cans					5935-99-	
V1, V2, V6		Valveholder			056-0127	McMurdo-XM7/UC1
		Screening can			056-3003	McMurdo
V3, V4		Resilient valveholder			911-1103	McMurdo-XM/UXT1
	+	Check plate				McMurdo-CP7
	*	Screening can			056-3003	McMurdo
		Screening can			056-0145	McMurdo
V5		Valveholder			056-0127	McMurdo-XM7/UC1

Cct. Ref.	Value	Description	Rat.	Tol. %	N.A.T.O. No.	Manufacturer
Valveholders and Screening cans contd...					5935-99-	
		Screening cans			056-3005	McMurdo
Inductors					5950-99-	
L1)		Aerial tuning			972-9580	Racal-BA7838
L2)		coil 12.0-37 kc/s				
L3)		Aerial tuning			972-9581	Racal-BA7839
L4)		coil 37-110 kc/s				
L5)		Aerial tuning			972-9582	Racal-BA7840
L6)		coil 110-330 kc/s				
L7)		Aerial tuning			972-9583	Racal-AA7841
L8)		coil 330-980 kc/s				
L9		980 kc/s low-pass filter			972-9584	Racal-AA7842
L10		980 kc/s low-pass filter			972-9585	Racal-AA7843
L11		980 kc/s low-pass filter			972-9585	Racal-AA7843
L12		980 kc/s low-pass filter			972-9585	Racal-AA7843
L13		980 kc/s low-pass filter			972-9588	Racal-AA8029
L14		Filter coil (l.t. supply)			972-9555	Racal-AA1655
L15		Choke (V2 anode)			972-8084	Bulgin-SW68
L16		Harmonic generator filter			972-9666	Racal-AA9199
L17		Harmonic generator filter			972-9586	Racal-AA7844
L18+		Harmonic generator filter			972-9395	Racal-AA7845
L18*		Harmonic generator filter				Racal-AA8313
L19		Anode load V3 and V4			972-9589	Racal-AA8033
L20)		Harmonic generator			972-9587	Racal-AA7846
L21)		output coil				
L22		Filter coil (l.t. supply)			972-9555	Racal-AA4655
L23		Choke			972-8084	Bulgin-SW68
L24		Choke			972-8084	Bulgin-SW68

Cct. Ref.	Value	Description	Rat.	Tol. %	N. A. T. O. No.	Manufacturer
		Miscellaneous			5950-99-	
T1		Mains transformer			972-9372	Racal-BT8288
		Mains input fuse holder				Belling-Lee-L356
F1		Mains input fuse				Belling-Lee-L338/ 250mA
					6240-99-	
LP1		Mains indicating lamp	8 volt	1.6W	995-1201	Luxram 983 (M. E. S.)
		Recommended spares				
		Signal lamp fitting			6250-99-943-4042	Bulgin-D187 Red
		Control knob (Switches)			5355-99-943-4799	Racal-AD6735
		Control knob (Tuning)			5355-99-943-4818	Racal-AD6817
		Slow-motion drive			5895-99-943-6511	Jackson-DR64511F
		Terminal strip				Cinch-77/508/3
		1 Mc/s connecting cable				Racal-AA8026
		R. F. Output cable				Racal-AA8027
		H. T. and A. V. C. cable				Racal-AA8028
		Attenuator switch assembly (includes S1, R1 to R10)				Racal-AA8034
		Harmonic generator filter assembly (includes L14, L15, C14, C19)				Racal-AA7848
		Low-pass filter assembly (includes C8, C9, C11, C13, C16, C18, C20, C21, C23, L9 to L13, R15, R16, R17, R23).				Racal-BA7530

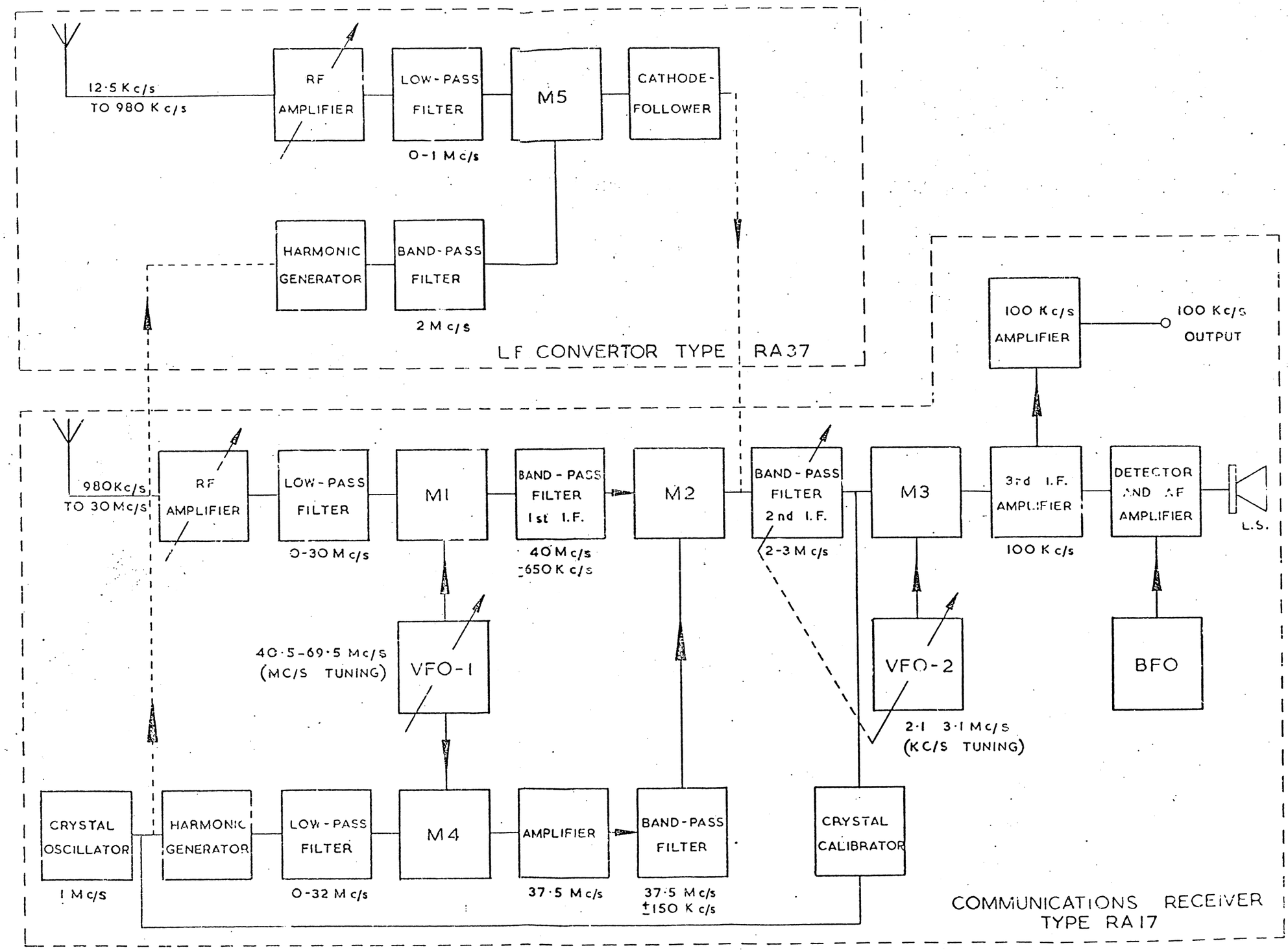


FIG. 1 BLOCK DIAGRAM

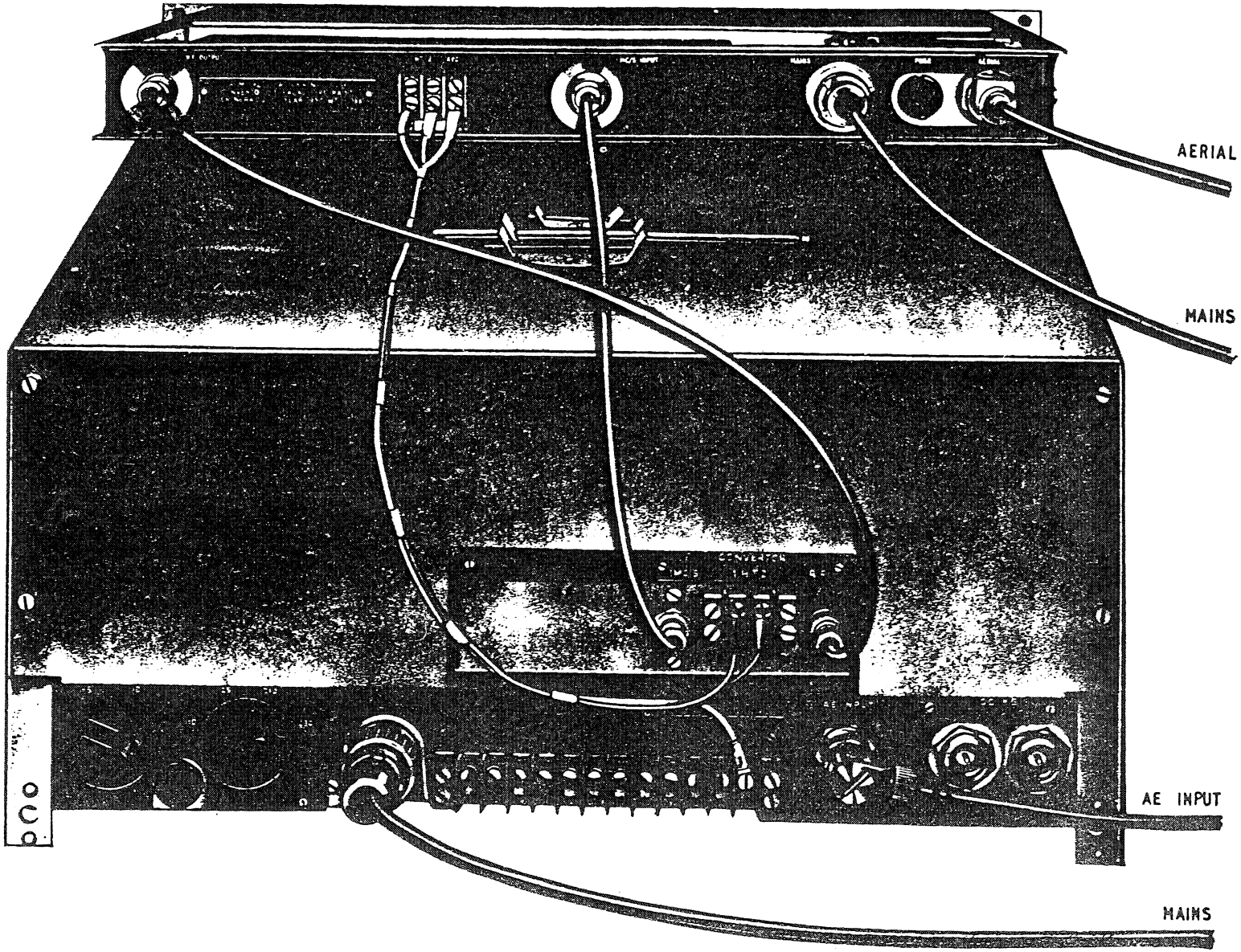


FIG. 2 INTERCONNECTIONS BETWEEN RA.17 & RA.37

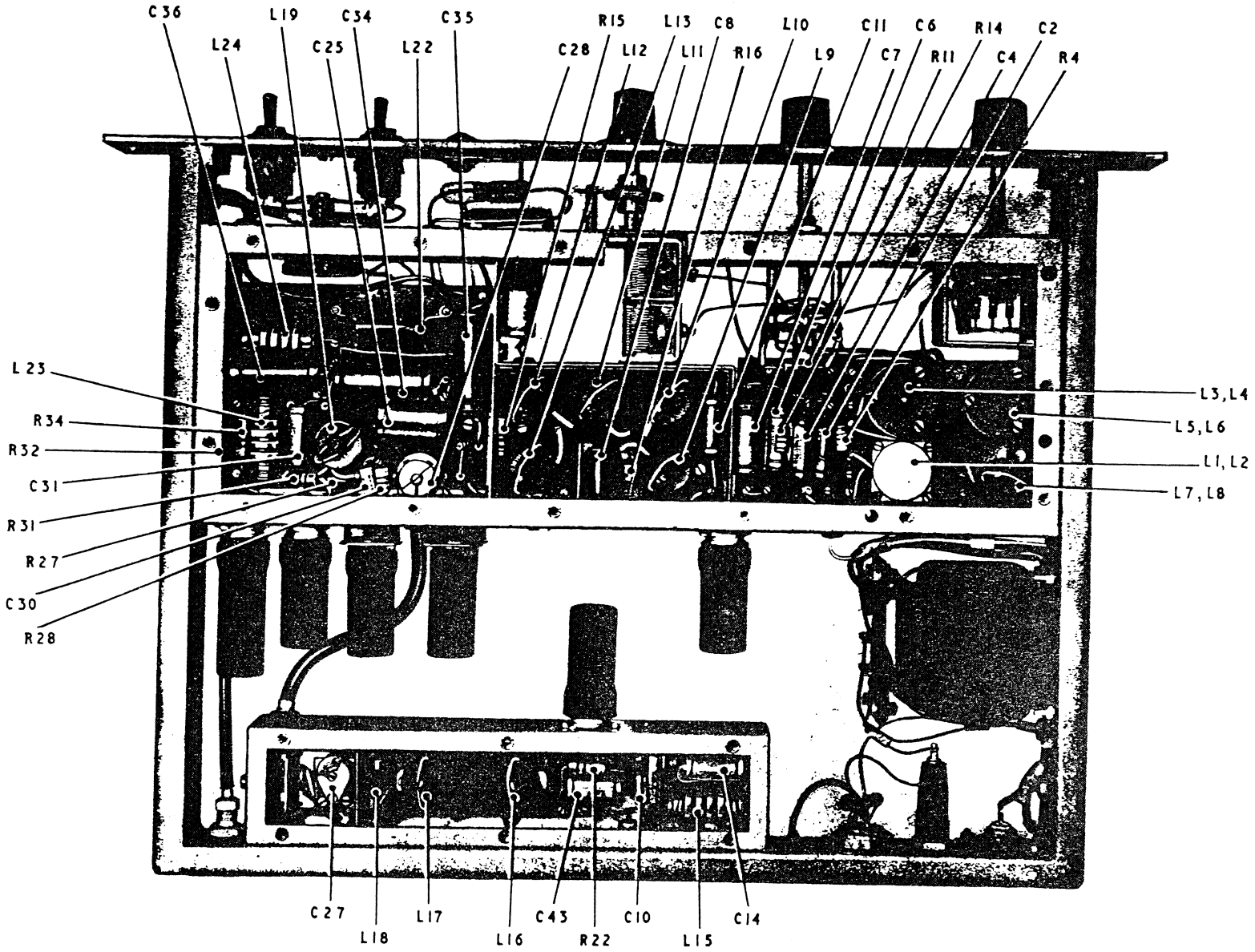


FIG. 3 R A. 37 CHASSIS - TOP

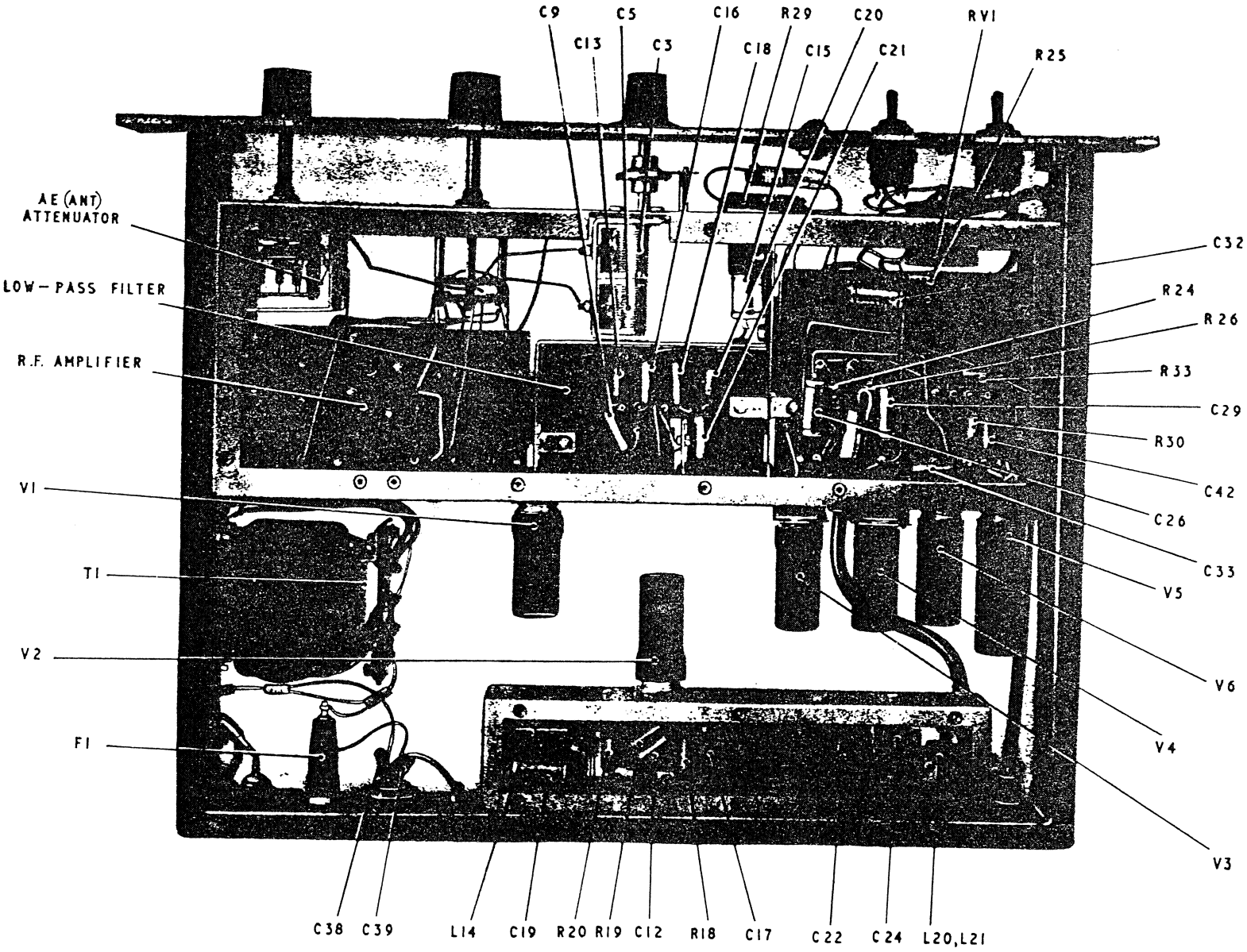


FIG. 4 R.A.37 CHASSIS - UNDERSIDE

VALVES & CRYSTALS	V1 V2 V3 V4 V5 V6
RESISTORS	R10 R12 R15 R17 R16 R22 R23 R36 R25 R26 R27 R38 R28 R29 R30 R31 R32 R33 R34
CAPACITORS	C1 C5 C6 C7 C8 C13 C15 C16 C43 C14 C19 C17 C18 C20 C25 C27 C26 C28 C35 C36 C39 C37 C38 C42 C41
INDUCTORS & TRANSFORMERS	L4 L5 L6 L7 L8 L9 L18 L19 L20 L21 T1 L22 L23 L24
SWITCHES	S1B S1E S2B S1C S1D S3 S4
MISCELLANEOUS	PL2 RV1 LP1 F1 PL4 PL3

SERIAL NUMBERS
(—)

R.F. AMPLIFIER | L.P. FILTER | BALANCED MIXER | R.F. OUTPUT

S1B S1C S1D S1E S2B S3 S4

WB 12·5–37 kc/s 37–110 kc/s 110–330 kc/s 330–980 kc/s

A E TUNE

MIN

AERIAL ATTENUATOR

V1 CV454 | V2 CV138 | V3 CV2209 | V4 CV2209 | V5 CV1932 | V6 CV138

HARMONIC GENERATOR

AVC LINE

6·3V

RV1 100Ω WW

LP1

T1 240V 220V 200V 120V 110V 100V 0V 5V 10V

F1 250mA

POWER

OPERATION

12–980 kc/s 980kc/s – 30Mc/s

REAR TERMINAL STRIP HT1 HT2 AVC

PL3 RF OUTPUT

PL4 MAINS INPUT

NOTES

1 ALL RESISTORS ARE ¼ WATT RATING UNLESS OTHERWISE STATED
2 CAPACITOR VALUES ONE OR DECIMAL ARE µF UNLESS OTHERWISE STATED
3 CAPACITOR VALUES GREATER THAN ONE ARE pF UNLESS OTHERWISE STATED
4 C3 & C5 ARE GANGED
5 S1A, B, C, D & E ARE GANGED (AE RANGE)
6 S2A & B ARE GANGED (AE ATTENUATOR)

DRG. No. CC7833

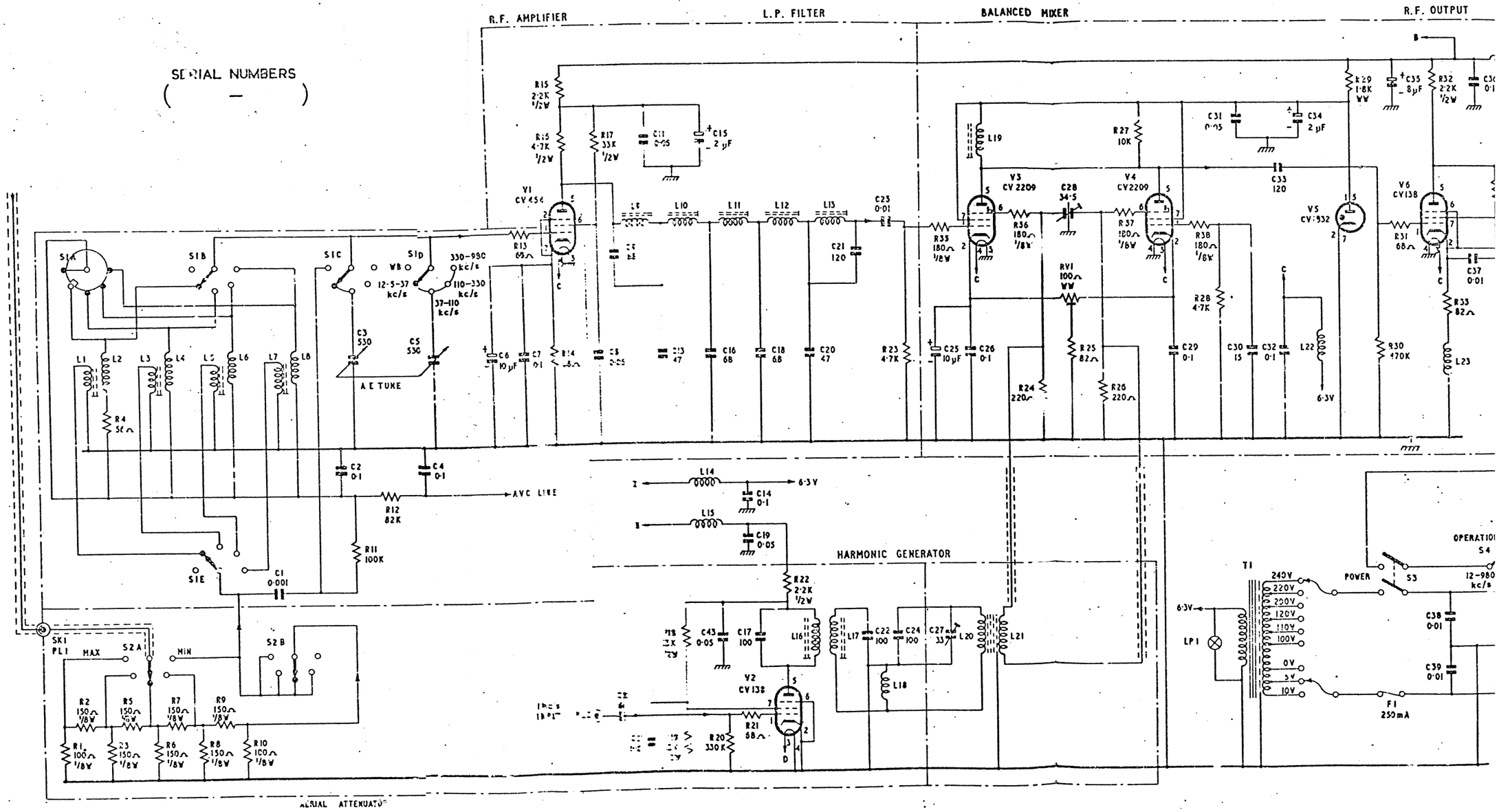
ISSUE | DRN | CHK'D | APP'D | DATE

RACAL ENGINEERING LTD. BRACKNELL, BERKS, ENGLAND

L. F. CONVERTOR TYPE RA37

FIG. 5

SERIAL NUMBERS
(—)



L. F. CONVERTOR TYPE RA37

V1 V2 V3 V4 V5 V6	VALVES & CRYSTALS
R10 R11 R12 R13 R15 R17 R16 R22 R23 R30 R24 R25 R26 R27 R28 R29 R30 R31 R32 R33 R34	RESISTORS
C1 C5 C6 C7 C8 C13 C15 C16 C43 C14 C18 C19 C17 C10 C20 C25 C27 C26 C31 C34 C35 C36 C39 C37 C38 C42 C41	CAPACITORS
L5 L6 L7 L8 L9 L19 L10 L20 L11 L21 T1 L22 L23 L24	INDUCTORS & TRANSFORMERS
S1B S1E S2B S1C S1D S3 S4	SWITCHES
PL2 RV1 LP1 F1 PL4 PL3	MISCELLANEOUS

R.F. AMPLIFIER — L.P. FILTER — BALANCED MIXER — R.F. OUTPUT

SERIAL NUMBERS
(—)

R15 2·2K 1/2W
R16 4·7K 1/2W
R17 33K 1/2W
C11 0·05
C15 2 µF
V1 6BA6
L9 L10 L11 L12 L13
C23 0·01
C21 120
R13 66Ω
Cv 68
S1B S1C S1D
3300-980 kc/s
980-330 kc/s
330-110 kc/s
110-37 kc/s
37-11 kc/s
ANT. TUNE
C3 530
C5 530
C6 10 µF
C7 0·1
R14 68Ω
C8 0·05
C13 47
C16 68
C18 68
C20 47
R23 4·7K
C25 10 µF
C26 0·1
R30 6·6K 1/2W
L19
V3 6AS6
C28 34·5
V4 6AS6
R27 10K
RV1 100Ω WW
R24 220Ω
R25 33Ω
R26 220Ω
C29 0·1
R26 4·7K
C31 0·05
C34 2 µF
C33 120
C30 15
C32 0·1
L22
6·3V
R29 1·8K WW
C35 8 µF
R32 2·2K 1/2W
L24
C36 0·1
V5 6AL5
V6 6AU6
R31 68Ω
R34 15K 1/2W
C41 0·01
C37 0·01
C42 0·01
R35 30Ω
L23
R30 470K
FL3 RF OUTPUT
C2 0·1
C4 0·1
AVC LINE
R12 82K
R11 100K
C1 0·001
S1E
S2 B
MIN
R9 150Ω 1/8W
R6 150Ω 1/8W
R10 100Ω 1/8W
ATTENUATOR
L14
C14 0·1
L15
C19 0·05
HARMONIC GENERATOR
R22 2·2K 1/2W
R18 47K 1/2W
C45 0·05
C17 100
L16
L17
C22 100
C24 100
C27 33
L20
L21
L18
V2 6AU6
R21 68Ω
R19 33K 1/2W
R20 33CK
C12 0·01
C10 68
PL2
EMc/s INPUT
REAR TERMINAL STRIP
HT 1
HT 2
AVC
OPERATION S4
POWER
S3
12-980 kc/s
980 kc/s — 30 Mc/s
T1
240V
220V
200V
127V
115V
105V
0V
5V
10V
6·3V
LP1
F1 250mA
C38 0·01
C39 0·01
POWER INPUT

NOTES
1. ALL RESISTORS ARE 1/4 WATT RATING UNLESS OTHERWISE STATED
2. CAPACITOR VALUES ONE OR DECIMAL ARE µF UNLESS OTHERWISE STATED
3. CAPACITOR VALUES GREATER THAN ONE ARE pF UNLESS OTHERWISE STATED
4. C3 & C5 ARE GANGED
5. S1A, B, C, D & E ARE GANGED (ANT. RANGE)
6. S2A & B ARE GANGED (ANT. ATTENUATOR)

DRG. No. CC 8309

ISSUE 2 — 3 — 4

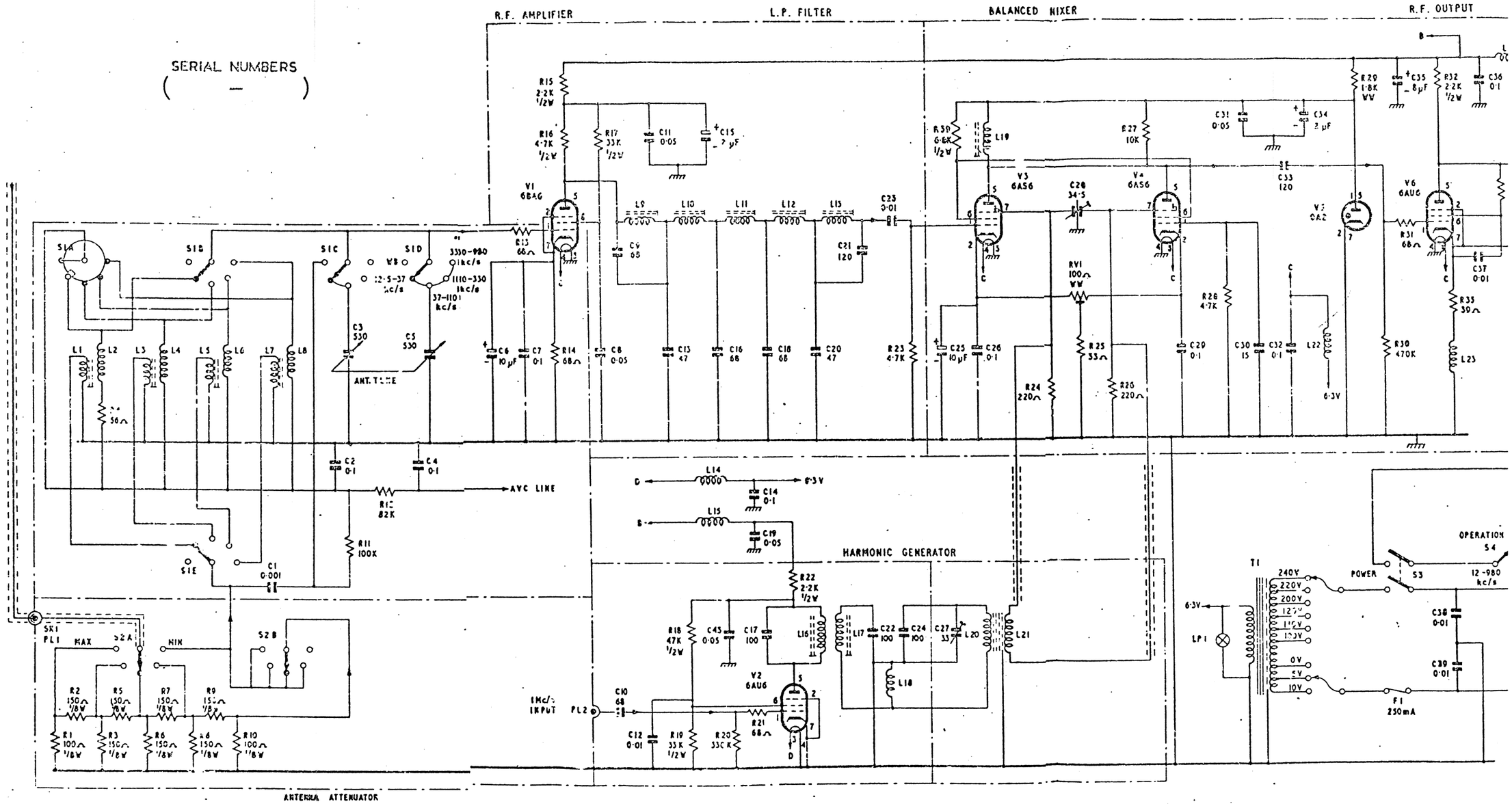
DRN TVC CHK'D APP'D DATE

RACAL ENGINEERING LTD
BRACKNELL, BERKS, ENGLAND

L. F. CONVERTOR TYPE RA37B

FIG. 5

SERIAL NUMBERS
(—)



L. F. CONVERTOR TYPE RA37B