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PART 5A
TECHNICAL DESCRIPTION

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CHAPTER 1

BRIEF DESCRIPTION

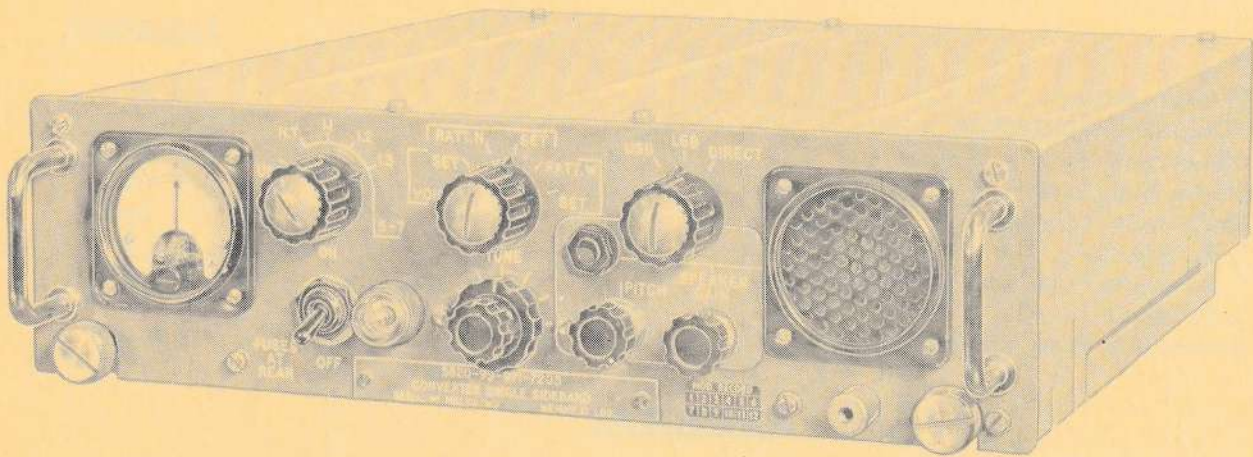
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CONVERTER SINGLE SIDEBAND

5820-99-971-7205

FIG. 5A.1.1

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CHAPTER 1BRIEF DESCRIPTIONIntroduction

1. The Receiver Adaptor Outfit FAZ enables the Receivers B40 and B41 to receive single sideband transmissions. It allows attended or nominally unattended reception of the following types of signal.

- (a) Wide-shift RATT (F.S.T.)
- (b) Narrow-shift RATT (F.S.T.)
- (c) S.S.B. Voice

The i.f. signal from the Receiver is fed to the Adaptor which converts it to a lower frequency and extracts the S.S.B. information. The Adaptor can be switched to receive either the upper or the lower sideband, (i.e. Arrangement 2 or 1 (F.S.T.)). The conventional method of extracting the correct audio frequencies from an S.S.B. transmission involves the provision in the receiving equipment of a highly accurate and stable reference (or 're-insertion'), frequency. No such reference frequency is available in a B40 or B41 receiver and the Outfit FAZ uses instead the tuned circuits in its a.f. discriminator as an "error detecting" device and automatically keeps its local oscillator tuned so as to maintain, in the case of RATT reception, the correct a.f. output tones and, in the case of S.S.B. voice reception, the a.f. output spectrum centred on 815 c/s, this having been found experimentally to be the median frequency of the spectral energy distribution in the normal human voice.

GENERAL DESCRIPTIONConstruction

2. The Adaptor Outfit FAZ consists of the undermentioned units and cable assemblies:-

- (a) Converter, Single Sideband (Chassis) 5820-99-971-7205
- (b) Four printed circuit boards:-
 - (i) Mixer Stage R.F. - 5820-99-972-2760 Board No. 1
 - (ii) Amplifier I.F. Signal 5820-99-972-2758 Board No. 2
 - (iii) Amplifier A.F. Loop - 5820-99-972-2759 Board No. 3
 - (iv) Corrector A.F. - 5820-99-972-2761 Board No. 4

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- (c) Tray Converter Assembly 5820-99-971-2706
 - (d) Cable Assembly R.F. 5820-99-972-2762
 - (e) Cable Assembly A.F. 5820-99-972-2763
3. The main unit is housed in the Tray Converter Assembly normally mounted on a bulkhead. In some cases however it will be mounted on top of the Receiver. The functional diagram (Fig. 5A.1.2) shows the breakdown of the unit into the four boards and the chassis.
4. The Converter consists of a single chassis which has a front panel and back plate. In the following list of major sub-assemblies and components which all are mounted on the top of the chassis, the circuit references given are applicable to Figure 5A.2.8.
- (a) The four printed circuit boards housed in two carriers
 - (b) Stabilised power supply board
 - (c) I.F. filter L1, L2 and L3
 - (d) Tone filter T3/T4
 - (e) Mains and output transformer T1

The front panel is fitted with the majority of the controls and fittings which are:-

- (a) Two lifting handles
- (b) Test meter M1 with associated multi-position switch SB. On USE, the meter records the error signal output from the discriminators; the other switch positions allow monitoring of the h.t. voltage and the h.t. currents at various points on the printed boards.
- (c) Function selector switch SA. Selects the appropriate discriminator for VOICE, RATT.N or RATT.W. Routes the RATT.N output through the Tone Filter. On SET positions the Automatic Frequency Control loop is broken, to permit fine tuning of the local oscillator, and to adjust frequency control components when setting-up the adaptor.
- (d) Sideband selector switch SC. Selects capacitance to be added to the tuned circuit of the local oscillator on LSB and removed from the circuit on USB. On DIRECT, the a.f. output of the B40 or B41 receiver is routed directly to line, by-passing the FAZ outfit.
- (e) Monitoring loudspeaker and headphone socket, with associated gain control RV2.
- (f) Mains ON/OFF switch SD, with associated indicating lamp ILP1

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- (g) TUNE control C1. Fine tuning of the local oscillator.
- (h) PITCH (voice) control RV4. Adjustment to allow for differences in voice pitch from one operator to another.
- (j) Earth (bonding) socket

The controls and fittings on the back plate are:-

- (a) The signal input and output sockets SKTA and PLA.
- (b) Power supply fixed plug PLB
- (c) Two fuseholders FS1 and FS2
- (d) B40/B41 selector switch SF. Selects the appropriate L, C and R components for the tuned circuit of the local oscillator.
- (e) Mains supply selector switch SE.
- (f) Pre-set amplitude control for line output RV3

Power Supplies

5. The Adaptor power supply input is either 230V or 115V, 50 to 60 c/s single phase. The appropriate tapings on the mains transformer are selected by the mains supply selector switch.

Frequency Changer

6. An input signal taken from the first i.f. stage of either a B40 or B41 Receiver is fed to the frequency changer in the Mixer Stage R.F. (Board No.1). This board also includes a local oscillator, local oscillator amplifier and two reactance diodes. The i.f. output from the frequency changer is in the range 20-23 kc/s, the exact frequencies depending on the type of transmission being received. The local oscillator frequency is controlled by the sideband selector switch to be above the input frequency for USB Voice and Arrangement 2 RATT, and below for LSB Voice and Arrangement 1 RATT. It is also controlled by the B40/B41 switch to cater for the differing i.f.'s of these receivers. The nominal frequencies in the various stages of the FAZ, in the various modes of operation, are as follows:-

(1) Mode of transmission		(2) Input from B40 (kc/s)	(3) FAZ Local Osc. (kc/s)	(4) FAZ i.f. (kc/s)	(5) a.f. output (c/s)
Wide-shift RATT	Arrgmt.2	500 $\pm$.425	522.550	22.550 $\pm$.425	2550 $\pm$ 425
	Arrgmt.1	500 $\pm$.425	477.450		
Narrow-shift RATT	Arrgmt.2	500 $\pm$.0425	521.000	21.000 $\pm$.0425	1000 $\pm$ 42.5
	Arrgmt.1	500 $\pm$.0425	479.000		
Voice	USB	501.35 to 498.65	521.65	20.3 - 23.0	300 - 3000
	LSB	498.65 to 501.35	478.35		

NOTE For B41 receiver, add 300 kc/s to all frequencies in columns (2) and (3).

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7. Automatic control and stabilisation of the local oscillator frequency is accomplished by means of a d.c. control voltage fed from the Corrector A.F. (Board No.4) and applied to the two reactance diodes connected across the local oscillator tuned circuit. Fine adjustment of the local oscillator frequency is carried out by a TUNE control located on the front panel.

I.F. Filter

8. The filter is located on the Converter Single Sideband chassis; it is a triple "T" band-pass filter of 3 kc/s (nominal) bandwidth, connected between the frequency changer and the first i.f. amplifier. It accepts the required intermediate frequencies in the range 20 - 23 kc/s and rejects unwanted frequencies from the frequency changer output.

I.F. Amplifier and Demodulator

9. The two stage i.f. amplifier circuit forms part of the Amplifier I.F. Signal (Board No.2), which also includes a ring demodulator and low pass filter. The i.f. amplifier output is fed into the ring demodulator, together with a 20 kc/s signal from a re-insertion oscillator circuit on the Amplifier A.F. Loop (Board No.3) (Paragraph 10). The demodulator output is the difference frequency between the i.f. amplifier and the re-insertion oscillator signals, shown in column 5 of the table in paragraph 6. The difference frequency is extracted by the 3000 c/s low pass filter and passed to the a.f. amplifier on the Amplifier A.F. Loop (Board No.3).

A.F. Amplifier

10. The a.f. amplifier and the 20 kc/s crystal controlled re-insertion oscillator comprise the Amplifier A.F. Loop. The a.f. output from the low pass filter (Paragraph 9) is fed to the a.f. amplifier, where it is applied across a preset gain control. After amplification the signal is fed to a phase splitter and then to a push-pull output stage which drives the a.f. output transformer. The transformer has three output windings for the following purposes:-

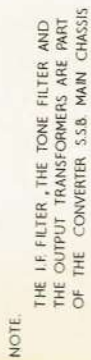
- (a) Monitoring via the monitor speaker or telephone jack socket
- (b) Signal output to a 600 ohm line
- (c) Feedback for local oscillator frequency control (Paragraph 7)

The wide and narrow RATT output signals are switched to the 600 ohm line termination by the function selector switch. The wide RATT signals proceed direct to the line but the narrow RATT are fed thereto via a filter circuit with a centre frequency of 1000 c/s and 200 c/s bandwidth. When the Sideband Selector Switch is put to DIRECT the FAZ outfit is removed from the circuit and the a.f. output of the B40/B41 is switched to line as in normal operation.

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Automatic Frequency Control

11. Automatic frequency control is accomplished by detecting deviations in the a.f. stage frequency response, due to local oscillator or incoming signal drift. The deviations are converted to an equivalent d.c. voltage and fed to the reactance diodes connected across the local oscillator tuned circuit (Paragraph 6). The discriminator circuits used for this purpose are part of the Corrector A.F. (Board No.4).
12. For voice modulation, the feedback signal from the output transformer is connected to a cross-over network, which is tuned to the mid-point of the audio frequency response. Under normal conditions the cross-over network outputs are equal and opposite and the resulting control voltage is therefore zero. In the event of frequency drift occurring as mentioned in Paragraph 11, the network will produce a voltage, the polarity of which is determined by the direction of the frequency drift.
13. For RATT reception the feedback voltage from the output transformer is connected to two Foster-Seeley discriminators, one being tuned to the upper limit of 1037.5 c/s (narrow shift) or 2.950 kc/s (wide shift) and the other to the lower limit of 962.5 c/s (narrow shift) or 2.150 kc/s (wide shift). The outputs are summed to produce a frequency discriminator with a gap of 75 c/s (narrow shift) or 800 c/s (wide shift). Frequency drift produces a d.c. control voltage the polarity of which is determined by the direction of the drift.



RECEIVER ADAPTOR OUTFIT FAZ FUNCTIONAL DIAGRAM

FIG. 5A1.2

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CHAPTER 2

DETAILED CIRCUIT DESCRIPTION

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Corrector A.F. 5820-99-972-2761 - Circuit Diagram	5A.2.7

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Figure No.

Converter Single Sideband 5820-99-971-7205 - Circuit Diagram
Automatic Frequency Control - Voice Operation
RATT. A.F.C. Discriminator Characteristics - Idealised
Automatic Frequency Control - RATT Operation

5A.2.8
5A.2.9
5A.2.10
5A.2.11

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CHAPTER 2DETAILED CIRCUIT DESCRIPTIONIntroduction

1. The circuit description in this chapter is written with reference to the main circuit diagrams Figures 5A.2.4 to 5A.2.8 and also Figures 5A.2.9 and 5A.2.11. The latter two Figures are extracts from the main circuits combined into one diagram, to assist the reader in following the action of the frequency control circuits. The circuit references of components mentioned in this chapter are prefixed with their unit reference number, as follows:-

	<u>Unit</u>
(a) Mixer R.F.	1
(b) Amplifier I.F. Signal	2
(c) Amplifier A.F. Loop	3
(d) Corrector A.F.	4
(e) Converter Single Sideband (<u>main chassis</u>)	5

MIXER R.F.Balanced Diode Mixer

(Figures 5A.2.4 and 8)

2. A signal from the first i.f. stage of a B40 or B41 receiver is fed via 5SKTB and 5SKTC/22 to the Mixer R.F. It is then applied via the blocking capacitor 1C1 across the preset gain control 1RV1. From here it is coupled via 1C2 to the balanced diode mixer circuit 1D1, 1D2, and 1T1 where it is additively mixed with the input from the local oscillator (Paragraph 3). The combined mixer output is then passed via 5SKTC/11 to the i.f. filter where the difference frequency in the band 20 kc/s to 23 kc/s is extracted.

Local Oscillator

3. The local oscillator is a shunt fed circuit which translates the B40/B41 i.f. input frequency to an intermediate frequency to preserve the fidelity of the information spectrum contained in either sideband and produces a frequency in the band 20 kc/s to 23 kc/s above or below the input signal to the R.F. Mixer for the upper or lower sidebands respectively. The local oscillator frequencies are as follows:-

- (a) B40 Input (i.f. 500 kc/s)
 - (i) Wide-shift RATT 522.55 kc/s (upper sideband reception)
477.45 kc/s (lower sideband reception)

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- (ii) Narrow-shift RATT 521.00 kc/s (upper sideband reception)
479.00 kc/s (lower sideband reception)
 - (iii) Voice 521.65 kc/s (upper sideband reception)
478.35 kc/s (lower sideband reception)
- (b) B41 Input (i.f. 800 kc/s)

Add 300 kc/s to each of the frequencies in (a).

The circuit consists of the oscillator 1VT1 with its emitter load 1R15/1R16, bias resistor 1R13, and a tuned circuit, partly composed of 1C11, 1C12 and the capacitance of the reactance diodes 1D3 and 1D4. Other components of the tuned circuit are switched into circuit according to the Adaptor mode of operation (See Paragraphs 5 and 6) and coupled to the base of 1VT1 via the tuning capacitor 1C9. The tuned circuit reactance diodes are used in conjunction with the Corrector A.F. for frequency control (Paragraph 22). Fine adjustment of the local oscillator frequency is made by the TUNE control capacitor 5C1.

4. The local oscillator output is fed to the Mixer via the buffer amplifier 1VT2. The collector load of this transistor, 1C4, 1R7 and the secondary of 1T1 is also the local oscillator injection circuit for the Mixer. When the Adaptor is operated from a B40 Receiver 1C5 and 1R8 are also switched into circuit to adjust its impedance and tuning (Paragraph 5). Decoupling is by 1C6.

B40 and B41 Receiver Selection

5. The intermediate frequency of the B40 Receiver is 500 kc/s and that of the B41 is 800 kc/s. The frequency of the Adaptor local oscillator is therefore varied to maintain an i.f. in the band 20 kc/s to 23 kc/s to suit either case. The local oscillator frequency is controlled by the B40/B41 selector switch 5SF controlling relay 1RLA which switches components in or out of circuit to achieve this (Paragraph 3). With the switch set to the B41 position the relay is de-energised and 1L1 and 1R10 are in circuit; in the B40 position the relay is energised via 5SKTC/19 and 20 so that 1L1 and 1R10 are switched out and 1R11 and 1L2 with 1R8 and 1C5 in the local oscillator injection circuit to the Mixer (Paragraph 4) are switched into circuit.

Upper and Lower Sideband Operation

6. The frequency of the local oscillator is also changed depending on whether the upper or lower sideband signal is required (Paragraph 3). This is controlled by the setting of the USB/LSB/DIRECT switch 5SC which in conjunction with the Relay 1RLB places 1C8 and 1C10 in or out of circuit. For the reception of the upper sideband the switch is set to USB. In this position the relay is de-energised and 1C8 and 1C10 are not in circuit. For lower sideband reception the switch is set to LSB when the relay is energised via 5SKTC/1 and 3 and 1C8 and 1C10 are brought into circuit.

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AMPLIFIER I.F. SIGNAL

(Figures 5A.2.5 and 8)

I.F. Filter

7. The I.F. Filter is mounted on the chassis. It is a "T" section band-pass filter of 4.8 kc/s nominal bandwidth, consisting of 5L3/5C12, 5L2/5C9, 5L1/5C7 and the capacitors 5C8 and 5C11. The filter is connected between the Mixer R.F. and the Amplifier I.F. Signal via 5SKTC/11, pins 1 to 4 of the I.F. Filter Board and 5SKTD/22. It passes nominal difference frequencies of between 20 kc/s and 23 kc/s from the output of the Mixer. The attenuation is 3dB at 2.5 kc/s from the mid point of the pass band.

First and Second Amplifiers

8. The signal from the I.F. Filter is fed to the Amplifier I.F. Signal via 5SKTD/22 and then to the base of the emitter follower 2VT1 via the coupling capacitor 2C1. The output of the emitter follower is developed across the load resistor 2R5 and d.c. coupled to the first i.f. amplifier 2VT2. The d.c. supply and bias voltages for 2VT1 and 2VT2 are derived from the bleeder network 2R1, 2R2 and 2R3, decoupled by 2C2, and negative feedback at signal frequency is provided for 2VT2 by 2R6, 2R7 and 2C4. The output of 2VT2 is transformer coupled to the second i.f. amplifier 2VT3. Bias voltages for 2VT3 are derived, under d.c. conditions, from 2R8 and 2R10, decoupled by 2C5, and negative feedback at signal frequency is provided by 2R12, 2R14 and 2C8.

Ring Demodulator

9. The transformers 2T2 and 2T3, with diodes 2D1, 2D2, 2D3 and 2D4 form a double-balanced ring demodulator circuit. The 20 kc/s output from the re-insertion oscillator is applied between the secondary of 2T2 and the primary of 2T3; so that one half-cycle applies forward bias to 2D1 and 2D2 and reverse bias to 2D3 and 2D4, the next half-cycle biases these pairs of diodes in the opposite sense. The output from the second I.F. amplifier, at the collector of 2VT3, is developed across 2T2 and is fed to 2T3 via whichever pair of diodes is switched on. The resultant signal appearing across the primary of 2T3 is one which undergoes a 180 degree phase reversal at every half-cycle of the re-insertion oscillator frequency, and which varies in amplitude at the "beat", or difference frequency of the two inputs. The r.f. component of this waveform is decoupled by 2C9 and 2C10, and the difference frequency is developed across 2T3 and fed to the base of emitter follower 2VT4. This difference frequency will be either 1000 c/s $\pm$ 42.5 c/s (narrow RATT), 2550 c/s $\pm$ 425 c/s (wide RATT) or audio frequencies between 300 c/s and 3000 c/s (Voice). This form of demodulation is preferred to the simple bridge type because it ensures that neither the sideband nor the locally generated carrier (re-insertion oscillator) frequencies appear across transformer 2T3, and also because it achieves twice the amplitude possible from the simple type.

10. The output of 2VT4 is developed across 2R18 and fed via 2C12 and 2R19 to a tuned low-pass filter comprising 2L1, 2C13 and 2C14, finely tuned by the preset inductance 2L1; the output being passed to the Amplifier A.F. Loop.

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AMPLIFIER A.F. LOOP

(Figures 5A.2.6 and 8)

Pre-amplifier

11. The signal from the low-pass filter is fed to the Amplifier A.F. Loop via 5SKTE/13 where it is developed across the preset gain control 3RV1 and passed via 3R2 and 3C2 to the pre-amplifier 3VT1. This is a Class "A" amplifier with load and bias resistors 3R5 and 3R3 respectively. The h.t. supply is decoupled by 3C1 across 3R4. The output of 3VT1 is developed across 3R5 and passed to the base of the driver amplifier 3VT2 via 3C4. Unwanted high audio frequencies in the output are attenuated by 3C3.

A.F. Amplifier

12. The driver amplifier is d.c. coupled to a Class "B" push-pull output stage, consisting of two complementary pairs of transistors arranged as compound emitter followers. (It should be noted that the circuit arrangement of the one p-n-p transistor (Paragraph 13) is effectively the same as that of an emitter follower using a n-p-n transistor). Emitter followers are used to provide negative feedback, and thus combat distortion caused by a shift of the operating point at the base of the driver amplifier with variations in the incoming frequency. The purpose of the second transistor in each pair is to provide a low impedance output. Arrangements are included (Paragraph 13) to prevent the cross-over distortion which occurs in Class "B" amplifiers if the change-over in current from one transistor to the other, at alternate half-cycles, is not smooth.

13. The preset variable resistor 3RV3, in the collector load of 3VT2, is adjusted so that under quiescent conditions the emitter followers 3VT3 and 3VT4 are just conducting. This is the first requirement in preventing cross-over distortion; the second requirement is to cancel the effect of changes in ambient temperature. Such changes affect the collector currents drawn by the transistors, and this in turn would alter the delicate relationship between the base potentials of 3VT3 and 3VT4, already set up by 3RV3. The diodes 3D1 and 3D2, which have a negative temperature coefficient, are included in the collector load of 3VT2, between the bases of 3VT3 and 3VT4. As the collector current increases or decreases, due to temperature changes, so the forward resistance of the diodes decreases or increases, tending to keep the voltage between the bases of 3VT3 and 3VT4 steady. Ideally, under quiescent conditions, the potential at the junction of the emitter followers, at test point SKTA (Figure 5A.2.6), would be equal to half the h.t. voltage, or nominally 10 volts, and this would also be the charge on the capacitors 3C13/3C14. The pre-set resistor 3RV2 is adjusted so that this mid-point is established, with the result that the outputs from the pairs of transistors 3VT3/3VT5 and 3VT4/3VT6 are symmetrical about the standing bias at the base of 3VT2. In this way a high degree of negative feedback is achieved through 3RV2, 3R27 and 3R6. The use of a p-n-p transistor for 3VT4 is a means of achieving push-pull amplification without recourse to a transformer or other phase-inverting device (Paragraph 15).

14. The capacitor 3C7 shunts any large transient voltages caused by h.t. switching; these voltages would otherwise charge the transistor depletion layer capacitor area and cause overloading.

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15. The action of the amplifier is as follows:-

- (a) During the positive half cycle of the input signal at the base of 3VT2, the collector current of this transistor increases and its collector potential falls. Current is drawn from the base of 3VT3, cutting this transistor off, and from the base of 3VT4, causing this p-n-p transistor to conduct more heavily. Transistor VT6 also conducts heavily, and capacitor C13/C14 discharges through the external load, (the output transformer 5T2), and through transistors 3VT6 and 3VT4.
- (b) During the negative half-cycle of the input signal at the base of 3VT2, the collector current of this transistor decreases, and its collector potential rises. Current flows into the base of 3VT3, causing this transistor to conduct more heavily, and into the base of 3VT4, cutting off this p-n-p transistor. Transistor VT5 also conducts heavily, and capacitor 3C13/3C14 charges above its nominal 10 volts through the external load of the output transformer and through transistors VT3 and VT5.

Re-insertion Oscillator

16. The re-insertion oscillator is mounted upon the Amplifier A.F. Loop Board, but is electrically quite separate from the amplifier. It is a crystal controlled oscillator operating at a frequency of 20 kc/s. The crystal 3XL1 is of the double flexion type, one half being connected between the collector and emitter, and the other half between the base and emitter of 3VT7. The preset tuned coil 3T1 forms part of the tuned circuit and in conjunction with 3C11 and the preset capacitor 3C16 also serves as a shaper for the output waveform. The operating condition of 3VT7 is determined by 3R13, 3R14, 3R15 and the preset amplitude control 3RV4. The emitter is decoupled by 3C10.

17. The output of 3VT7 is coupled via 3C12 to the base of the emitter follower 3VT8 where it is developed across the emitter load 3R19 and fed via 3C15, 5SKTE/21 and 5SKTD/6 to the ring demodulator on the Amplifier I.F. Signal Board (Paragraph 9).

OUTPUT TRANSFORMER

(Figure 5A.2.8)

Introduction

18. The Output Transformer 5T2 is mounted on the main chassis. It has a single primary winding connected between the a.f. output and earth and three secondary windings, connected as follows:-

- (a) To the Corrector A.F. for frequency control (Paragraphs 23 and 27).
- (b) To a 600 ohm line of the ship's wiring (Paragraph 19).
- (c) To a loudspeaker or headphones, for monitoring the a.f. output (Paragraph 21).

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600 Ohm Line Output

19. The output from 5T2 (Paragraph 18(b)) is passed to the function selector switch 5SA. When this switch is set to either VOICE, VOICE SET, RATT W or RATT W SET the signal is fed to the line output amplitude control 5RV3, from which it passes to the USB/LSB/DIRECT switch 5SC. In the USB or LSB position of this switch the signal is transmitted via 5PLA/D and a 600 ohm feeder to the terminal equipment. The signal return path is via 5PLA/C, 5SC and 5RV3. The output signal follows the same path when 5SA is set to RATT N or RATT N SET except that the feed to 5RV3 is made via the Tone Filter 5T3/5T4. This circuit passes signals, in the output from 5T2, which lie within the range 900 c/s to 1100 c/s, and attenuates other a.f. by at least 3dB.
20. In the DIRECT position of switch 5SC the signal from the B40/B41 receiver is routed directly from 5PLA to 5SKTA, by-passing the outfit FAZ.

Loudspeaker Output

21. The output from 5T2 (Paragraph 17(c)) is applied across the SPEAKER GAIN control 5RV2 which feeds the loudspeaker via the headphone jack socket 5JKA. When headphones are plugged into the jack socket the loudspeaker is disconnected from the circuit.

CORRECTOR A.F.

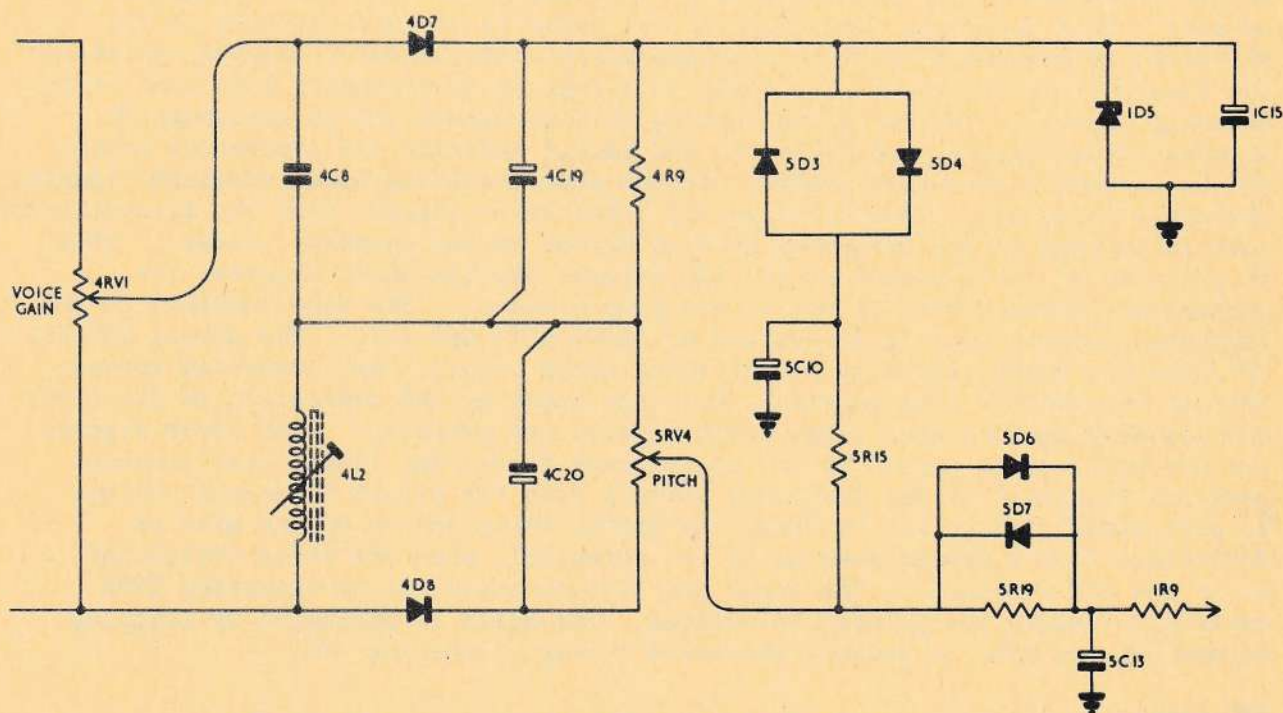
(Figures 5A.2.7, 8, 9, 10 and 11)

22. The Corrector A.F. has two frequency discriminator circuits, one for voice and the other for RATT operation. Their purpose is to maintain the local oscillator frequency in correct relationship with the incoming signal frequency and thus minimise the effect of oscillator or signal frequency drift occurring in the B40 or B41 Receiver. The circuits are remotely selected by relays, which are controlled by the action of the function selector switch 5SA. For clarity the main circuit diagram (Figure 5A.2.7) is supplemented by extracted circuit diagrams Figures 5A.2.9 (Voice operation), and 5A.2.11 (RATT operation). These show only those components, switch positions, relay contacts, and interconnections relevant to the particular mode of operation illustrated.

Automatic Frequency Control - Voice Operation

23. The discriminator for voice operation is selected by setting the function selector switch 5SA to VOICE or SET (Voice) completing the energising circuits for relays 4RLC and 4RLD. The relevant circuit for VOICE selection is shown in Figure 5A.2.9 and, in simplified form, in Figure 5A.2.1 (inset).

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AUTOMATIC FREQUENCY CONTROL-VOICE-SIMPLIFIED

FIG. 5A.2.I.

The voltage from a secondary winding on the output transformer 5T2, is applied across the circuit comprising 4C8 and 4L2 in series. The level of the voltage is preset by VOICE GAIN control, 4RV1.

24. The capacitor 4C8 and the inductance 4L2 have been so selected that at input audio frequencies centred about 815 c/s (the "cross-over" frequency), the d.c. voltages developed across 4C19 and across 4C20 are equal and opposite. When the centre frequency of the a.f. output falls below 815 c/s, a larger d.c. voltage is developed across 4C19 than across 4C20, due to the increased reactance of 4C8. The sum of these signals, developed across 4R9 and 5RV4, appears as Voice Error between Pins 15 and 13. When the centre frequency rises above 815 c/s a larger d.c. voltage is developed across 4C20 than across 4C19, due to the increased reactance of 4L2. The sum of these signals, developed across 5RV4 and 5R9, appears as Voice Error, via Pin 8, between Pins 13 and 15. The PITCH control 5RV4 makes small adjustments to either side of 815 c/s to provide "cross-over" frequencies suitable to the voices of varying operators.

Voice Discriminator Output

25. With the function switch 5SA on VOICE, the voice error signal is applied between the cathode of the Zener diode 1D5 and the common cathode of the reactance diodes 1D3 and 1D4. The error signal thus adds to or subtracts from the standing bias applied to 1D3 and 1D4 by the action of the Zener. Adding to the bias decreases the capacity of the diodes, thus increasing the frequency

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of the local oscillator tuned circuit; decreasing the bias has the opposite effect. Thus the voice error signal, the polarity of which depends on the direction of frequency drift as detected by the discriminator, serves to restore the frequency of the local oscillator to a correct relationship with that of the incoming signal. The foregoing text in this paragraph and in paragraph 25, together with Figures 5A.2.1 (inset) and 5A.2.9 describe the corrective action of the automatic frequency control circuit when receiving upper sideband signals. Obviously to receive lower sideband any voice error signals from the discriminator must be applied to the frequency control diodes in the opposite sense. This is achieved by the sideband switch 5SC (Figure 5A.2.9), which reverses the connections between Pins 15 and 13 and Pins 6 and 4. The time constant of the frequency control loop is determined by 5R19, 5C13 and 1C7. The diodes 5D6 and 5D7, one for either polarity of the voice error signal, are connected across 5R19 to shorten the time constant, and thus speed up the correction of the local oscillator frequency when large error signals are present. When error signals are too small to be passed by the appropriate diode, the longer time constant prevents "hunting" of the frequency control loop for slight frequency shifts. To give visual indication of frequency drift, voice errors appear also as deviations from a centre reading on the meter 5M1, when the meter switch 5SB is in the USE position. The error can then be tuned out by operating TUNE control to return the pointer to centre. The meter is protected by clipping diodes 5D3 and 5D4, to prevent excessive voltages damaging it.

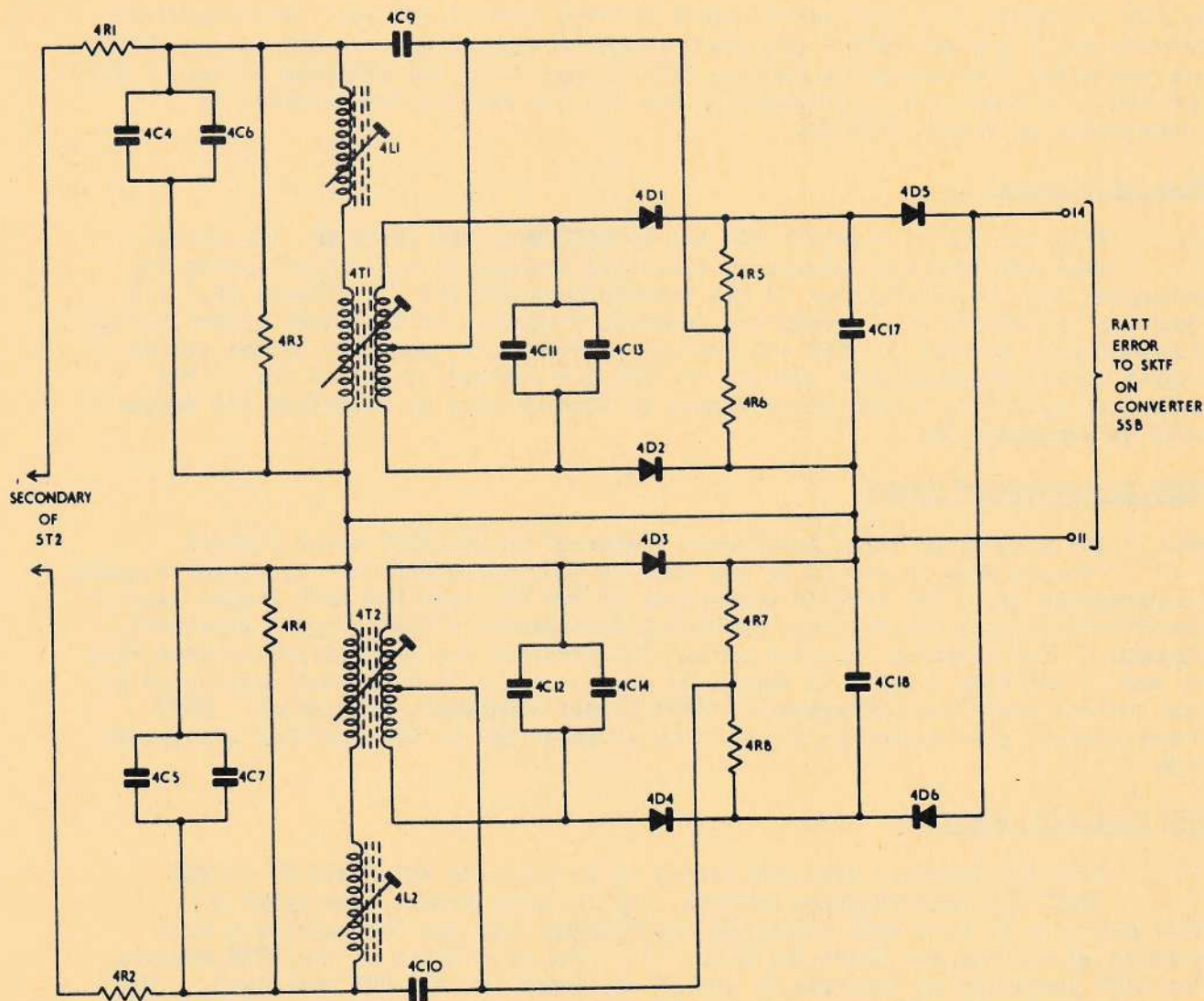
SET Condition (Voice)

26. With function switch 5SA on SET (Voice) the frequency control loop is broken, and only the bias set by the zener diode 1D5 is fed to the reactance diodes 1D3 and 1D4. The local oscillator is therefore held at a constant frequency. This position of the function switch is used when adjusting the SPEAKER GAIN and TUNE controls in setting up the equipment (Part 5B, Chapters 1 and 2).

Automatic Frequency Control - RATT Operation

27. The discriminators for RATT operation are selected by setting switch 5SA to RATT N, SET (RATT N), RATT W or SET (RATT W). In any of these positions relay 4RLD is de-energised, disconnecting the voice discriminator and connecting the feedback signal from 5T2 across the RATT discriminator circuit.

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AUTOMATIC FREQUENCY CONTROL-RATT-SIMPLIFIED

FIG 5A.2.2

Narrow RATT Operation

28. With the function switch 5SA on the RATT N or SET (RATT N) position, the relays 4RLA and 4RLB are de-energised, and the circuit for RATT N selection is as shown in Figure 5A.2.11. One discriminator circuit is preset by the adjustment of 4L1 and 4T1, to give nil output across 4C17 at a frequency of 962.5 c/s; at frequencies below 962.5 c/s a d.c. voltage is developed across 4C17 of such polarity that Pin 11 is negative with respect to the cathode of 4D5. This voltage is passed by 4D5 to appear as a RATT error signal between Pins 14 and 11. The second discriminator circuit is preset, by adjustment of 4L2 and 4T2, to give nil output across C18 at a frequency of 1037.5 c/s; at frequencies above 1037.5 c/s a d.c. voltage is developed across 4C18 of such polarity that Pin 11 is positive with respect to the anode of 4D6. This voltage is passed

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by 4D6 to appear as a RATT error signal between Pins 11 and 14. At frequencies between 962.5 c/s and 1037.5 c/s the voltages developed across 4C17 and/or 4C18 are prevented from appearing between Pins 14 and 11 by the clipping action of 4D5 and 4D6. A plot of d.c. voltages at Pin 11, for varying frequencies, is illustrated by Figure 5A.2.10.

Wide RATT Operation

29. With the function switch 5SA set to RATT **W** or SET (RATT **N**), the relays 4RLA and 4RLB are energised, selecting changes of capacitors across the primaries and the secondaries of the transformers 4T1 and 4T2 (Figure 5A.2.11). This has the effect of altering the resonant frequency of the first (lower limit) discriminator circuit to 2150 c/s instead of 962.5 c/s, and that of the second (upper limit) discriminator circuit to 2950 c/s instead of 1037.5 c/s. The method of achieving a RATT error signal is then exactly as described for Narrow RATT in paragraph 28.

RATT Discriminator Output

30. The control of local oscillator frequency by the RATT error signals between Pins 11 and 14 is the same as that described for voice error signals in paragraph 25. The text in paragraphs 28 and 29, together with Figure 5A.2.11, describes frequency control when receiving Arrangement 2 RATT, (upper sideband), signals. The sideband selector switch 5SC reverses the connections between Pins 14 and 11 and Pins 6 and 4 to apply any error signals to the local oscillator in the correct sense for Arrangement 1 RATT, (lower sideband), reception. RATT error signals also appear in visual form on meter 5M1 in USE position (Paragraph 25).

SET Condition (RATT)

31. With the function selector switch 5A in position SET (RATT **W**) or SET (RATT **N**), the frequency control loop is again broken (Paragraph 26). This position is used when adjusting the SPEAKER GAIN and TUNE controls when setting up the adaptor (Part 5B, Chap. 1). The adjustment of the TUNE control for RATT operation is achieved by use of the meter 5M1 (in USE position). The meter remains connected across the RATT error output, via 5R18 instead of 5R17 (Figure 5A.2.11). The SET (RATT) positions of the function selector switch are also used, in conjunction with USE position of the meter switch, for alignment of the discriminators (Part 5B, Chapter 3).

POWER SUPPLIES

(Figure 5A.2.8)

Introduction

32. The power supply unit is a series load stabilised circuit. The input and output voltages and current ratings are as follows:-

Mains Input

- (i) 240V (Nominal) 50/60 c/s single phase
- (ii) 110V (Nominal) 50/60 c/s single phase

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Output

+ 20V d.c. at 50 mA (maximum)

Maximum Power Consumption

10 watts

Circuit Description

33. The mains supply is connected across the primary of the mains transformer 5T1 via the fuses 5FS1/2, the ON/OFF switch 5SD and the mains tapping selector switch 5SE. The indicator lamp 5ILP1 is connected across the input in series with the dropper resistor 5R1. The secondary of 5T1 is centre tapped and an output of 36V (nominal) is derived from the full wave rectifier 5D1/5D2, bleeder resistor 5R4 and reservoir capacitor 5C3. High frequencies are by-passed by 5C2 and 5R2.

34. The d.c. output of the rectifier is divided into two supplies; one is of 20 volts between the positive side and earth, the other is the complete 36 volts (nominal) output. The first supply provides h.t. for printed boards 1, 2 and 3; the second supply, dropped by approximately 8 volts through 5R14, is for the 28 volt relays on printed boards 1 and 4. The stabilising circuit consists of a comparator stage 5VT3, 5D5 with the potential divider 5R13/5R11/5R12, a d.c. amplifier stage 5VT2 and a series control stage 5VT1 in the negative rail of the regulator. A reference base to emitter voltage for 5VT3 is established by the combination of the zener diode and the adjustment of RV1; deviations from this bias are d.c. amplified by 5VT2, the output from which causes the control transistor 5VT1 to conduct either more or less heavily, so increasing or decreasing the voltage across the potential divider. When the mains supply is first switched on, transistor 5VT1 forms an open circuit, preventing a return path for current to flow through the potential divider, so that no forward bias is developed at the base of 5VT3, and none of the transistors conducts. A path for current through the potential divider is provided at this time through 5R9 and the closed contact 5RLA1. (The relay 5RLA is energised by the charging current drawn by 5C4 through 5R5 and the coil of 5RLA. This is sufficient to close the relay contacts for approximately 9 ms, after which the charging current decays and the relay contacts open). The voltage developed across the potential divider renders the base of 5VT3 positive with respect to its emitter. 5VT3 is switched on and its collector potential falls. Current is drawn from the base of p-n-p transistor 5VT2 so that this transistor switches on and its collector current flows into the base of 5VT1. This transistor conducts, completing the circuit to the negative rail of the regulator.

Stabilising Circuit

35. The stabilising circuit has three main functions to perform; to maintain a stable output from the rectifier with normal mains voltage or load variations, and also to provide protection against fault conditions. The manner in which the circuit operates under these various conditions is as follows:-

- (a) Decrease in output voltage due to decrease in mains supply or increase in load:-

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- (i) The voltage at the emitter of 5VT3, through the zener diode, decreases by a similar amount.
 - (ii) The voltage at the base of VT5 decreases by only (approximately) half of the amount in (i), due to the potential divider.
 - (iii) The effect of (i) and (ii) is to increase the base to emitter voltage of 5VT3, causing this transistor to conduct more heavily.
 - (iv) Current is drawn from the base of p-n-p transistor 5VT2, so that this transistor also conducts more heavily.
 - (v) Current flows into the base of 5VT1 causing this transistor to conduct more heavily. The increase in collector current of 5VT1 is developed across the potential divider to restore both the h.t. voltage and the reference bias on 5VT3 to their previous values.
- (b) An increase in output voltage, due to an increase in mains supply or a decrease in load, is compensated by a reversal of the circuit action described in (a).
- (c) Under conditions of fault, such as a short on the regulated h.t. supply, or a failure of the mains supply, either of which would give a rapid decrease in output voltage, the action is as follows:-
- (i) As the voltage on the positive rail falls below 10 volts, the zener diode 5D5 becomes open circuited, and the base to emitter voltage of 5VT3 decreases, so that this transistor conducts less heavily.
 - (ii) The decrease in the current drawn from the base of 5VT2 causes this p-n-p transistor to conduct less heavily.
 - (iii) The increase in current flowing into the base of 5VT1 causes this transistor to conduct less heavily, further decreasing the voltage across the potential divider.
 - (iv) The actions (i), (ii) and (iii) are continuous and cumulative, till 5VT1 is cut-off and the output circuit of the rectifier is broken.

METER FACILITIES

(Figure 5A.2.8)

36. Meter 5M1 provides the following facilities, selected by meter switch 5SB:-
- (a) On USE position, the error signals at SKTF/15 (VOICE) and at SKTF/14 (RATT) are fed via the switch SB to one side of the meter and the error signals at SKTF/13/8 (VOICE) and SKTF/11 (RATT) are fed to the other side (Paragraphs 25 and 30). Errors are indicated by deviations from the centre zero of the meter, and can be tuned out by the TUNE control, 5C1, which makes small frequency adjustments to the local oscillator. The meter indications are also used when aligning the discriminators (Part 5B, Chapter 3).

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- (b) On H.T. position the meter is connected as a voltmeter via 5R3 between the h.t. rail of the rectifier and earth, to check the + 20 volts supply.
- (c) On positions I.1, I.2 and I.3 the meter registers the h.t. currents being taken by the printed boards 1, 2 and 3 respectively. The calibration of the meter for use in positions H.T., I.1, I.2 and I.3 is described in Part 5C, Chapter 2.

37. Converter, Single Sideband 5820-99-971-7205 (after 1 January 1971)

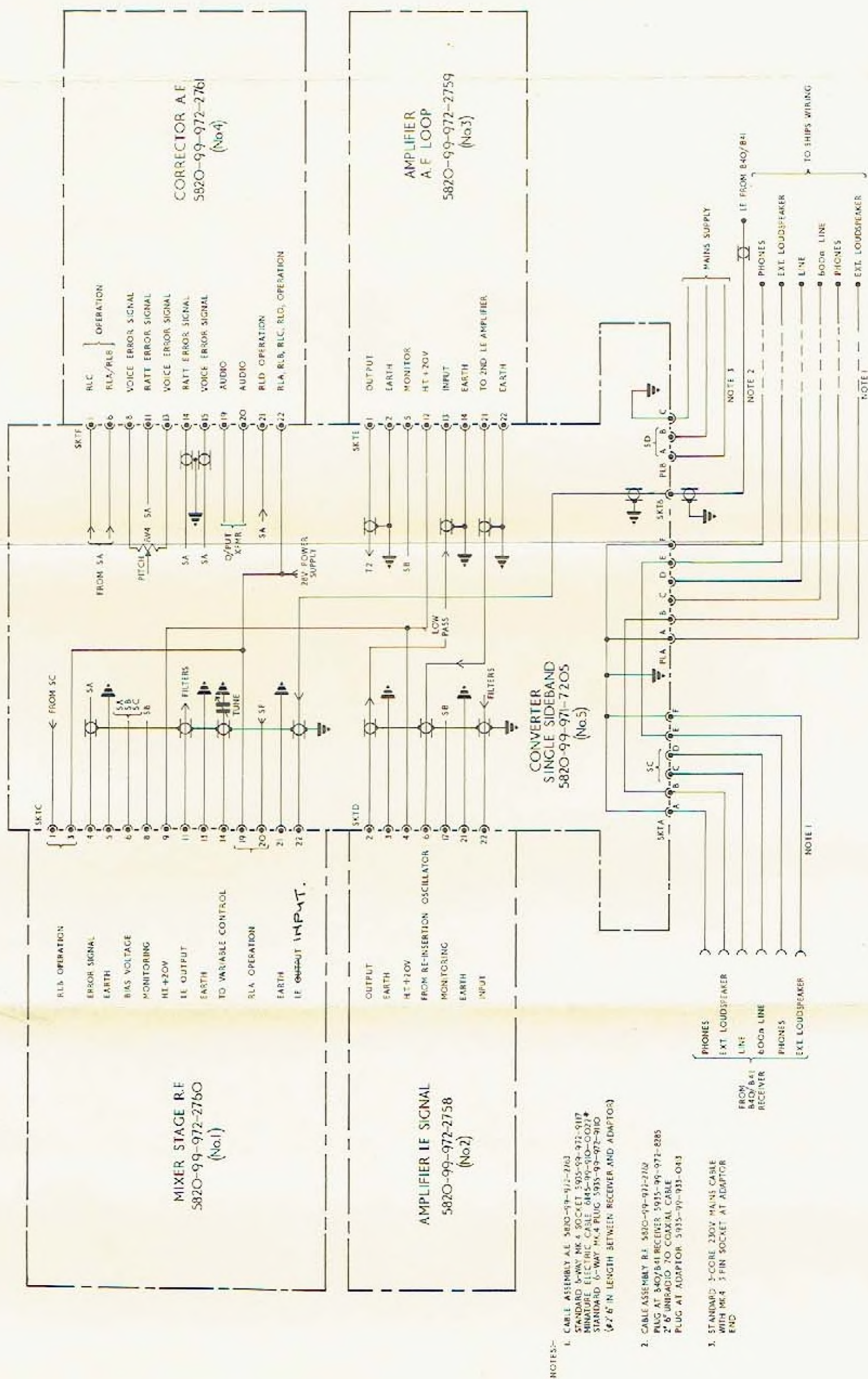
Later versions of VT5 and VT6 (CV7334) in Amplifier A.F. Loop have slightly different characteristics from earlier ones. To maintain performance the following (non retrospective) changes have been made to Converters delivered after 1 January 1971.

(a) Main Chassis of Converter Unit

A 1500 pF capacitor (C16) connected across pins 1 and 2 of Transformer T1.

(b) Amplifier A.F. Loop

- (i) Resistor R16 selected on test from values between 3.9k and 6.8k to give meter reading of 6 (1 division) with the meter switch set to 1.3.
- (ii) The balance between VT5 and VT6 can only be made at the extreme end of travel of 3RV2 when the later versions of VT5 and VT6 are fitted. In converters manufactured after 1 March 1971 the value of R7 has been decreased from 22k to 10k. Similar changes may be required if it becomes necessary to change VT5 or VT6 on boards in service.



ADAPTOR OUTFIT FAZ EQUIPMENT CIRCUIT DIAGRAM

FIG. 5A.2.3.

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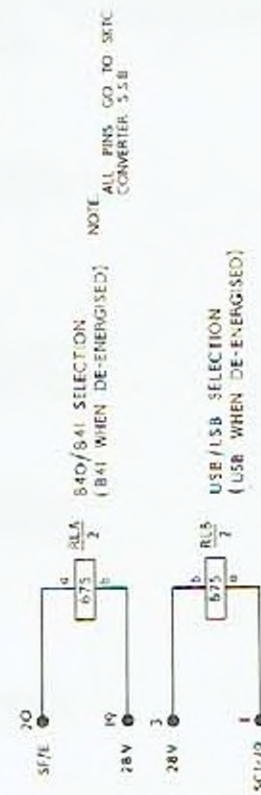
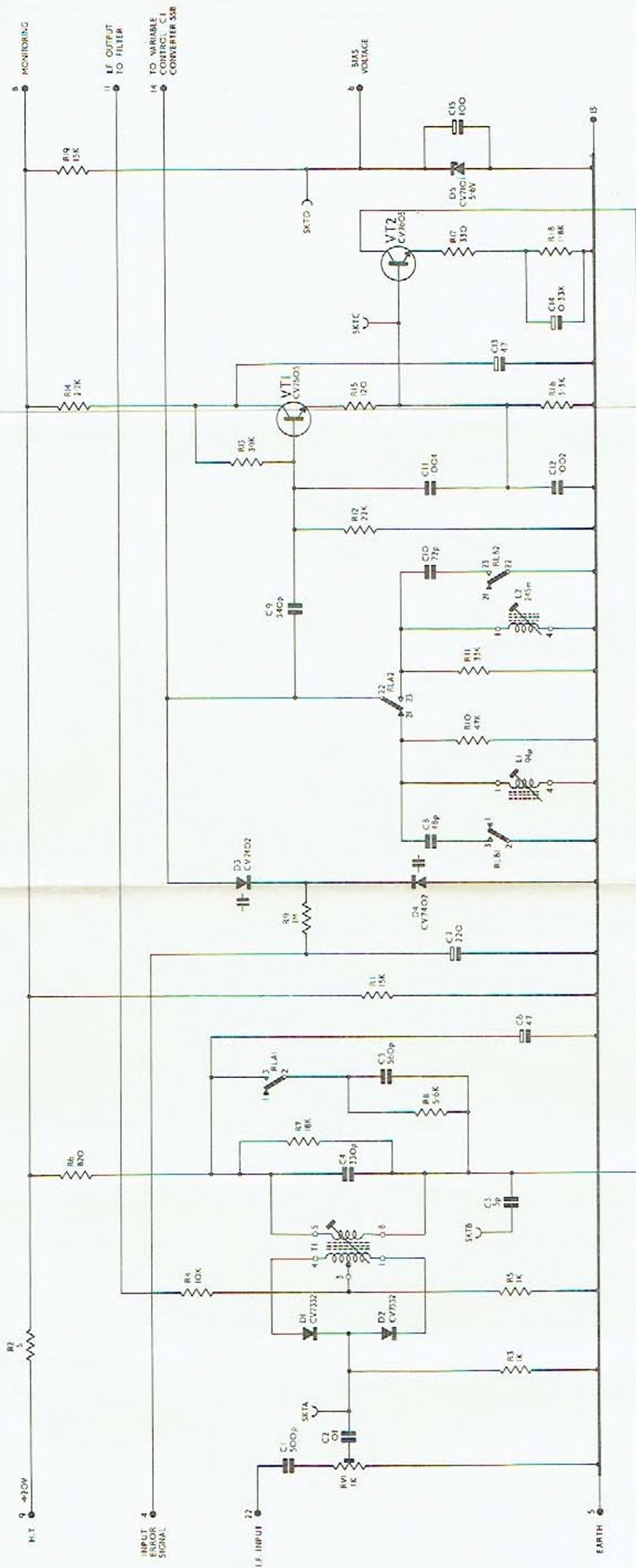
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BR 2432 (SA) Chap 2
Change 1 8.69

R	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
C	1	2																		
MISC.	RVI	RLA	SKTA	D1	D2	TI	SKTB	RLA1	RLA2	L1	RLA2	L2	RLB2	VT1	SKTC	VT2	SKTD	DS		R

BALANCED DIODE MIXER

LOCAL OSCILLATOR

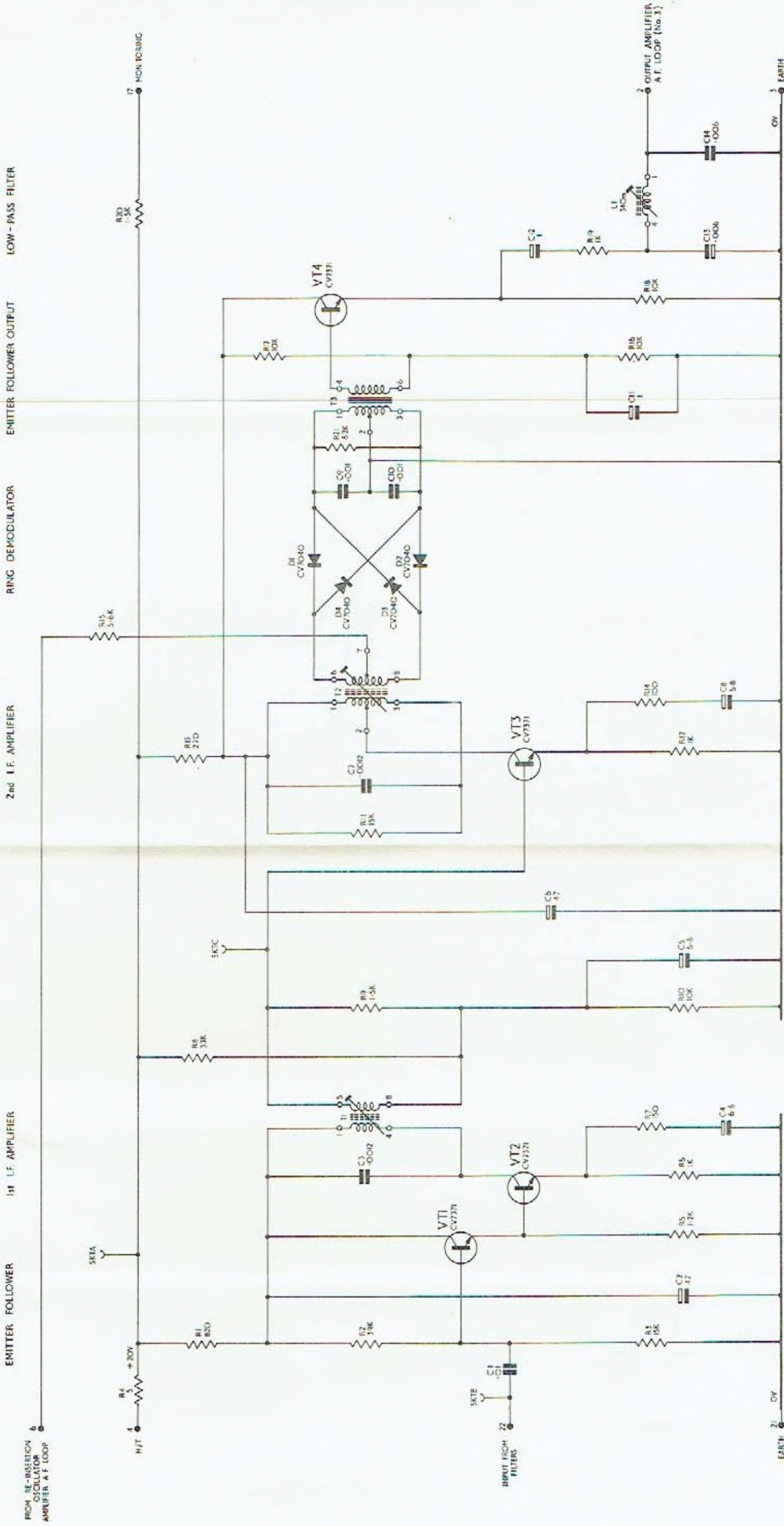


MIXER STAGE R.F. (No.1)
5820-99-972-2760 CIRCUIT DIAGRAM

FIG. 5A.2.4

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R	4	2	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	R
C	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	C
MISC	SKTB	VT1 SKTA	VT2	VT12	VT1	VT1	VT1	VT1	VT1	VT1	VT1	VT1	VT1	VT1	VT1	VT1	VT1	VT1	MISC



NOTE
ALL PINS GO TO SKID CONVERTER SSB



AMPLIFIER I.F. SIGNAL (No.2)
5820-99-972-2758 CIRCUIT DIAGRAM

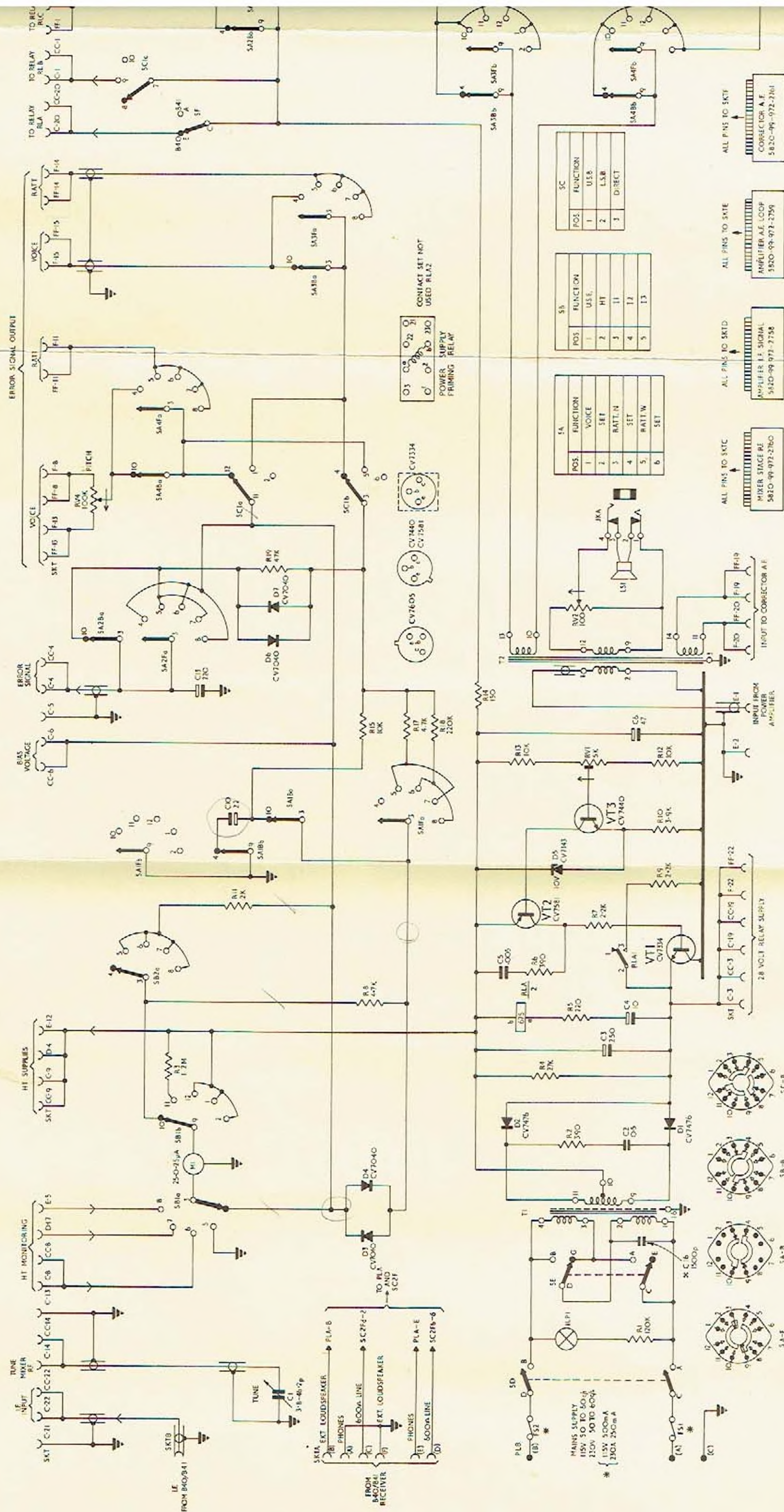
FIG. 5A2.5

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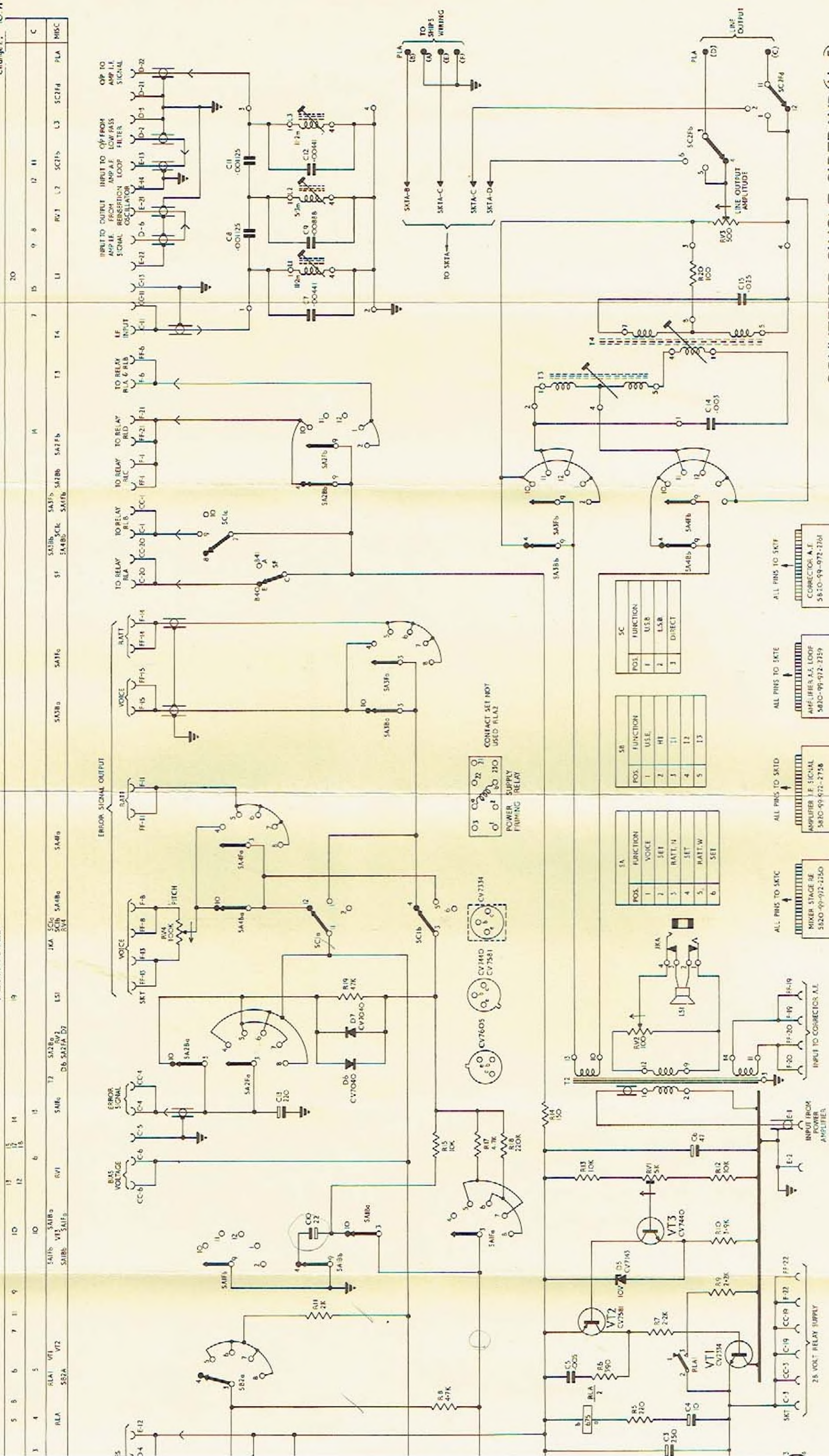
R	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022	1023	1024	1025	1026	1027	1028	1029	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	1041	1042	1043	1044	1045	1046	1047	1048	1049	1050	1051	1052	1053	1054	1055	1056	1057	1058	1059	1060	1061	1062	1063	1064	1065	1066	1067	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077	1078	1079	1080	1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116	1117	1118	1119	1120	1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131	1132	1133	1134	1135	1136	1137	1138	1139	1140	1141	1142	1143	1144	1145	1146	1147	1148	1149	1150	1151	1152	1153	1154	1155	1156	1157	1158	1159	1160	1161	1162	1163	1164	1165	1166	1167	1168	1169	1170	1171	1172	1173	1174	1175	1176	1177	1178	1179	1180	1181	1182	1183	1184	1185	1186	1187	1188	1189	1190	1191	1192	1193	1194	1195	1196	1197	1198	1199	1200	1201	1202	1203	1204	1205	1206	1207	1208	1209	1210	1211	1212	1213	1214	1215	1216	1217	1218	1219	1220	1221	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CONVERTER SINGLE SIDEBAND (No. 5)
5820-99-97-7205 CIRCUIT DIAGRAM
FIG. 5A2.8

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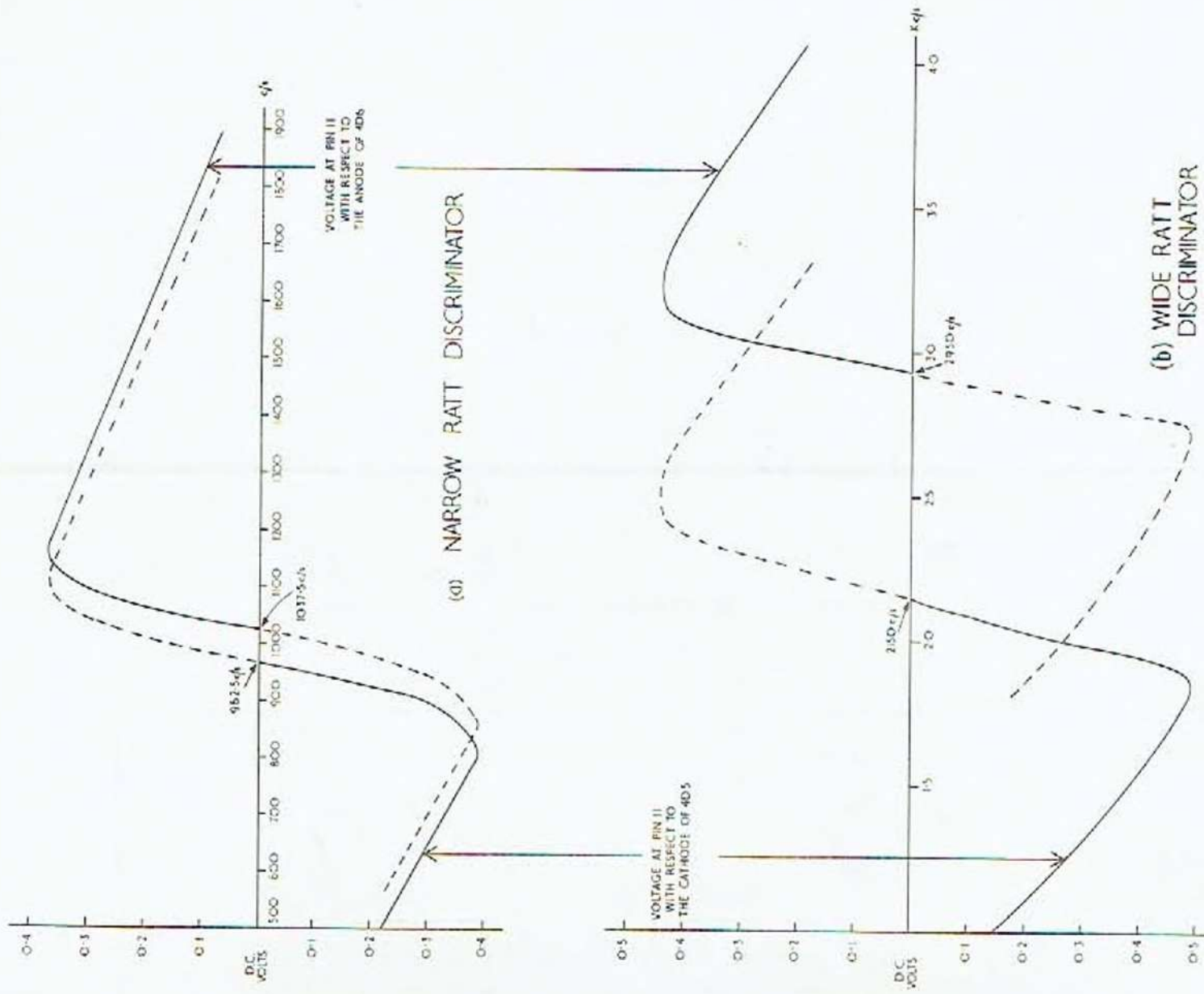
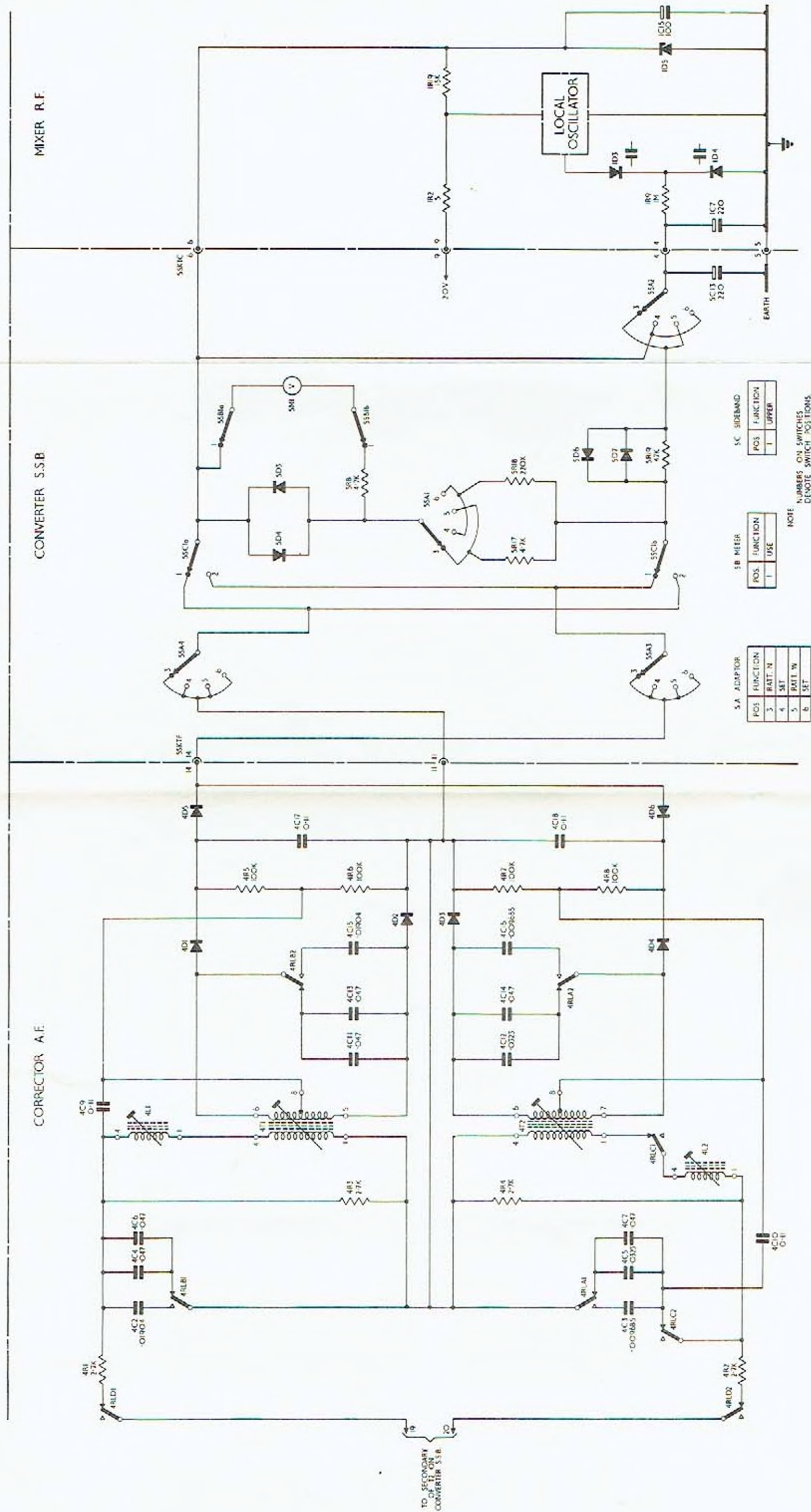


FIG. 5A.2. 10. RATT AFC DISCRIMINATOR CHARACTERISTICS—IDEALISED

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AUTOMATIC FREQUENCY CONTROL
RATT. OPERATION

FIG. 5A.2.11

RESTRICTEDB.R. 2432 (5A) Chap. 3
Original 2.67CHAPTER 3MECHANICAL DESCRIPTIONCONTENTS LIST

	<u>Paragraphs</u>
Introduction	1
Weight and Dimensions	2
Tray Converter Mounting N.S.N. 5820-99-971-7206	3
Chassis Layout	4
Printed Circuit Carriers	5
Plug-in Printed Circuit Boards	6
Front Panel	7
Back Plate	8
Cable Assemblies	9-11

ILLUSTRATIONS

	<u>Figure No.</u>
Converter Single Sideband - 5820-99-971-7205	
Chassis (photograph)	5A.3.1
Back Plate (photograph)	5A.3.2

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B.R.2432 (5A) Chap. 3
Original 2.67

CHAPTER 3

MECHANICAL DESCRIPTION

Introduction

1. The Receiver Adaptor Outfit FAZ is assembled to a single chassis bolted to a front panel. A cover is fitted over the top of the chassis to which it is secured by seventeen 4 B.A. cheesehead screws. The complete unit is housed in the Tray Converter Mounting (Paragraph 3).

Weight and Dimensions

2. The dimensions and weight of the Adaptor complete with the Tray Converter Mounting are as follows:-

<u>Width</u>	<u>Height</u>	<u>Depth</u>	<u>Weight</u>
13 $\frac{1}{4}$ in	3 5/8 in	16 $\frac{1}{2}$ in	17 lb

Tray Converter Mounting N.S.N. 5820-99-971-7206

3. In the majority of installations this tray is bulkhead mounted by fitting shock absorbers to the transverse members on its underside; the tray can also be positioned on top of a B40 or B41 Receiver by means of four $\frac{1}{4}$ in. diameter unified thread bolts and nuts.

Chassis Layout

(Figure 5A.3.1)

4. The majority of the circuit components are assembled on four plug-in printed circuit boards (Paragraph 6) housed in a pair of printed circuit carriers (Paragraph 5). Other components are mounted directly on to the main chassis as follows:-

- (a) At the rear of the right-hand printed circuit carrier:-
 - (i) A component panel for the stabilised power supply
 - (ii) The mains supply transformer
 - (iii) A mounting bracket for the mains transformer and other miscellaneous components
- (b) At the rear of the left-hand printed circuit carrier:-
 - (i) The output transformer
 - (ii) The i.f. filter
 - (iii) The 1000 c/s tone filter

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A tagboard associated with a meter circuit is attached to the front of the left-hand carrier.

Printed Circuit Carriers

5. The two printed circuit carriers are constructed of aluminium in the form of a rectangular frame with one open side. The printed circuit boards, two to each carrier, are positioned horizontally one above the other in guides bolted to two sides of the frame. When the boards are placed in position they connect with standard 22-way printed circuit sockets bolted to the remaining side of the frame. Adjacent to the top socket on each of the two carriers is a further socket, connected in parallel with the first, into which the uppermost board can be plugged so that it then assumes a vertical position. This facility allows access to all the boards when the unit is under test.

Plug-in Printed Circuit Boards

6. Each board is copper clad, single sided and is made from 1/16 in. epoxy glass cloth. Terminations are made to a standard 22-way printed circuit connector integral with the board.

Front Panel

7. The front panel which is bolted to the main chassis by six 4 B.A. 3/8 in. cheesehead screws, carries the undermentioned controls and fittings:-

- (a) ON/OFF switch and associated indicator lamp.
- (b) Testmeter
- (c) Meter switch (USE/H.T./I.1/I.2/I.3/5-7)
- (d) Function Selector switch (VOICE/SET RATT.N/SET RATT.W/SET)
- (e) Sideband selector switch (USB/LSB/DIRECT)
- (f) Local oscillator TUNE control
- (g) Monitoring loudspeaker
- (h) Speaker GAIN control
- (j) PITCH (voice) control
- (k) Headphone jack socket
- (l) Two knurled head locking screws
- (m) Two lifting handles
- (n) Earth (bonding) Socket

The function of the controls and fittings is described in Part 5B, Chapter 1.

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RESTRICTEDB.R.2432 (5A) Chap. 3
Original 2.67Back Plate

8. The back plate is integral with the chassis assembly, being an extension of the chassis bent at 90° and strengthened with side flanges and gussets. The following items are mounted on the panel:-

- (a) RATT output amplitude control
- (b) Signal input and output connectors
- (c) Three pin mains input plug
- (d) Two fuseholders
- (e) 115/230V mains tapping selector switch
- (f) B40/B41 selector switch

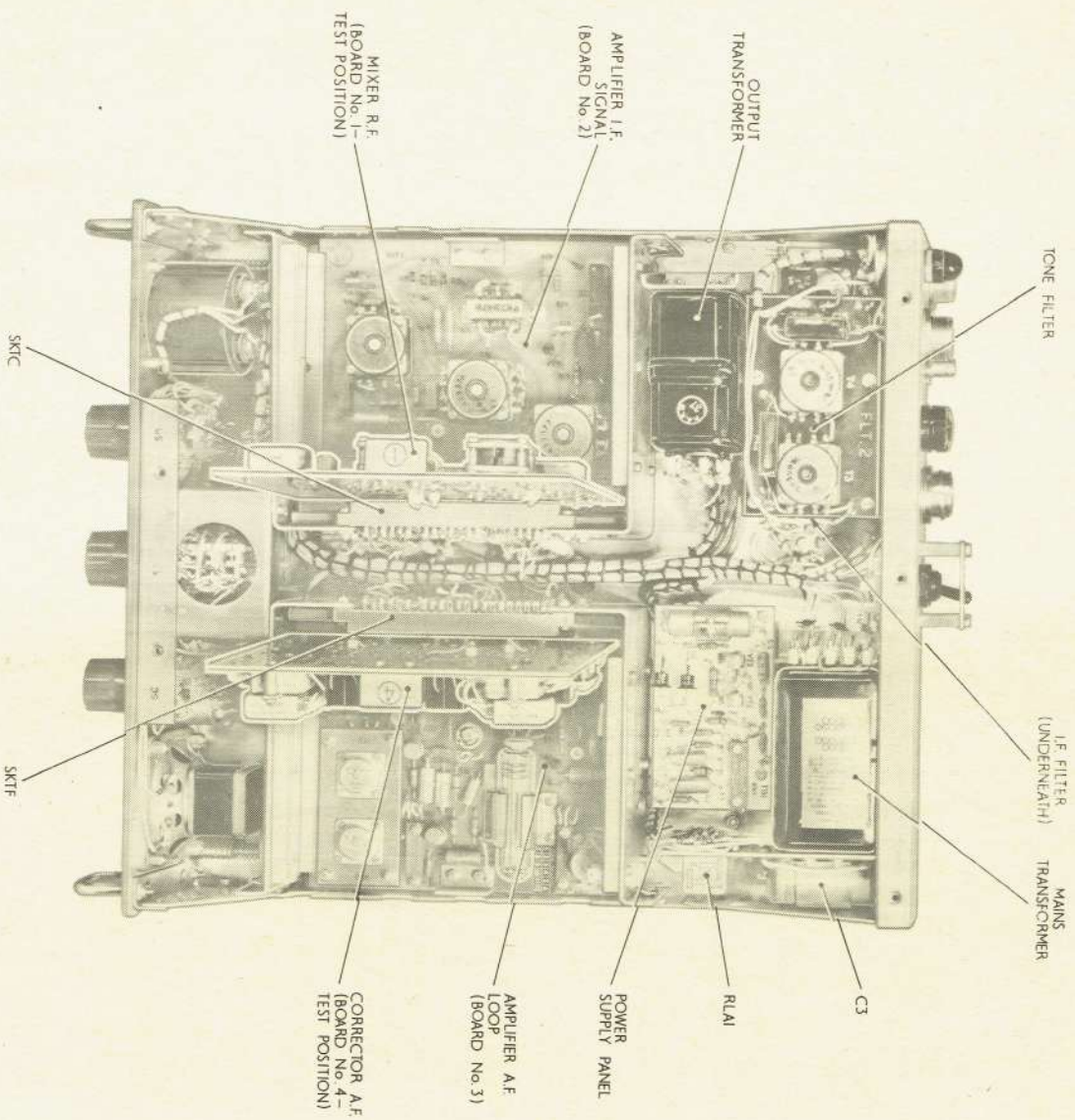
Cable Assemblies

(Figure 5A.2.3)

9. The i.f. signal from the B40 or B41 Receiver is routed to the Adaptor by the 5820-99-972-2762 Cable Assembly R.F. This is a 2'6" length of Uniradio 70 coaxial cable, terminated at the Receiver by a 5935-99-972-8285 Plug and at the Adaptor by a 5935-99-933-0413 Plug.
10. The a.f. output from the B40 or B41 Receiver is fed to the Adaptor by a Cable Assembly A.F., 5820-99-972-2763, which consists of a 2'6" length of miniature electric cable, 6145-99-910-0022, terminated at the Receiver end by a standard 6-way Mk.4 socket, 5935-99-972-9117, and at the Adaptor end by a standard 6-way Mk.4 plug, 5935-99-972-9110. The a.f. output from the Adaptor is fed to the ships wiring by a similar cable assembly.
11. The a.c. mains input is connected to the Adaptor via a standard 3-core 230V mains cable, terminated with a Mk.4 3-pin socket.

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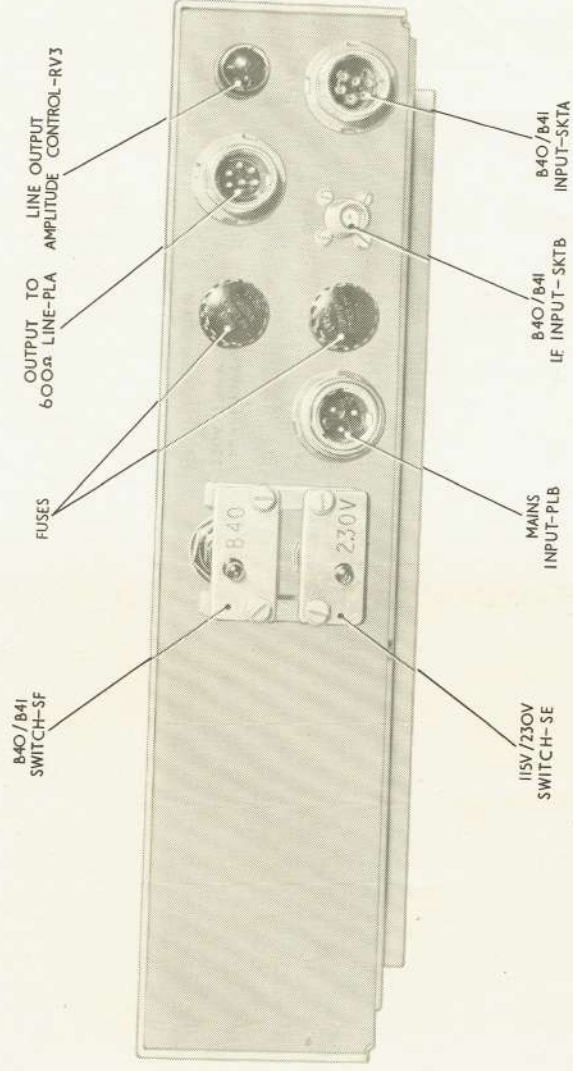


CONVERTER SINGLE SIDEBAND-CHASSIS
5820-99-971-7205

FIG. 5A.3.1

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CONVERTER SINGLE SIDEBAND — BACK PLATE
5820-99-971-7205

FIG. 5A. 3.2

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B.R. 2432(5B)
Original 2.67

PART 5B

SWITCHING ON/OFF SETTING UP
AND PERFORMANCE TESTS

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RESTRICTEDB.R.2432, Part 5B
Original 2.67PART 5BSWITCHING ON/OFF, SETTING UPAND PERFORMANCE TESTSCONTENTS LIST

CHAPTER 1 - OPERATING INSTRUCTIONS

CHAPTER 2 - SETTING TO WORK

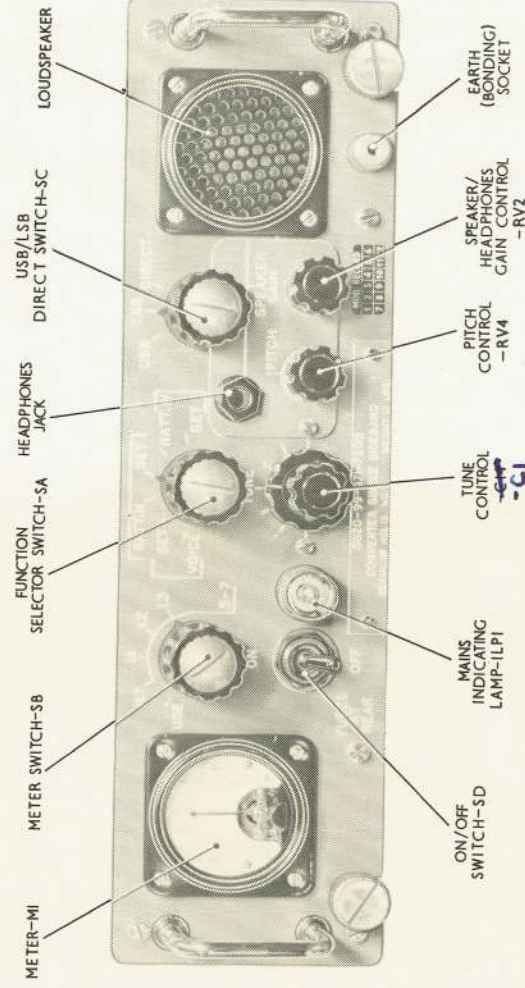
CHAPTER 3 - ALIGNMENT

CHAPTER 4 - HARBOUR ACCEPTANCE TRIALS (To be issued later)

ILLUSTRATIONSFigure No.

CONVERTER SINGLE SIDEBAND 5820-99-971-7205 - FRONT PANEL	5B.1.1
TEST EQUIPMENT CONNECTIONS - I.F. FILTER	5B.3.1
TEST EQUIPMENT CONNECTIONS - TONE FILTER	5B.3.2
TEST EQUIPMENT CONNECTIONS - LOCAL OSCILLATOR FREQUENCY ALIGNMENTS	5B.3.3
TEST EQUIPMENT CONNECTIONS - LOCAL OSCILLATOR DISTORTION CHECK	5B.3.4
TEST EQUIPMENT CONNECTIONS - FREQUENCY CONTROL CIRCUIT CHECK	5B.3.5A
TEST EQUIPMENT CONNECTIONS - FREQUENCY CONTROL CHECK	5B.3.5B
TEST EQUIPMENT CONNECTIONS - I.F. RESPONSE	5B.3.6
TEST EQUIPMENT CONNECTIONS - RING DEMODULATOR CHECKS	5B.3.7
TEST EQUIPMENT CONNECTIONS - AMPLIFIER A.F. LOOP	5B.3.8
TEST EQUIPMENT CONNECTIONS - RE-INSERTION OSCILLATOR CHECK	5B.3.9
TEST EQUIPMENT CONNECTIONS - RATT DISCRIMINATOR - UPPER LIMIT	5B.3.10
TEST EQUIPMENT CONNECTIONS - OVERALL TEST - LOCAL OSCILLATOR FREQUENCIES	5B.3.11A
TEST EQUIPMENT CONNECTIONS - OVERALL TEST	5B.3.11B

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CONVERTER SINGLE SIDEBAND—FRONT PANEL

5820-99-971-7205

FIG. 5B.I.1

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BR 2432(5B) Chap. 1.
Change 1, 8.69:CHAPTER 1
=====OPERATING INSTRUCTIONS
=====CONTENTS LISTParagraphs

Introduction	1
Initial Setting-up S.S.B. Adaptor	2
Initial Setting-up - B40, B40A/B/C/D and B41, B41A/B/C Receivers	3
Setting-up the Receiver for Voice Signals	4
Setting-up the S.S.B. Adaptor for Voice Signals	5-7
Setting-up the Receiver for RATT Signals	8
Setting-up the S.S.B. Adaptor for RATT Signals in the absence of Frequency Availability Broadcast	9
Setting-up the S.S.B. Adaptor for RATT Signals in the presence of Frequency Availability Broadcast	10

ILLUSTRATIONSFigure No.

Converter Single Sideband 5820-99-971-7205 - Front Panel

5B.1.1

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RESTRICTEDB.R.2432 (5B) Chap. 1
Original 2.67CHAPTER 1OPERATING INSTRUCTIONSIntroduction

1. Detailed instructions for the operation of the B40 and B41 Receivers are given in B.R.1617 and B.R.1618 respectively, therefore instructions for the joint operation of the Receiver and Adaptor only are given in this Chapter.

Initial Setting-up - S.S.B. Adaptor

- 2.(1) Meter switch to USE.
- (2) TUNE control to its central position
- (3) PITCH control to its central position
- (4) USB/LSB/DIRECT switch to DIRECT.
- (5) SPEAKER GAIN control fully counter-clockwise
- (6) ON/OFF switch to ON.

Initial Setting-up - B40, B40A/B/C/D and B41, B41A/B/C Receivers

- 3.(1) ON/OFF switch to ON.
- (2) A.G.C. ON/OFF to ON.
- (3) L.S. ON/OFF to ON.
- (4) OSC. TRIM to 0. (B40D only).

Setting-up the Receiver for Voice Signals

- 4.(1) System switch to R/T.
- (2) BANDWIDTH switch to NARROW (B40, B40A, B41, B41A) or 3 KC/S (B40B/C/D, B41B/C).
- (3) Tune for maximum volume from the loudspeaker. Alternatively, it may be found preferable to put the B40 System Switch to TUNE and tune for zero beat.

NOTE: As this is an S.S.B. transmission the signals will be unintelligible.

- (4) L.S. ON/OFF to OFF.

Setting-up the S.S.B. Adaptor for Voice Signals

- 5.(1) Function switch to VOICE SET.

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- (2) USB/LSB/DIRECT switch to USB or LSB.
 - (3) Turn the SPEAKER GAIN control clockwise for a reasonable level of output from the loudspeaker or headphones.
 - (4) Adjust the TUNE control for undistorted signals.
 - (5) Function switch to VOICE.
6. If the signal tone is too high or low the PITCH control should be turned in a counter-clockwise or clockwise direction respectively, a little at a time, pausing for at least 10 seconds between each adjustment until the tone changes to the desired pitch. A change in the transmitted signal may also require further adjustment of the PITCH control.
7. During the reception of signals any deterioration in quality will be indicated by the meter pointer becoming off-set from its mid-scale position. This should be remedied by returning the function switch to VOICE SET and readjusting the TUNE control.

Setting-up the Receiver for RATT Signals

8.(a) Wide RATT

- (i) System switch to TUNE
- (ii) BANDWIDTH switch to NARROW (B40, B40A, B41, B41A) or 3 KC/S (B40 B/C/D, B41B/C).
- (iii) L.S. ON/OFF to ON.
- (iv) Tune the Receiver for zero beat or the lowest pitched signal.

NOTE: This centres the two tones in the passband of the i.f.

- (v) L.S. ON/OFF to OFF.

(b) Narrow RATT

- (i) System switch to TUNE.
- (ii) BANDWIDTH switch to NARROW (B40, B40A, B41, B41A) or 1 KC/S (B40 B/C/D, B41B/C).
- (iii) L.S. ON/OFF to ON.
- (iv) Tune the Receiver for zero beat or the lowest pitched signal.

NOTE: This centres the two tones in the passband of the i.f.

- (v) L.S. ON/OFF to OFF.

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Setting-up the S.S.B. Adaptor for RATT Signals in the absence of Frequency Availability Broadcast

- 9.(1) Function switch to RATT N SET or RATT W SET.
- (2) USB/LSB/DIRECT switch to USB or LSB.
- (3) Turn the SPEAKER GAIN control clockwise for a reasonable level of output from the loudspeaker or headphones.
- (4) Adjust the TUNE control so that the meter reads 0.
- (5) Function switch to RATT N or RATT W and check that the teleprinter is working.
- (6) SPEAKER GAIN control fully counter-clockwise.

NOTE

- (i) When receiving signals the receiver drift is indicated by the meter pointer becoming off-set from 0, this is remedied by readjusting the TUNE control to return the meter reading to 0.
- (ii) Any adjacent F.A.B. signal or other unwanted signal that falls within the discriminator responses will cause a spurious meter reading. In this case proceed as follows:-

Setting-up the S.S.B. Adaptor for RATT Signals in the presence of Frequency Availability Broadcast

- 10(1) Function switch to RATT N SET or RATT W SET.
- (2) USB/LSB/DIRECT switch to USB or LSB.
- (3) Turn the SPEAKER GAIN control clockwise for a reasonable level of output from the loudspeaker or headphones.
- (4) Tune FAZ for correct two tone O/P as heard in the FAZ loudspeaker.
- (5) Function switch to RATT N or RATT W and check that the teleprinter is working.
- (6) SPEAKER GAIN control fully counter-clockwise.

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RESTRICTEDB.R. 2432, (5B) Chap. 2
Original 2.67CHAPTER 2SETTING TO WORKIntroduction

1. This chapter describes the procedure for installing a Receiver Adaptor Outfit FAZ and matching it to a B40 or B41 Receiver.

Test Equipment

2. The undermentioned test equipment is required:-
 - (a) 6625-99-943-7177 Oscilloscope General Purpose CT386A.
 - (b) 6625-99-972-7257 Signal Generator CT452.
 - (c) 5905-99-012-8233 Resistor 620 ohm 5% $\frac{1}{2}$ W
 - (d) 6625-99-943-1524 Multimeter 8SX

Installation

- 3.(1) Set the B40/B41 switch on the Adaptor as required.
- (2) Set the Mains Supply Switch on the Adaptor to the correct voltage input.
- (3) Fit the Adaptor to the Mounting Tray and tighten the two knurled locking screws.
- (4) Remove the cover from the Adaptor.
- (5) Remove the a.f. line output socket from the Receiver.
- (6) Connect the 5820-99-972-2763 Cable Assembly A.F. between the a.f. line output plug of the Receiver and SKTA on the Adaptor.
- (7) Connect the mains supply lead to Plug PLB on the Adaptor.
- (8) Connect the 5820-99-972-2762 Cable Assembly R.F. between the I.F. OUTPUT of the Receiver and the Adaptor.
- (9) Switch ON the mains supply to the Adaptor and the Receiver.
- (10) Set the Meter switch in turn to each of its test positions and check that the reading on the meter is 6 divisions ± 1 division in each case.

NOTE

If in position I.3 of the switch the meter reading is below 5 then 3RV3 on the Amplifier A.F. Loop Board should be adjusted.

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Setting-up the Receiver

4. Set-up the Receiver as follows:-

- (1) Receiver B40:-
 - (i) System switch to CW HIGH
- (2) Receivers B40A/B/C/D and B41:-
 - (i) System switch to CW HIGH
 - (ii) BANDWIDTH switch to 3 kc/s
 - (iii) OSC TRIM control to 0 (B40D only)
- (3) Connect the CT452 to the aerial input plug of the Receiver and inject a signal as follows:-
 - (i) Receivers B40A/B/C/D:- 3 Mc/s at 2mV
 - (ii) Receiver B41:- 50 kc/s at 2mV
- (4) A.G.C. switch to ON
- (5) Loudspeaker switch to ON
- (6) Tune to the injected signal (Step 3)
- (7) System switch to R/T
- (8) Loudspeaker switch to OFF

Setting-up the Adaptor

5. Set-up the Adaptor as follows:-

- (1) Function selector switch to VOICE SET
- (2) USB/LSB/DIRECT switch to USB or LSB
- (3) SPEAKER GAIN control midway
- (4) Connect the 620 ohm Resistor across Pins C and D of Plug PLA
- (5) Connect the CT386A across the 620 ohm Resistor
- (6) Adjust the TUNE control for a note of approximately 1 kc/s selecting the louder beat note.
- (7) Observe the sine wave on the CT386A and adjust 3RV1 until limiting commences. Note the amplitude of the waveform.
- (8) Readjust 3RV1 until the amplitude of the waveform is reduced by 10%.

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- (9) Disconnect the CT386A, switch the Multimeter to the 2.5V d.c. range and connect it across the 620 ohm Resistor.
- (10) Adjust 5RV3 until the Multimeter reads 1.1V.
- (11) Disconnect the 620 ohm Resistor and the Multimeter.
- (12) Connect the a.f. line output socket to plug PLA.

NOTE

At the first opportunity tune the Receiver to an S.S.B. voice transmission and if it is necessary to improve the a.f.c. lock, adjust 4RV1 in a clockwise direction.

- (13) Replace the cover on the Adaptor.

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=====A L I G N M E N T
=====Introduction

1. This chapter describes the alignment procedure for each unit of the Adaptor. Where no ambiguity can arise switches and controls have been referred to by name only.

General Instructions

2. The following general instructions should be observed:-
 - (a) Most tests will be more easily carried out if the FAZ is moved to the E.M.R. or L.M.A.
 - (b) When connecting or disconnecting components or test equipment all power supplies to the Adaptor and test equipment must be switched off.
 - (c) The Adaptor and test equipment should be connected to a common earth.
 - (d) All connecting leads should be as short as possible and the screening leads should be connected to a common earth.
 - (e) The Adaptor and test equipment must be warmed up for at least 15 minutes before commencing alignment. A longer period is necessary if the ambient temperature is below 40 °F.
 - (f) Trimming tools should be selected from those in the kit of tools for E.M.R. use.

Test Equipment Required

3. (a) Multimeter Model 8SX 6625-99-943-1524.
- (b) Oscilloscope General Purpose CT386A 6625-99-943-7177.
- (c) Probe for Oscilloscope CT386A 6625-99-972-7114.
- (d) Signal Generator CT452 6625-99-972-7257.
- (e) Signal Generator Audio Frequency CT433 6625-99-943-4059.
- (f) Counter Electronic Frequency CT488 6625-99-971-8519.
- (g) Voltmeter Electronic CT471 6625-99-972-0247.
4. The undermentioned components are also required:-
 - (a) Resistor 4.7 k $\frac{1}{4}$ W 10% (2 off) (Pattern 013-5890 suitable).
 - (b) Resistor 10 k $\frac{1}{4}$ W 5% (2 off) (Pattern 013-5898 suitable).

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- (c) Capacitor $2\mu\text{F}$ 250 V (1 off) (Pattern 011-9840 suitable).
- (d) Battery 1.5 V (1 off) (Pattern 910-1135 suitable).

Power Supplies

5. The undermentioned power supply is required:-
 $230\text{ V} \pm 10\text{ V}$, 40-62 c/s at up to 1 amp.

MAIN CHASSIS

I.F. Filter

6. The alignment of the i.f. filter ensures a passband extending between 18.6 kc/s and 23.4 kc/s and a bandwidth of 4.8 kc/s for 3 dB attenuation.

The Procedure

- 7.(1) Remove all printed circuit boards.
(2) Connect the test equipment as shown in Figure 5B.3.1.

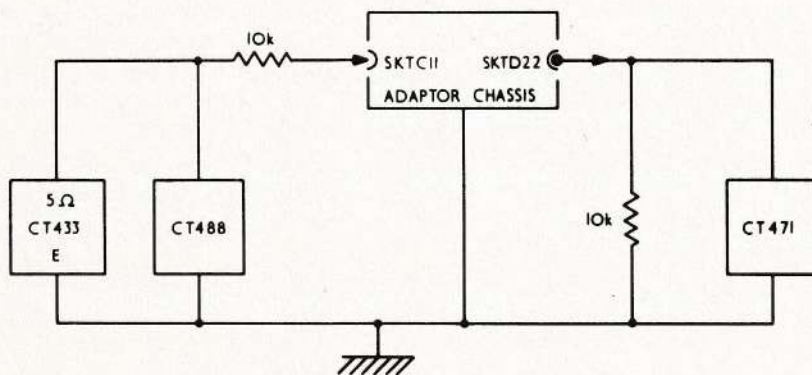


FIG. 5B.3.1. TEST EQUIPMENT CONNECTIONS
- I.F. FILTER

- (3) Set the CT433 to $21\text{ kc/s} \pm 10\text{ c/s}$ as indicated on the CT488.
- (4) Switch the CT471 to the 1.2 V range.
- (5) Adjust the output level of the CT433 to give a convenient reading on the CT471.
- (6) Adjust and readjust 5L1, 5L2 and 5L3 in that order until a maximum reading is obtained on the CT471.

NOTE These coils are adjusted from underneath the chassis.

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- (7) Readjust the output of the CT433 for a reading of 1 V on the CT471.
 - (8) Reset the CT433 to the upper and lower limit frequencies of 23 380 c/s $\pm$ 400 c/s and 18 620 c/s $\pm$ 60 c/s respectively, as indicated on the CT488. The CT471 should read 0.7 V (i.e. an attenuation of 3 dB) at both frequencies. If not set the CT433 to the upper and lower frequencies and readjust 5L1, 5L2 and 5L3 until the CT471 reads 0.7 V.
- NOTE**
- (a) It may be found that it is more practicable to set up the lower frequency to between 18.56 kc/s and 18.68 kc/s by adjusting 5L1, 5L2 and 5L3 for 0.7 V on the CT471.
 - (b) Set the CT433 to 21 kc/s $\pm$ 10 c/s as indicated on the CT488.
 - (c) Readjust the output of the CT433 for reading of 1 V on the CT471.
 - (d) Repeat (a), (b) and (c) until these operations require no further alterations to the inductors.
 - (e) Check that the upper frequency is between 22.98 kc/s and 23.78 kc/s when the CT471 indicates 0.7 V.

- (9) Adjust the frequency of the CT433 and check that when the CT471 reads 0.1 V (i.e. an attenuation of 20 dB) the frequencies indicated by the CT488 are:-

(a) Upper limit - less than 27.5 kc/s.

(b) Lower limit - greater than 16.5 kc/s.

- (10) Disconnect the test equipment and replace printed circuit boards.

Tone Filters

8. The alignment of the tone filter ensures a passband extending between 890 c/s and 1090 c/s and a bandwidth of 200 c/s for 3 dB attenuation.

The Procedure

- 9.(1) Remove all printed circuit boards.
- (2) Connect the test equipment as shown in Figure 5B.3.2.

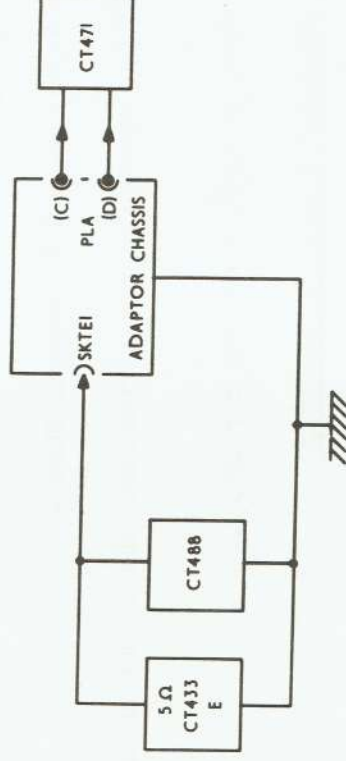


FIG. 5B.3.2. TEST EQUIPMENT CONNECTIONS
- TONE FILTER

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- (3) Set the CT433 to $990 \text{ c/s} \pm 2 \text{ c/s}$ as indicated on the CT488.
- (4) Switch the CT471 to the 1 V range.
- (5) Function selector switch to RATT N.
- (6) Adjust the output level of the CT433 to give a convenient reading on the CT471.
- (7) Adjust 5RV3 for maximum reading on the CT471.
- (8) Adjust the output level of the CT433 until a reading of 1 V is obtained on the CT471.
- (9) Set the CT433 to a nominal upper and lower frequency limit of $1130 \text{ c/s} \pm 5 \text{ c/s}$ and $875 \text{ c/s} \pm 5 \text{ c/s}$ in turn as indicated on the CT488. The CT471 should read 0.7 V (approximately 3 dB attenuation). If not proceed as follows:-

Set the CT433 to the upper and then to the lower limit frequencies; readjust 5T3 and 5T4 respectively until the CT471 reads 0.7 V.

- (10) Adjust the frequency of the CT433 and check that when the CT471 reads 0.1 V (20 dB attenuation) the frequencies indicated on the CT488 are:-
 - (a) Upper limit - less than 1500 c/s.
 - (b) Lower limit - greater than 500 c/s.
- (11) Set the CT433 to 1 kc/s as indicated on the CT488 and adjust the output level to give a reading of 1 V on the CT471.
- (12) Function selector switch to VOICE. The CT471 should read less than 1 V.
- (13) Disconnect the test equipment and replace the printed circuit boards.

MIXER STAGE R.F. (BOARD NO. 1)

10. Alignment of the Mixer Stage R.F. ensures that:-
 - (a) The local oscillator frequencies are correct and the output of the mixer is undistorted.
 - (b) The frequency control circuit functions correctly.

The Procedure - Local Oscillator Frequency Alignment

- 11(1) Remove all the printed circuit boards.

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- (4) Switch the CT471 to the 1.2 V range.

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- (2) Plug Board No. 1 into socket 5SKTCC of the Adaptor chassis, which must be correctly aligned.
- (3) Connect the test equipment as shown in Figure 5B.3.3.

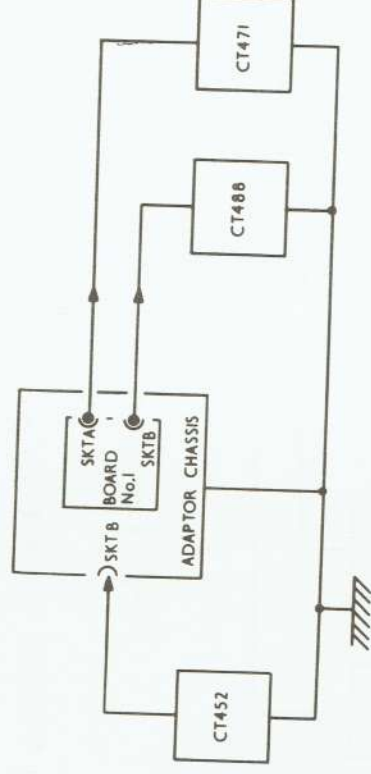


FIG. 5B.3.3. TEST EQUIPMENT CONNECTIONS
- LOCAL OSCILLATOR FREQUENCY ALIGNMENTS

- (4) Meter switch to USE.
- (5) Function selector switch to any SET position.
- (6) USB/LSB/DIRECT switch to USB and the B40/B41 switch to B41.
- (7) TUNE control to the centre graduation line.
- (8) Set the CT452 to $800 \text{ kc/s} \pm 20 \text{ c/s}$ at $50 \text{ mV r.m.s. c.w.}$
- (9) Check 1RV1 for smoothness of operation and turn fully clockwise.

NOTE

During Steps (10), (11), (14) and (15) the TUNE control may be turned a few degrees either side of the centre graduation line to obtain the frequencies.

- (10) Adjust 1L1 until the CT488 registers $821.5 \text{ kc/s} \pm 500 \text{ c/s}$.
- (11) USB/LSB/DIRECT switch to LSB; the CT488 should register $778.5 \text{ kc/s} \pm 500 \text{ c/s}$.
- (12) USB/LSB/DIRECT switch to USB and the B40/B41 switch to B40.
- (13) Set the CT452 to $500 \text{ kc/s} \pm 10 \text{ c/s}$ at $50 \text{ mV r.m.s. c.w.}$
- (14) Adjust 1L2 until the CT488 registers $521.5 \text{ kc/s} \pm 500 \text{ c/s}$.
- (15) USB/LSB/DIRECT switch to LSB, the CT488 should register $478.5 \text{ kc/s} \pm 300 \text{ c/s}$.

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- (16) Disconnect the test equipment and replace the printed circuit boards.

The Procedure - Local Oscillator Distortion Check

- 12(1) Remove all the printed circuit boards.
- (2) Plug Board No. 1 into socket 5SKTCC of the Adaptor Chassis, which must be correctly aligned.
- (3) Connect the test equipment as shown in Figure 5B.3.4.

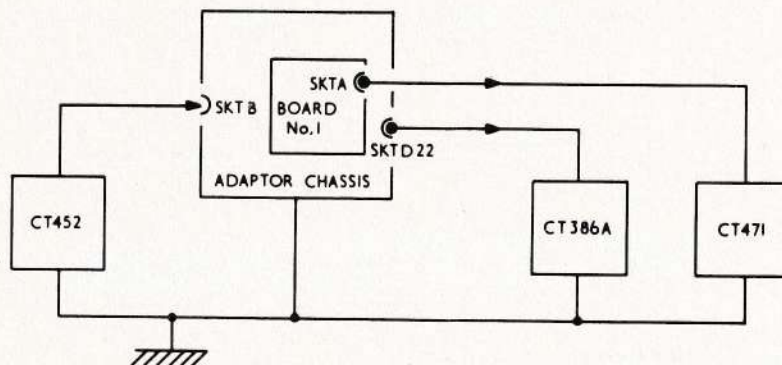


FIG. 5B.3.4. TEST EQUIPMENT CONNECTIONS
- LOCAL OSCILLATOR DISTORTION CHECK

- (4) USB/LSB/DIRECT switch to LSB.
- (5) B40/B41 switch to B40.
- (6) Set the CT452 to $500 \text{ kc/s} \pm 10 \text{ c/s}$ at $50 \text{ mV r.m.s. c.w.}$
- (7) Adjust the TUNE control for maximum output on the CT471.
- (8) Check that the output as seen on the CT386A is an undistorted waveform of more than 4 mV p-p .

NOTE If a CT386A is not available, a CT436 (6625-99-914-2605) may be used, with the input selector switch in the A C X10 position.

- (9) Set the CT452 to $800 \text{ kc/s} \pm 20 \text{ c/s}$ the B40/B41 switch to B41 and repeat Step (8).
- (10) Disconnect the test equipment and replace the printed circuit boards.

The Procedure - Frequency Control Circuit Check

- 13(1) Remove all the printed circuit boards.
- (2) Plug Board No. 1 into socket 5SKTCC of the Adaptor chassis, which must be correctly aligned.

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AMPLIFIER I.F. SIGNAL (BOARD NO. 2)

14. The amplifier i.f. signal testing procedure ensures that:-

- (a) The alignment and gain of the i.f. amplifier is correct.
- (b) The ring demodulator functions correctly.

The Procedure

- 15(1) Remove Boards Nos. 1, 3 and 4.
- (2) Connect the test equipment as shown in Figure 5B.3.6.

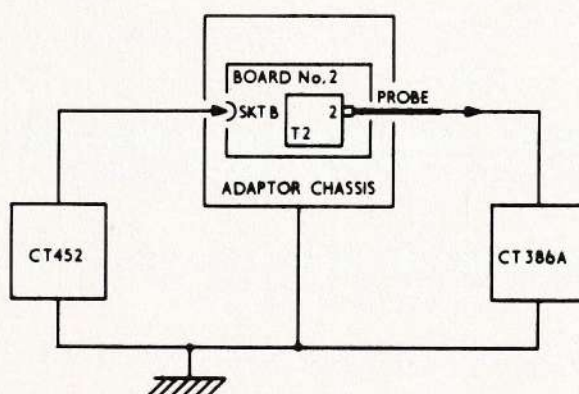


FIG. 5B.3.6. TEST EQUIPMENT CONNECTIONS
- I.F. RESPONSE

- (3) Set the CT452 to 21.5 kc/s at 1 mV.
- (4) Measure the output signal on the CT386A. It should be greater than 400 mV.
- (5) Adjust the frequency of the CT452 above and below 21.5 kc/s to the frequency at which the output falls to 0.7 of the value obtained in Step (5), i.e. 3 dB. The difference between these two frequencies, (i.e. bandwidth) shall not be less than 6 kc/s.
- (6) Connect the test equipment as shown in Figure 5B.3.7.

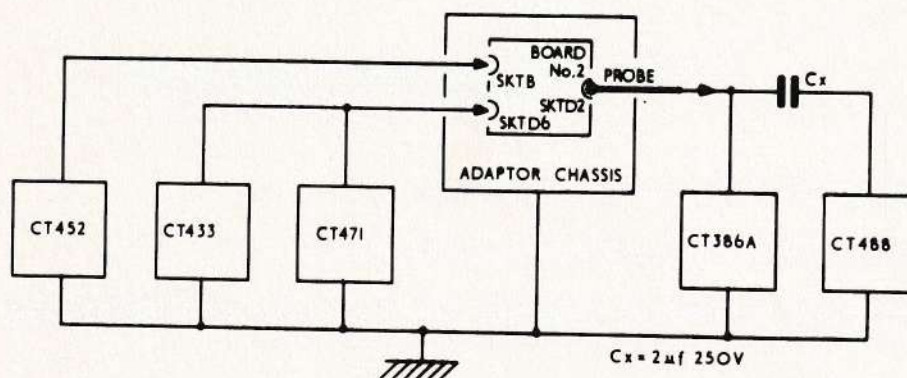


FIG. 5B.3.7. TEST EQUIPMENT CONNECTIONS
- RING DEMODULATOR CHECK

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- (7) Set the CT452 to 21.5 kc/s at 1 mV.
- (8) Set the output of the CT433 to approximately 20 kc/s and set the level to 0.7 V as measured on the CT471.
- (9) Decrease the frequency of the CT433 until counter reads 1800 c/s, (the CT433 should be at 19.7 kc/s).
- (10) Observe on the CT386A that the output from SKTD2 is a sine wave greater than 220 mV p-p with no visible distortion.
- (11) Increase the frequency of the CT433 by approximately 1.5 kc/s until the output measured on the CT386A falls to 0.7 of the value obtained in Step (10), (i.e. 3 dB). The frequency indicated on the CT488 should not be greater than 300 c/s.
- (12) Reduce frequency of the CT433 by approximately 4.2 kc/s until the output again falls to 0.7 of that obtained in Step (10). The frequency indicated on the CT488 should not be less than 4500 c/s.

NOTE

During Steps (11) and (12) it may be necessary to increase the output level of the CT433 in order that the CT488 will operate. The output level of the CT433 should be reduced to 0.7 V before proceeding to Paragraph 13.

- (13) Disconnect the CT452 and CT488.
- (14) Reset the CT433 to 20 kc/s and check that the residual output as seen on the CT386A is below 8 mV p-p.

NOTE If a CT386A is not available, a CT436 (6625-99-914-2605) may be used, with the input selector switch in the A C X10 position.

- (15) Disconnect the test equipment and replace the printed circuit boards.

AMPLIFIER A.F. LOOP (BOARD NO. 3)

16. The alignment of the Amplifier A.F. Loop establishes:-

- (a) The operating point and current drawn by the amplifier.
- (b) The frequency and amplitude of the re-insertion oscillator.

The Procedure

- 17(1) Remove Boards 1, 2 and 4.
- (2) Set 3RV2 to mid-position.
- (3) Set 3RV3 fully counter-clockwise.

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- (4) Connect the test equipment as shown in Figure 5B.3.8.

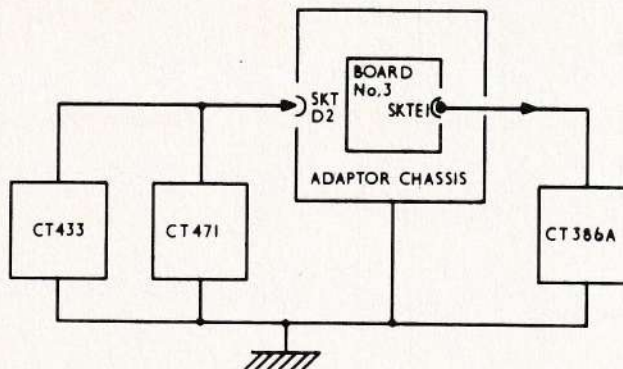


FIG.5B.3.8. TEST EQUIPMENT CONNECTIONS
AMPLIFIER A.F. LOOP

- (5) Set the CT433 to 1800 c/s and the output level indicated on the CT471 to 100 mV.
- (6) Check that 3RV1 gives smooth control of output and set it to give 4 V p-p displayed on the CT386A.

NOTE There may be distortion as mentioned in Paragraph (12).

- (7) Meter switch to I.3.
- (8) Adjust 3RV3 for minimum reading on the Meter M1 with no crossover distortion observed on the CT386A display. Lock 3RV3.
- (9) With the Multimeter 8SX measure the d.c. voltage between 3SKTA and earth and 3 SKTA and h.t., (i.e. junction of R8 and R12 for h.t.).
- (10) Adjust 3RV2 until the readings obtained in Step (9) are equal, (i.e. 10 V approximately): lock 3RV2.
- (11) Disconnect the Multimeter 8SX and adjust 3RV1 for 4 V p-p display on CT386A.
- (12) Observe that there is no visible distortion except for the superimposed breakthrough from the re-insertion oscillator, which should be less than 200 mV p-p.
- (13) Reconnect the test equipment as shown in Figure 5B.3.9.

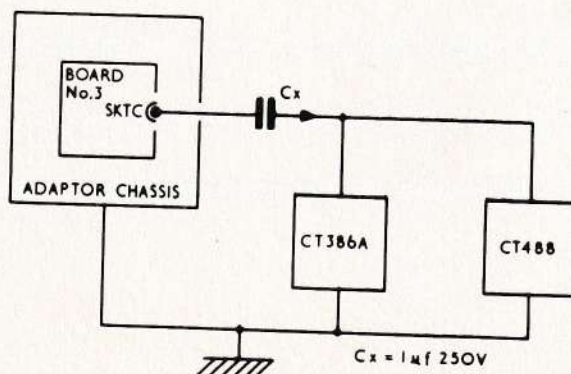


FIG.5B.3.9. TEST EQUIPMENT CONNECTIONS
-INSERTION OSCILLATOR CHECK

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- (14) Adjust 3C16 for maximum output on the CT386A.
- (15) Check 3RV4 for smooth operation.
- (16) Adjust 3RV4 for 3 V output peak-to-peak or maximum that can be obtained (up to 3 V) as seen on the CT386A.
- (17) Check that the output waveform is free from visible distortion and that the frequency reading on the CT488 is $20 \text{ kc/s} \pm 5 \text{ c/s}$.
- (18) Disconnect all test equipment and replace the boards.

CORRECTOR A.F. (BOARD NO. 4)

18. The alignment of Board No. 4 ensures that:-

- (a) The upper and lower limits of the discriminator response for wide and narrow RATT operation are correct.
- (b) The response of the voice discriminator circuit is correct.
- (c) The output amplitude of the error signal is correct.

The Procedure - RATT Discriminator - Upper Limit Check

- 19(1) Remove printed circuit Boards 2, 3 and 4 and plug Board No. 4 into Socket 5SKTFF of the Adaptor Chassis, which must be correctly aligned.
- (2) Unsolder 4R4 from its connection to the stand-off pin on the board.
- (3) Connect the test equipment as shown in Figure 5B.3.10.

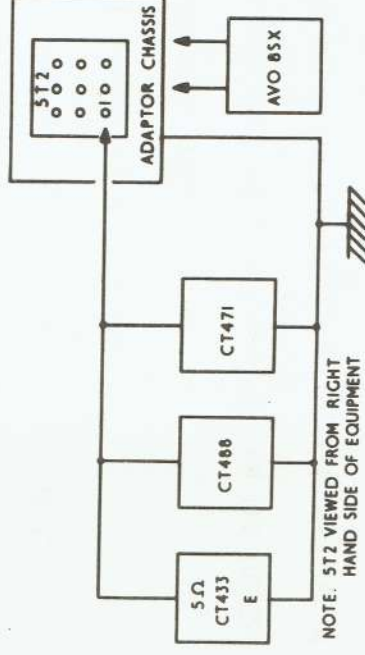


FIG.5B.3.10. TEST EQUIPMENT CONNECTIONS
- RATT. DISCRIMINATOR - UPPER LIMIT

- (4) Meter function selector switch to USE.
- (5) Function selector switch to RATT N SET.
- (6) USB/LSB/DIRECT switch to USB.

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- (7) PITCH control to the engraved line.
- (8) Set the CT433 to register $1037.5 \text{ c/s} \pm 1 \text{ c/s}$ on the CT488.
- (9) Adjust the output level of the CT433 to give a reading of 2 V on the CT471.
- (10) Connect the 4.7 kohm resistor between Pins 6 and 7 on 4T2.
- (11) Disconnect the CT471 and reconnect it to SKF11 and post of 4R4.
- (12) Adjust 4L2 for maximum reading on the CT471.

NOTE Only a very slight change in output will be observed on the CT471 as 4L2 is adjusted.

- (13) Disconnect the 4.7 kohm resistor from 4T2 and resolder 4R4 in position.
- (14) Switch the Multimeter 8SX to the 2.5 V d.c. range and connect the positive and negative leads to SKTB and SKTC respectively. Adjust 4T2 for zero reading.
- (15) Adjust the CT433 to register 1075 c/s on the CT488 at 2 V.
- (16) Check that the reading on the Multimeter is not less than 1.2 V.
- (17) Function Selector switch to RATT W SET.
- (18) Increase the frequency of the CT433 until the Multimeter reads zero and check on the CT488 that the frequency is $2954 \text{ c/s} \pm 20 \text{ c/s}$.
- (19) Set the CT433 to $3100 \text{ c/s} \pm 5 \text{ c/s}$ measured by the CT488 and check that the Multimeter reads not less than 1.8 V.

The Procedure - RATT Discriminator - Lower Limit Check

- 20(1) Connect the test equipment as shown in Figure 5B.3.10.
- (2) Function Selector switch to RATT N SET.
- (3) USB/LSB/DIRECT switch to LSB.
- (4) Set the CT433 to register $962.5 \text{ c/s} \pm 1 \text{ c/s}$ on the CT488.
- (5) Adjust the output level of the CT433 to give a reading of 2 V on the CT471.
- (6) Unsolder 4R3 from its connection to the stand-off pin on the board.
- (7) Connect the 4.7 kohm resistor between Pins 5 and 6 of 4T1.
- (8) Disconnect the CT471 and reconnect it to Pin 4 of 4L1 and Pin 1 of 4T1.
- (9) Adjust 4L1 for maximum reading on the CT343.

NOTE Only a very slight change in output will be observed on the CT471 as 4L1 is adjusted.

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Change 1, 8.69:

- (10) Disconnect the 4.7 kohm resistor and resolder 4R3 in position.
- (11) Switch the Multimeter 8SX to the 2.5 V d.c. range and connect the positive and negative leads to SKTA and SKTB respectively. Adjust 4T1 for zero reading on the meter.
- (12) Set the CT433 to $900 \text{ c/s} \pm 2 \text{ c/s}$ and check that the Multimeter reading is not less than 1.2 V.
- (13) Function Selector switch to RATT W SET.
- (14) Increase the frequency of the CT433 until the Multimeter reads zero and check on the CT488 that the frequency is $2140 \text{ c/s} \pm 20 \text{ c/s}$.
- (15) Set the CT433 to $2050 \text{ c/s} \pm 5 \text{ c/s}$ as registered on the CT488 and check that the Multimeter reads not less than 1.8 V.
- (16) Disconnect the Multimeter and the CT471.

The Procedure - Voice Discriminator Check

- 21(1) Connect the test equipment as shown in Figure 5B.3.10.

- (2) Function Selector switch to VOICE.
- (3) USB/LSB/DIRECT switch to USB.
- (4) 4RV1 to mid-position.

NOTE This is approximately 11 turns from one end.

- (5) Switch the Multimeter 8SX to the 2.5 V d.c. range and connect the positive and negative leads to 5SKTF15 and 4SKTC6 respectively.
- (6) Set the CT433 to register $650 \text{ c/s} \pm 5 \text{ c/s}$ on the CT488 and adjust the output level of the CT433 to give a reading of 0.7 V on the CT471. It should be possible to adjust the PITCH control for a zero reading on the Multimeter.
- (7) Repeat Step (6) with the CT433 set to $950 \text{ c/s} \pm 5 \text{ c/s}$.
- (8) Set the CT433 to register 815 c/s on the CT488 and adjust the PITCH control for zero reading on the Multimeter.
- (9) Keeping the level of the CT433 constant, set it to register $900 \text{ c/s} \pm 5 \text{ c/s}$ on the CT488. The Multimeter should read a negative voltage greater than -0.07 V.
- (10) Set the CT433 to register 600 c/s on the CT488. The Multimeter should read not less than +0.4 volts.
- (11) Adjust 4RV1 until the Multimeter reads +0.45 V keeping the input level constant.
- (12) Disconnect all test equipment and replace the boards.

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OVER-ALL TEST

Additional Instructions

NOTE The following additional instructions should be observed before commencing the over-all tests.

- 22(1) All boards to be fitted and secured.
- (2) Top cover to be secured with all screws (to avoid stray capacitance affecting L.O.).
- (3) Connection to PLA(C) and (D) may be made easier by using a six-way Plessey Socket (Pattern 972-9117).
- (4) Reference to Figure 5A.2.10 is advised.
- (5) Where a frequency from the CT452 is asked for the signal generator should first be set up by connecting directly to the frequency counter CT488.

L.O. TEST

- 23(1) Connect the test equipment as shown in Figure 5B.3.11A.

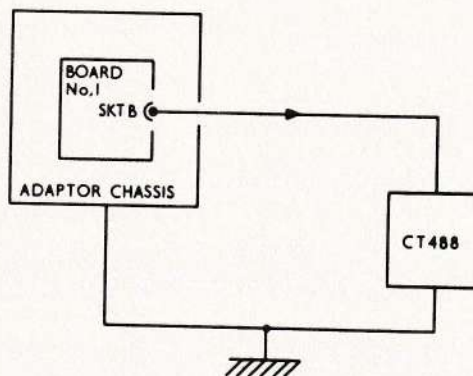


FIG.5B.3.IIA. TEST EQUIPMENT CONNECTIONS
—OVERALL TEST-LOCAL
OSCILLATOR FREQUENCIES

- (2) Function Selector switch to RATT N SET.
- (3) USB/LSB/DIRECT switch to USB.
- (4) Meter switch to USE.
- (5) B40/41 switch to B41.
- (6) TUNE control to centre engraved line.
- (7) The CT488 should read 821.5 kc/s $\pm$ 500 c/s.

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Change 1, 8.69:

- (8) Turn the TUNE control to the 3 o'clock position and then the 9 o'clock position. At each position the reading on the CT488 should change by approximately 23 kc/s from the centre reading.
- (9) Return the TUNE control to the centre.
- (10) USB/LSB/DIRECT switch to LSB. The CT488 should read $778.5 \text{ kc/s} \pm 500 \text{ c/s}$.
- (11) USB/LSB/DIRECT switch to USB.
- (12) B40/B41 switch to B40. The CT488 should read $521.5 \text{ kc/s} \pm 500 \text{ c/s}$.
- (13) USB/LSB/DIRECT switch to LSB. The CT488 should read $478.5 \text{ kc/s} \pm 300 \text{ c/s}$.
- (14) B40/B41 switch to B41. USB/LSB/DIRECT switch to USB.
- (15) Connect the test equipment as shown in Figure 5B.3.11B.

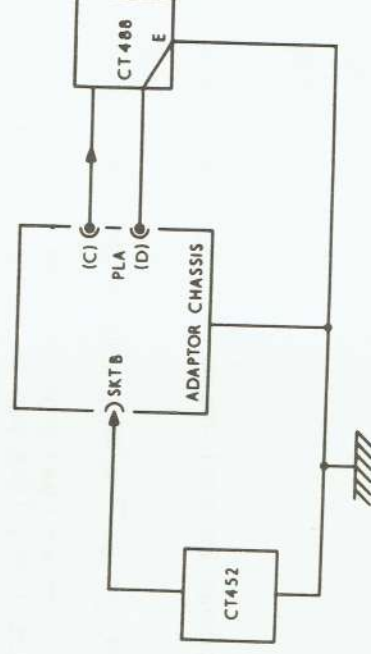


FIG. 5B.3.11B. TEST EQUIPMENT CONNECTIONS
-OVERALL TEST

Discriminator Width Check (RATT Narrow)

- (16) Set the CT452 to $800 \text{ kc/s} \pm 5 \text{ c/s c.w.}$ at 50 mV.
- (17) Adjust the TUNE control very carefully for $1000 \text{ c/s} \pm 5 \text{ c/s}$ on CT488 when Meter M1 should read 0.
- (18) Rotate TUNE control gently counter-clockwise until M1 just moves negatively from 0. The counter should read $963 \text{ c/s} \pm 5 \text{ c/s}$.
- (19) Rotate TUNE control gently clockwise, meter should first go back to zero then just as the meter moves positively from zero, the counter should read $1037 \text{ c/s} \pm 5 \text{ c/s}$.

Loop Function Check (RATT Narrow)

- (20) Reset the tune control for $1000 \text{ c/s} \pm 5 \text{ c/s}$ on the CT488 when the Meter M1 should read zero.
- (21) Increase the frequency of the CT452 to $800.1 \text{ kc/s} \pm 5 \text{ c/s}$ and note the reading on the meter and the CT488 (1000 c/s approximately).

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- (22) Function Selector switch to RATT N. The meter reading should decrease towards zero and the CT488 should read approximately 963 c/s.

Discriminator Width Check (RATT Wide)

- (23) Function Selector switch to RATT W SET.
- (24) Reset the CT452 to 800 kc/s $\pm$ 5 c/s and adjust the TUNE control until the CT488 reads 2550 $\pm$ 50 c/s, when the meter should read zero.
- (25) Rotate TUNE control gently counter-clockwise until M1 just moves negatively from zero. The counter should read 2150 c/s $\pm$ 10 c/s.
- (26) Rotate TUNE control gently clockwise, meter should first go back to zero, then just as the meter moves positively from zero the counter should read 2950 c/s $\pm$ 10 c/s.

Loop Function Check (RATT Wide)

- (27) Readjust the TUNE control to the centre of the gap, (i.e. until the CT488 reads 2550 c/s $\pm$ 10 c/s) when the meter should read zero.
- (28) Increase the frequency of the CT452 to 800.6 kc/s $\pm$ 10 c/s and note the reading on the meter and the CT488.
- (29) Function Selector switch to RATT W. The meter reading should decrease and the CT488 should read approximately 2150 c/s.

Voice Discriminator Check

- (30) Function Selector switch to VOICE set.
- (31) Readjust CT452 for 800 kc/s $\pm$ 5 c/s.
- (32) Adjust TUNE control for zero beat output from loudspeaker.
- (33) Rotate TUNE control clockwise to obtain a reading of 815 c/s $\pm$ 5 c/s on the CT488.
- (34) Set PITCH CONTROL to engraved line.
- (35) Function Selector switch to VOICE.
- (36) Carefully adjust PITCH CONTROL for 815 c/s, meter should read zero.
- (37) Release pitch knob and set to engraved line, tighten up.
- (38) Set the CT452 alternatively to 799.9 kc/s $\pm$ 5 c/s and 800.1 kc/s $\pm$ 5 c/s. The reading on the CT488 should not vary by more than $\pm$ 15 c/s and the meter reading should indicate alternatively one division either side of zero.
- (39) Check the SPEAKER GAIN control for smooth operation.
- (40) Check that the insertion of the headphone jack into the headphone socket disconnects the loudspeaker.
- (41) Disconnect the test equipment.

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PART 5C
MAINTENANCE

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RESTRICTEDB.R. 2432 Part 5C
Original 2.67P A R T 5 CM A I N T E N A N C ECONTENTS LIST

CHAPTER 1 -	DISMANTLING AND REASSEMBLY
CHAPTER 2 -	PREVENTIVE MAINTENANCE
CHAPTER 3 -	FAULT FINDING
CHAPTER 4 -	ILLUSTRATIONS, COMPONENT LISTS AND COIL INFORMATION

ILLUSTRATIONSFigure No.

MIXER STAGE R.F. 5820-99-972-2760 Circuit Diagram	5C.4.1
AMPLIFIER I.F. SIGNAL 5820-99-972-2758 Circuit Diagram	5C.4.2
AMPLIFIER A.F. LOOP 5820-99-972-2759 Circuit Diagram	5C.4.3
CORRECTOR A.F. 5820-99-972-2761 Circuit Diagram	5C.4.4
CONVERTER SINGLE SIDEBAND 5820-99-971-7205 Component Layout Circuit Diagram	5C.4.5 5C.4.6
RECEIVER ADAPTOR OUTFIT FAZ Equipment Circuit Diagram	5C.4.7 5C.4.8

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RESTRICTEDB.R. 2432 (5C) Chap. 1
Original 2.67CHAPTER 1DISMANTLING AND REASSEMBLYCONTENTS LIST

Mains Transformer - Removal and Replacement
Output Transformer - Removal and Replacement
Access to Front Panel Wiring and Components
Tone Filter - Removal and Replacement
I.F. Filter - Removal and Replacement

Paragraph

1
2
3
4
5

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B.R.2432 (5C) Chap. 1
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CHAPTER 1

DISMANTLING AND REASSEMBLY

Mains Transformer - Removal and Replacement

1. Proceed as follows:-

- (1) Switch off the power supply to the Adaptor.
- (2) Unsolder the wiring to the transformer and note the connections.
- (3) Place the chassis on its side and release the two 4 B.A. bolts securing the small bracket to the chassis.
- (4) Support the transformer and release the three 4 B.A. bolts securing the large mounting bracket to the chassis.
- (5) Withdraw the transformer with the two brackets attached and expose the four 4 B.A. bolts securing the transformer to the large bracket, taking care not to strain the wiring to the other components attached to the large bracket.
- (6) Release the four 4 B.A. bolts.
- (7) Replace the transformer by reversing the above procedure.

Output Transformer - Removal and Replacement

2. Proceed as follows:-

- (1) Unsolder the wiring to the transformer and note the connections.
- (2) Place the chassis on its side and remove the two 4 B.A. bolts securing the small bracket to the chassis.
- (3) Remove the four 4 B.A. bolts securing the transformer to the large bracket.
- (4) Lift the transformer clear of the chassis and remove the two 4 B.A. bolts securing the transformer to the small bracket.
- (5) Replace the transformer by reversing the above procedure.

Access to Front Panel Wiring and Components

3. Proceed as follows:-

- (1) Remove the two 6 B.A. bolts from the centre stiffening plate securing the front panel to the printed circuit board carriers.

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- (2) Remove the six 4 B.A. front panel bolts and carefully ease the front panel forward.
- (3) Replace the panel by reversing the above procedure.

Tone Filter - Removal and Replacement

4. Proceed as follows:-

- (1) Unsolder the wiring to the filter and note the connections.
- (2) Remove the four 6 B.A. bolts securing the filter to the hexagonal stand-off pillars and remove the filter.
- (3) Replace the filter by reversing the above procedure.

I.F. Filter - Removal and Replacement

- 5. The I.F. Filter is mounted beneath the Tone Filter. Proceed as follows:-
 - (1) Release the Tone Filter from the hexagonal pillars (Paragraph 4 (2)).
 - (2) Lift the Tone Filter clear of the chassis taking care not to strain the wiring.
 - (3) Unsolder the wiring to the I.F. Filter and note the connections.
 - (4) Remove the four 6 B.A. bolts securing the Filter to the chassis.
 - (5) Replace the Filter by reversing the above procedure.

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RESTRICTEDB.R. 2432 (5C) Chap. 2
Original 2.67CHAPTER 2PREVENTIVE MAINTENANCECONTENTS LIST

	<u>Paragraph</u>
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CLEANING LUBRICATION AND INSPECTION	
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METER AND FUNCTIONAL TESTS	
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Mixer Stage R.F. (Board No. 1)	11
Amplifier I.F. Signal (Board No. 2)	12
Amplifier I.F. Loop (Board No. 3)	13
OVERALL PERFORMANCE TEST	14

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RESTRICTEDB.R.2432 (5C) Chap. 2
Original 2.67CHAPTER 2PREVENTIVE MAINTENANCEIntroduction

1. The Preventive Maintenance Routines for Outfit FAZ are given below; the periodicity of the routines is detailed in the Planned Maintenance Schedules issued by the Class Authority.

Test Equipment

2. The following test equipment is required:-

- (a) Multimeter 8SX - 6625-99-943-1524

CLEANING, LUBRICATION AND INSPECTIONPreparation

- 3.(1) Switch OFF the power supplies to the Receiver and Adaptor.
- (2) Disconnect the mains supply and signal input and output connectors from the back plate of the Adaptor.
- (3) Release the two knurled-headed screws on the front panel and remove the Adaptor from the Mounting Tray.
- (4) Remove the Adaptor cover.

Cleaning and Lubrication

- 4.(1) Clean the interior of the Adaptor.
- (2) Clean and lubricate the contacts of the undermentioned switches with Cleaning and Lubricating Compound 0473/320-2568:-
 - (i) Meter Switch
 - (ii) Function Selector Switch
 - (iii) USB/LSB/DIRECT Switch.

Inspection

- 5.(1) Inspect the following components, ensure that they are undamaged and secure:-
 - (i) Front Panel controls, switches and fittings.
 - (ii) Back plate plugs and sockets, switches, fuse holders and controls.
 - (iii) Printed Circuit Board Carriers and Sockets.

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- (iv) Filters, Power Supply Board, tag board and all other components mounted on the chassis.
- (v) Mounting Spigots.
- (2) Examine all chassis wiring for deterioration, bad joints or damaged insulation.
- (3) Examine the printed circuit boards for deterioration, burns and bad soldering. Check the components for damage and ensure that they are secure on the boards.

METER AND FUNCTIONAL TESTS

Front Panel Meter Readings

- 6. Set the Meter switch to each of its test positions in turn and check that in each position the meter reading is between 5 and 7.

NOTE

If in position I3 of the switch the Meter reads less than 5, switch OFF the Adaptor, remove Board No. 4 and adjust 3RV3 as instructed in Part 5B, Chap. 3, Paragraph 17 Step (9).

Calibration of Front Panel Meter

- 7.(1) Switch OFF the Adaptor, switch the Multimeter to the 25V range and connect it between 5SKTC9 and earth.
- (2) Switch ON the Adaptor and set the Meter switch to each of its test positions in turn. Provided that the Multimeter reads 20V, the Front Panel Meter should read between 5 and 7 in each position of the switch.

Functional Test

- 8.(a) Carry out a functional test as follows:-

- (1) Switch on the Adaptor; check that the Mains Indicator Lamp lights and that all front panel controls operate correctly.
- (2) Select any voice or RATT signal of reasonable strength.
- (3) Set up the Receiver and Adaptor according to the relevant instructions given in Part 5B, Chapter 1.
- (4) Check the function of the Adaptor.
- (b) Check the hold-in range of the Adaptor as follows:-
 - (1) USB/LSB/DIRECT switch to USE.
 - (2) Function switch to SET (RATT N).
 - (3) Meter switch to USE.

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- (4) Tune the Receiver to a narrow RATT or c.w. signal of reasonable strength which is being transmitted continuously.

NOTES (i) For convenience a facsimile transmission may be used.

- (ii) The signal selected can be anywhere within the full frequency range of the B41, but must be at the lower end of Band 1 on the B40.

- (5) Tune the Adaptor as normal on SET (RATT N)

- (6) Switch to RATT N

- (7) De-tune the Receiver, very slowly, above or below the signal and observe the Adaptor Meter. When the Receiver has been de-tuned by approximately 500 c/s (B40) or 800 c/s (B41), the Meter should show full scale deflection.

- (8) Continue to de-tune the Receiver. Provided the incoming signal is continuously maintained the Adaptor should continue to hold-in until the Receiver has been de-tuned by 1500 c/s (B40) or 2400 c/s (B41).

- (9) De-tune the Receiver in the opposite direction and repeat Steps (7) and (8).

D.C. VOLTAGES

H.T. Level and Regulation

- 9.(1) Switch OFF the Adaptor, switch the Multimeter to the 25V range and connect it between 5SKTC9 and earth.
- (2) Switch ON and adjust 5RV1 on the Power Supply Board. Check that over its full range of adjustment, the reading on the Multimeter varies between 17V and 22V.
- (3) Set 5RV1 for a reading of 20V on the Multimeter.
- (4) Switch OFF the Adaptor and remove the printed circuit boards.
- (5) Switch ON and check that the reading on the Multimeter does not exceed 20.25V.
- (6) Switch OFF, replace the boards and disconnect the Multimeter.

Main Chassis

- 10.(1) Switch OFF the Adaptor, and connect the Multimeter to the junction of 5R4 and 5R14.
- (2) Switch ON and check the undermentioned voltages with respect to the 2CV line (i.e. junction of 5R4 and 5R14):-
 - (i) Emitter of 5VT1 - + 36V.

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- (ii) Collector of 5VT2 - + 33V
- (iii) Emitter of 5VT3 - +10V

(3) Switch OFF and disconnect the Multimeter.

Mixer Stage R.F. (Board No.1)

11.(1) Switch OFF the Adaptor, remove Board No. 1 and plug it into 5SKTCC.

(2) Switch the Multimeter to the 10V range, switch ON and check the following voltages with respect to earth:-

- (i) 1SKTC - + 5V
- (ii) 1SKTD - + 5.5V
- (iii) Emitter of 1VT1 - + 4.5V

(3) Switch OFF, disconnect the Multimeter and replace Board No.1.

Amplifier I.F. Signal (Board No.2)

12.(1) Switch OFF the Adaptor and remove Board No.1.

(2) Switch the Multimeter to the 10V range, switch ON and check the following voltages with respect to earth:-

- (i) Emitter of 2VT1 (junction of 2R5 and base of 2VT2) - + 3.1V.
- (ii) Emitter of 2VT2 (junction of 2R6 and 2R7) - + 2.5V
- (iii) Emitter of 2VT3 (junction of 2R12 and 2R14) - + 3.5V
- (iv) Emitter of 2VT4 (junction of 2R18 and 2C12) - + 8.5V

(3) Switch OFF, disconnect the Multimeter and replace Board No. 1.

Amplifier A.F. Loop (Board No.3)

13.(1) Switch OFF the Adaptor and remove Board No.4.

(2) Switch the Multimeter to the 25V range, switch on the Adaptor and check the following voltages with respect to earth:-

- (i) Collector of 3VT1 (junction of 3R3 and 3C3) - + 10V.
- (ii) Emitter of 3VT7 (junction of 3C10 and 3R14) - + 16V.
- (iii) Emitter of 3VT8 (3SKTC) - + 10V.

(3) Check the voltage between 3SKTA and earth, 3SKTA and h.t. (i.e. at the junction of 3R8 and 3R12). The Multimeter should read approximately 10V in each case.

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Amdt 3, 10.73

- (4) Switch OFF, disconnect the Multimeter and replace Board No.4.

OVERALL PERFORMANCE TEST

14. Carry out an overall performance test as given in Part 5B, Chapter 3, Paragraph 22 (1-5) and Paragraph 23 (1-41).

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RESTRICTEDB.R. 2432 (5C) Chap. 3
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Introduction

1

Table 5C.3.1 - Main Chassis Faults

Table 5C.3.2 - Printed Circuit Board Faults

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C H A P T E R 3
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F A U L T F I N D I N G
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Introduction

1. This Chapter gives the information necessary to locate a fault in a particular printed circuit board or sub-assembly. Normally replacement of the board concerned, or a component on it will clear the fault. Possible faults on the main chassis or printed circuit boards are listed in Tables 5C.3.1 and 5C.3.2 respectively.

TABLE 5C.3.1 - MAIN CHASSIS FAULTS

Symptoms	Possible faults	Corrective action
Neon mains indicating lamp ILP1 fails to light.	No mains supply	(a) Check supply on input plug PLB. (b) Check fuses.
Adaptor functions correctly but ILP1 fails to light.	Voltage dropping resistor 5R1 open circuit.	Check resistor.
No signals from Adaptor and no reading on meter M1 in any switch position.	Failure of h.t. supply to all boards.	Check with multimeter between pin 9 of Mixer Board and earth (+20V should be present).
No voltage on pin 9 of Mixer Board.	(a) Failure of Mains Transformer T1. (b) Failure of component on Power Supply Board.	(a) Check Transformer T1 for continuity. (b) Check components.
No reading on meter in any switch position but +20V present on pin 9 of Mixer Board.	Failure of meter or wiring to it.	Examine wiring and check meter.
No signals from Adaptor and no fluctuation of meter reading in USE position.	(a) No input signals from B40/B41 Receiver.	(a) Switch on B40/B41 loudspeakers and ascertain that signals are present. If signals present check connections between B40/B41 Receiver and Adaptor.

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Symptoms	Possible faults	Corrective action
No signals from Adaptor loudspeaker. Meter M1 fluctuating on USE position.	(b) Fault in I.F. Filter circuit.	(b) Check I.F. Filter in accordance with Part 5B, Chap. 3. Paragraphs 6 and 7.
	(a) Fault in output transformer T2.	(a) Check windings of transformer for continuity.
	(b) Fault in phone jack.	(b) Check with headphones.
	(c) Fault in loudspeaker.	(c) Check loudspeaker and wiring for continuity.
	(d) Fault in volume control RV2.	(d) Check RV2 for continuity over its full range.
Failure of signals in RATT N position of function switch.	Failure of Tone Filter.	Check Filter in accordance with Part 5B, Chap. 3, Paragraphs 8 and 9.

NOTE Before resorting to substitution of any of the printed circuit boards, cleanliness of the connectors should be ensured.

TABLE 5C.3.2 - PRINTED CIRCUIT BOARD FAULTS

Symptoms	Possible faults	Corrective action
No output from the Adaptor.	(a) Local oscillator not oscillating.	(a) Check by substitution of correctly aligned Mixer Stage R.F. Board.
	(b) Re-insertion oscillator circuit unserviceable.	(b) Check by substitution of correctly aligned Amplifier A.F. Loop Board.
Low or distorted signal output.	Faulty or incorrectly aligned i.f. or a.f. stage.	Check by substitution of serviceable Amplifier I.F. Signal or Amplifier A.F. Loop Board.

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RESTRICTEDB.R.2432 (5C) Chap. 4
Original 2.67CHAPTER 4ILLUSTRATIONS COMPONENT LISTSAND COIL DATACONTENTS LIST

Table 5C.4.1 - Coil Data - Outfit FAZ

ILLUSTRATIONSFigure No.Coil Data - Outfit FAZ
Mixer Stage R.F. 5820-99-972-2760
Circuit Diagram

5C.4.1

5C.4.2

Amplifier I.F. Signal 5820-99-972-2758
Circuit Diagram

5C.4.3

Amplifier A.F. Loop 5820-99-972-2759
Circuit Diagram

5C.4.4

Corrector A.F. 5820-99-972-2761
Circuit Diagram

5C.4.5

Converter Single Sideband 5820-99-971-7205
Component Layout
Circuit Diagram

5C.4.6

5C.4.7

Receiver Adaptor Outfit FAZ
Equipment Circuit Diagram

5C.4.8

COMPONENT LISTSMixer Stage R.F. 5820-99-972-2760
Amplifier I.F. Signal 5820-99-972-2758
Amplifier A.F. Loop 5820-99-972-2759
Corrector A.F. 5820-99-972-2761
Converter Single Sideband 5820-99-971-72052 leaves
1 leaf
2 leaves
1 leaf
2 leaves**RESTRICTED**

TABLE 5C.4.1 - COIL DATA - OUTFIT FAZ

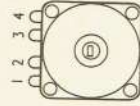
Cct. Ref.	Winding No.	Start	Finish	Tap	Remarks
<u>MIXER STAGE R.F.</u>					
L1	-	1	4	-	L 99mH. R 0.85Ω Q 180 min. at 800 kc/s.
L2	-	1	4	-	L 260mH. R 2.3Ω Q 180 min. at 500 kc/s.
T1	1 2	5 1	8 4	- 3	Between tags 5 & 8 L 107μH " " 1 & 3 R 0.3Ω " " 3 & 4 R 0.3Ω " " 5 & 8 R 2.25Ω Q 28 min. at 10 kc/s between tags 5 & 8.
<u>AMPLIFIER I.F. SIGNAL</u>					
L1	-	1	4	-	L 330mH. R 93Ω Q 100 min. at 21.5 kc/s.
T1	1 2	5 1	8 4	- -	Between tags 1 & 4 L 42.8mH " " 1 & 4 R 30Ω " " 5 & 8 R 9.5Ω Q 100 min. at 21.5 kc/s between tags 1 & 4
T2	1 2 3 4	6 7 5 1	7 8 4 3	- - - 2	Between tags 1 & 3 L 40mH " " 1 & 3 R 34.5Ω " " 4 & 5 R 28.5Ω " " 6 & 8 R 2.65Ω Q 90 min. at 21.5 kc/s between tags 1 & 3
T3	1 2 3	1 2 4	2 3 6	- - -	Between tags 1 & 3 L 1.6mH Bifilar " 4 & 6 L 35mH " " 4 & 6 R 210Ω " " 1 & 2 R 15Ω " " 2 & 3 R 15Ω
<u>AMPLIFIER A.F. LOOP</u>					
T1	-	2	4	3	Between tags 2 & 4 L 385mH. " " 2 & 3 R 6.5Ω " " 2 & 4 R 100Ω Q 55 min. at 21.5 kc/s.

RESTRICTED

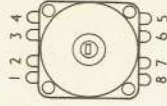
Cot. Ref.	Winding No.	Start	Finish	Tap	Remarks
<u>CORRECTOR A.F.</u>					
L1	-	4	1	-	L 302mH. R 86 Ω Q 20 min. at 1 kc/s
L2	-	1	4	-	L 302mH. R 86 Ω Q 20 min. at 1 kc/s.
T1	1	4	1	-	Between tags 5 & 6 L 312mH. " " 1 & 4 R 28 Ω " " 5 & 6 R 193 Ω " " 6 & 8 R 96 Ω Q 9 min. at 1 kc/s
T2	1 2	1 7	4 6	- 8	Between Tags 6 & 7 L 312mH. " " 1 & 4 R 28 Ω " " 6 & 7 R 193 Ω " " 6 & 8 R 96 Ω Q 9 min. at 1 kc/s between tags 6 & 7
<u>CONVERTER S.S.B.</u>					
L1	-	1	4	-	L 11.38mH R 2.85 Ω Q 280 min. at 21.5 kc/s
L2	-	1	4	-	L 5.05mH R 2.3 Ω Q 230 min. at 21.5 kc/s
L3	-	1	4	-	L 10.38mH R 2.85 Ω Q 280 min. at 21.5 kc/s
T3	-	1	5	4	L 105mH R 1.6 Ω Q 60 min. at 1 kc/s
T4	1 2	4 7	1 5	- 8	Between tags 5 & 7 L 853mH " " 5 & 8 R 8 Ω " " 1 & 4 R 13 Ω Q 55 min. at 1 kc/s between tags 5 & 7.

RESTRICTED

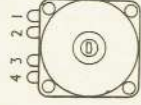
RESTRICTED

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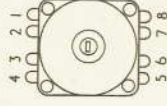
BASE 1



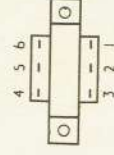
BASE 2



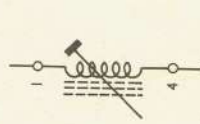
BASE 3



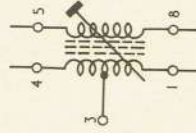
BASE 4



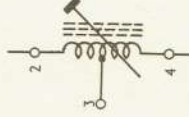
BASE 5



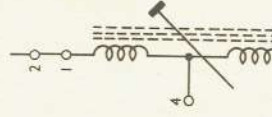
L1 } MIXER STAGE R.F.
L2 } BASE 1
L1 } CONVERTER SSB
L2 } BASE 3
L1 } CORRECTOR A.F.
L2 } BASE 1
L1 } AMPLIFIER I.F. SIGNAL
L2 } BASE 3



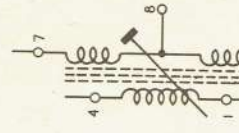
T1
MIXER STAGE R.F.
BASE 2



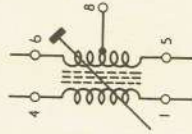
T1
AMPLIFIER A.F. LOOP
BASE 1



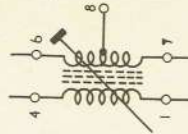
T3
CONVERTER SSB
BASE 2



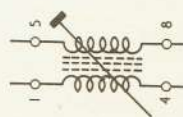
T4
CONVERTER SSB
BASE 2



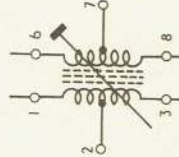
T2
CORRECTOR A.F.
BASE 2



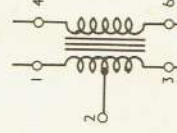
T1
CORRECTOR A.F.
BASE 2



T1
AMPLIFIER I.F. SIGNAL
BASE 4



T2
AMPLIFIER I.F. SIGNAL
BASE 4



T3
AMPLIFIER I.F. SIGNAL
BASE 5

COIL DATA - OUTFIT FAZ

FIG.5C.4J.

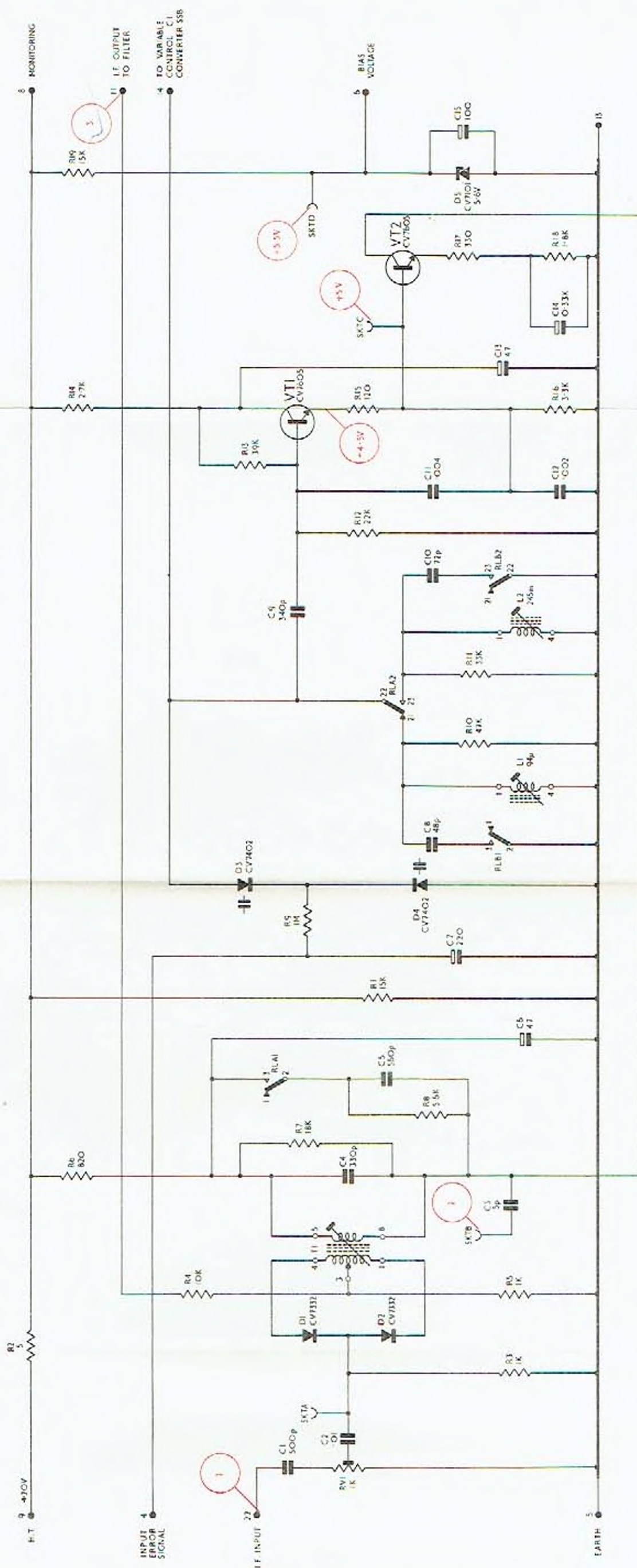
RESTRICTED

RESTRICTED

R	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
C																				
MISC.																				

BALANCED DIODE MIXER

LOCAL OSCILLATOR



1. CW (B4Q/B4I) 50mV RMS
2. 775-5KHz (USB TO 800KHz) (USB) (B4I)
3. 475-5KHz (LSB TO 500KHz) (LSB) (B4Q)
4. >10V PEAK TO PEAK - UNO STOPPED



NOTE: ALL PINS GO TO SKT
CONVERTER 55B

B4Q/B4I SELECTION
(B4I WHEN DE-ENERGISED)

USB/LSB SELECTION
(USB WHEN DE-ENERGISED)

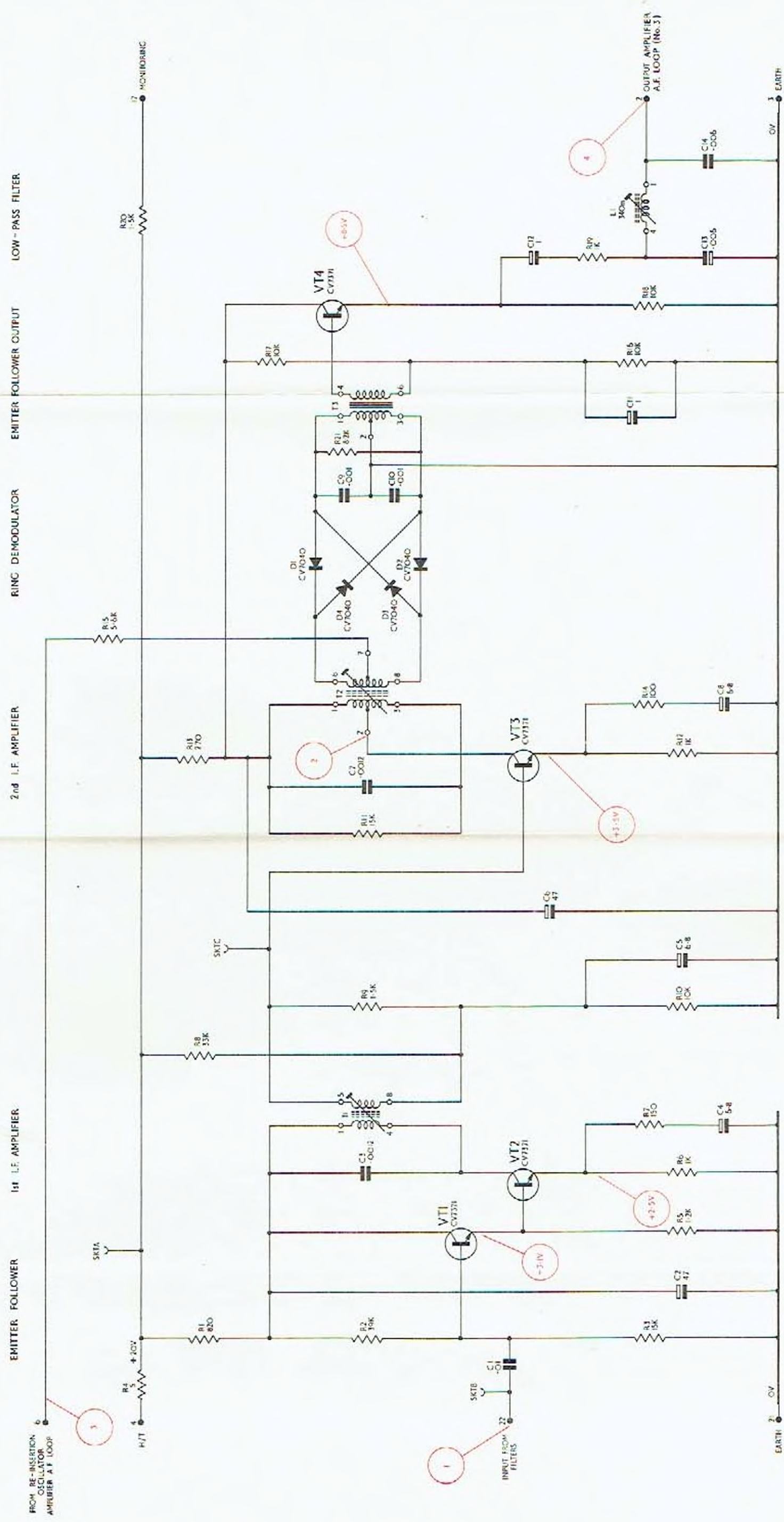
MIXER STAGE R.F. (No.1)
5820-99-972-2760 CIRCUIT DIAGRAM

FIG 5C.4.2

RESTRICTED

RESTRICTED

R	4	2	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	R
C	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	C
MISC	SKTB	VT1 SKTA	VT2	VT3	SKTC	VT4	VT5	VT6	VT7	VT8	VT9	VT10	VT11	VT12	VT13	VT14	VT15	VT16	MISC



- 1. CW 20.5KHz - 10V RMS
- 2. CW 20.5KHz - 100mV PEAK TO PEAK
- 3. CW 20.5KHz - 0.1V RMS
- 4. 1000 Hz - 100mV PEAK TO PEAK



AMPLIFIER I.F. SIGNAL (No. 2)
5820-99-972-2758 CIRCUIT DIAGRAM

FIG 5C.43

RESTRICTED

RESTRICTED

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R	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022	1023	1024	1025	1026	1027	1028	1029	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	1041	1042	1043	1044	1045	1046	1047	1048	1049	1050	1051	1052	1053	1054	1055	1056	1057	1058	1059	1060	1061	1062	1063	1064	1065	1066	1067	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077	1078	1079	1080	1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116	1117	1118	1119	1120	1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131	1132	1133	1134	1135	1136	1137	1138	1139	1140	1141	1142	1143	1144	1145	1146	1147	1148	1149	1150	1151	1152	1153	1154	1155	1156	1157	1158	1159	1160	1161	1162	1163	1164	1165	1166	1167	1168	1169	1170	1171	1172	1173	1174	1175	1176	1177	1178	1179	1180	1181	1182	1183	1184	1185	1186	1187	1188	1189	1190	1191	1192	1193	1194	1195	1196	1197	1198	1199	1200	1201	1202	1203	1204	1205	1206	1207	1208	1209	1210	1211	1212	1213	1214	1215	1216	1217	1218	1219	1220	1221	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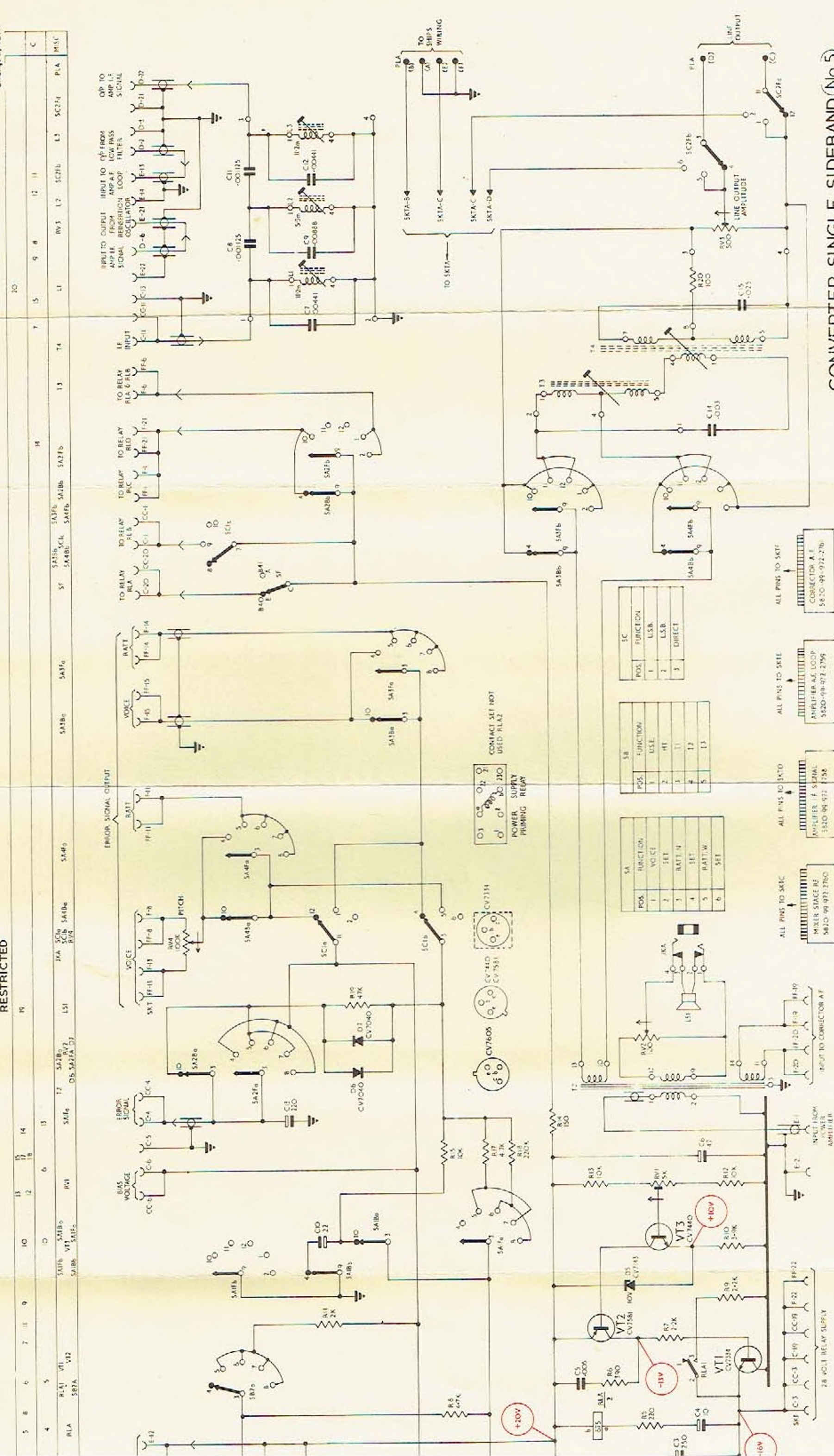
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CONVERTER SINGLE SIDEBAND (No. 5)
5820-99-971-7205 CIRCUIT DIAGRAM
FIG. 5C4.7

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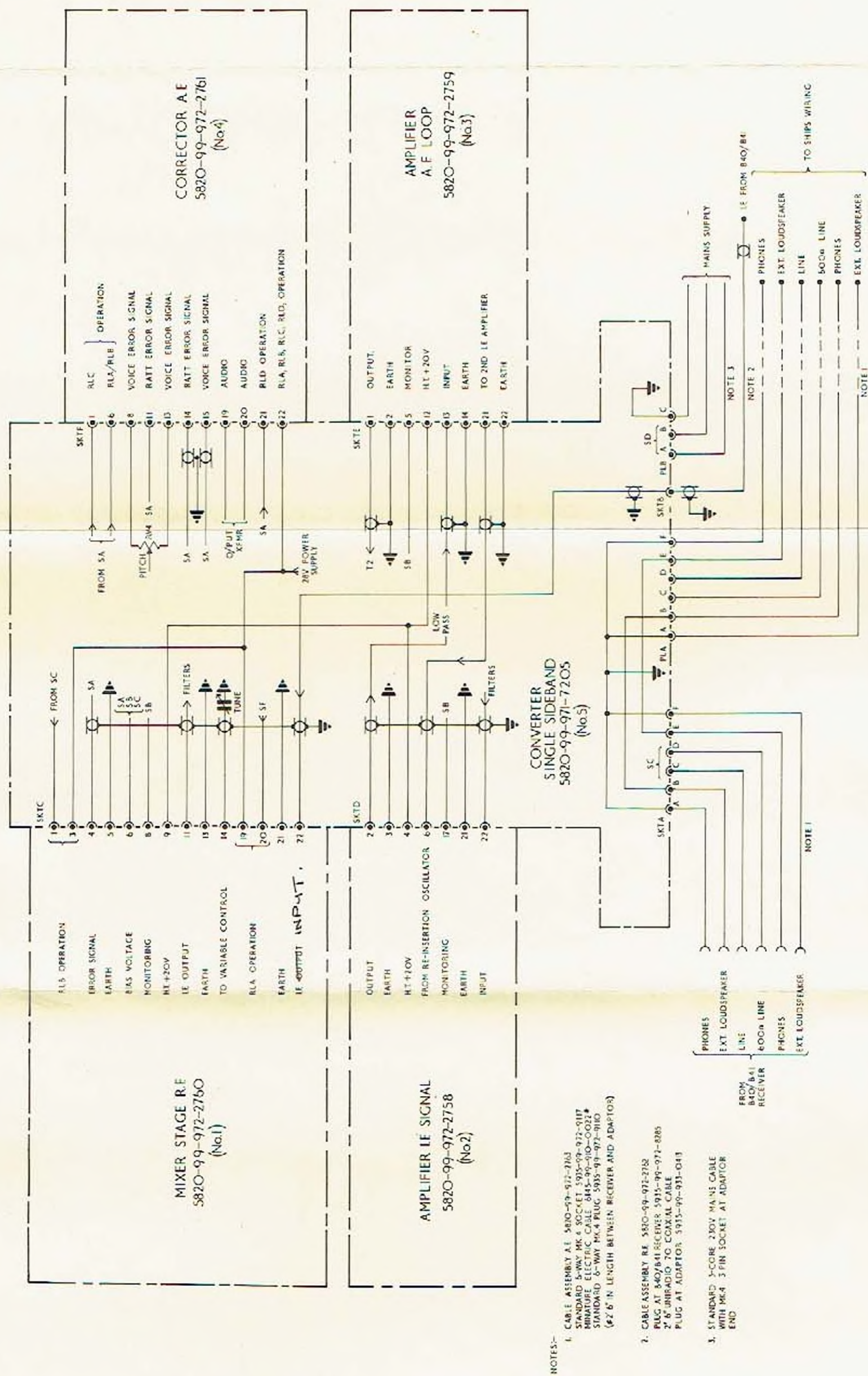
ADAPTOR OUTFIT FAZ
EQUIPMENT CIRCUIT DIAGRAM

FIG. 5C.4.8

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B.R.2432(5C) Chap. 4.
Original 2.67.

COMPONENT LIST

MIXER STAGE R.F. 5820-99-972-2760

Fig. 5C.4.1

NOTE: Before ordering parts, refer to relevant E List and B.R.1923 - Substitution Guide.

Cct. Ref.	NSN or other Ref. No.	Description	Value	Tol. ± %	Rating
RV1	5905-99-	<u>RESISTORS, VARIABLE</u>			
	011-8259	Composition	1K	± 20	$\frac{1}{4}W$
R1	5905-99-	<u>RESISTORS, FIXED</u>			
	012-4775	Metal Oxide GRD.1	15K	± 5	$\frac{1}{2}W$
R2		Electrothermal, Series G101 Type 3505R	5Ω	±0.1	$\frac{1}{4}W$
R3	012-4695	Metal Oxide GRD.1	1K	± 5	$\frac{1}{2}W$
R4	012-4751	Metal Oxide GRD.1	10K	± 5	$\frac{1}{2}W$
R5	012-4695	Metal Oxide GRD.1	1K	± 5	$\frac{1}{2}W$
R6	012-4693	Metal Oxide GRD.1	820Ω	± 5	$\frac{1}{2}W$
R7	012-4757	Metal Oxide GRD.1	18K	± 5	$\frac{1}{2}W$
R8	012-4745	Metal Oxide GRD.1	5.6K	± 5	$\frac{1}{2}W$
R9	012-8310	Metal Oxide GRD.1	1M	± 5	$\frac{1}{2}W$
R10	012-4767	Metal Oxide GRD.1	47K	± 5	$\frac{1}{2}W$
R11	012-4763	Metal Oxide GRD.1	33K	± 5	$\frac{1}{2}W$
R12	012-4759	Metal Oxide GRD.1	22K	± 5	$\frac{1}{2}W$
R13	012-4765	Metal Oxide GRD.1	39K	± 5	$\frac{1}{2}W$
R14	012-4721	Metal Oxide GRD.1	2.7K	± 5	$\frac{1}{2}W$
R15	012-4573	Metal Oxide GRD.1	120Ω	± 5	$\frac{1}{2}W$
R16	012-4727	Metal Oxide GRD.1	3.3K	± 5	$\frac{1}{2}W$
R17	012-4583	Metal Oxide GRD.1	330Ω	± 5	$\frac{1}{2}W$
R18	012-4709	Metal Oxide GRD.1	1.8K	± 5	$\frac{1}{2}W$
R19	012-4755	Metal Oxide GRD.1	15K	± 5	$\frac{1}{2}W$
C1	5910-99-	<u>CAPACITORS, FIXED</u>			
C2	012-0132	Paper	500p	± 20	750V
	012-0113	Paper	.01	± 20	250V

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Cat. Ref.	NSN or other Ref. No.	Description	Value	Tol. ± %	Rating
C3 C4 C5	5910-99- 972-1831 972-1836 516-6688	<u>CAPACITORS FIXED CONP'D</u> Mica Mica Mica	5p 330p 560p	± 1p ± 1 ± 1	350V 350V 350V
C6 C7	013-0500 013-0450	Tantalum Tantalum	47 220	± 20 ± 20	20V 10V
C8		Mica C12E J.W.C.	48p	± 1p	350V
C9 C10 C11 C12	519-6678 519-6679 971-7433 971-7090	Mica Mica Mica Mica	340p 72p •004 •002	± 1p ± 1p ± 1p ± 1p	350V 350V 350V 350V
C13 C14 C15	013-0500 580-5096 013-0461	Tantalum Tantalum Tantalum	47 0•33 100	± 20 ± 20 ± 20	20V 35V 20V
	5960-99-	<u>VALVES ELECTRONIC</u>			
VT1 VT2	037-4061 037-4061	Transistor CV7605 Transistor CV7605			
D1 D2 D3 D4 D5	037-2903 037-2903 037-3434 037-3434 037-2201	Diode CV7332 Diode CV7332 Diode CV7402 Diode CV7402 Diode (Zener) CV7104			
		<u>TRANSFORMERS, INDUCTORS</u>			
T1	B459874	Transformer			
L1 L2	B459867 B459870	Inductor Inductor			
	5845-99-	<u>RELAYS, MAGNETIC</u>			
RLA RLB	580-5601 580-5601	2C 2C	6752 6752		24V 24V

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Original 2.67MIXER STAGE R.F. 5820-99-972-2760 (Contd.)

Cct. Ref.	NSN or other Ref. No.	Description	Value	Tol. ± %	Rating
SKTA SKTB SKTC SKTD	5935-99- 947-2000 947-2000 947-2000 947-2000	<u>SOCKETS, TEST</u> Type 8400S White Type 8400S White Type 8400S White Type 8400S White			

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Original 2.67.

COMPONENT LIST

AMPLIFIER I.F. SIGNAL 5820-99-972-2758

Fig. 5C.4.3

NOTE: Before ordering parts, refer to relevant E List and B.R.1923 - Substitution Guide.

Cat. Ref.	NSN or other Ref. No.	Description	Value	Tol. $\pm$ %	Rating
	5910-99-	<u>CAPACITORS, FIXED</u>			
C1	012-0113	Paper	.01	± 20	250V
C2	013-0500	Electrolytic Tantalum	47	± 20	20V
C3	972-2066	Mica	.0012	± 1	350V
C4	946-4293	Electrolytic Tantalum	6.8	± 20	6V
C5	946-4293	Electrolytic Tantalum	6.8	± 20	6V
C6	013-0500	Electrolytic Tantalum	47	± 20	20V
C7	972-2066	Mica	.0012	± 1	350V
C8	946-4293	Electrolytic Tantalum	6.8	± 20	6V
C9	012-0119	Paper	.001	± 20	500V
C10	012-0119	Paper	.001	± 20	500V
C11	946-4295	Electrolytic Tantalum	1	± 20	20V
C12	946-4295	Electrolytic Tantalum	1	± 20	20V
C13	972-2152	Mica	.006	± 1	350V
C14	972-2152	Mica	.006	± 1	350V
	5905-99-	<u>RESISTORS, FIXED</u>			
R1	012-4693	R02-C, Oxide, Film	820 Ω	5	0.5W
R2	012-4765	R02-C, Oxide, Film	39K	5	0.5W
R3	012-4755	R02-C, Oxide, Film	15K	5	0.5W
R4	Type 3505R	Electrothermal Series G 101	5 Ω	± 0.1	0.25W
	5905-99-				
R5	012-4697	R02-C, Oxide, Film	1.2K	5	0.5W
R6	012-4695	R02-C, Oxide, Film	1K	5	0.5W
R7	012-4675	R02-C, Oxide, Film	150K	5	0.5W
R8	012-4763	R02-C, Oxide, Film	33K	5	0.5W
R9	012-4699	R02-C, Oxide, Film	1.5K	5	0.5W
R10	012-4751	R02-C, Oxide, Film	10K	5	0.5W

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Cat. Ref.	NSN or other Ref. No.	Description	Value	Tol. ± %	Rating		
R11 R12 R13 R14	5905-99-	<u>RESISTORS, FIXED (CONT'D)</u> R02-C, Oxide, Film R02-C, Oxide, Film R02-C, Oxide, Film R02-C, Oxide, Film	15K 1K 270Ω 100Ω	5 5 5 5	0.5W 0.5W 0.5W 0.5W		
R15 R16 R17 R18 R19			012-4,745 012-4,751 012-4,751 012-4,751 012-4,695	R02-C, Oxide, Film R02-C, Oxide, Film R02-C, Oxide, Film R02-C, Oxide, Film R02-C, Oxide, Film	5.6K 10K 10K 10K 1K	5 5 5 5 5	0.5W 0.5W 0.5W 0.5W 0.5W
R20 R21			012-4,699 012-4,749	R02-C, Oxide, Film R02-C, Oxide, Film	1.5K 8.2K	5 5	0.5W 0.5W
VT1 VT2 VT3 VT4			5960-99-	<u>VALVES, ELECTRONIC</u> Transistor CV7371 Transistor CV7371 Transistor CV7371 Transistor CV7371			
D1 D2 D3 D4	037-2016 037-2016 037-2016 037-2016	Diode CV7040 Diode CV7040 Diode CV7040 Diode CV7040					
T1 T2 T3 L1	B439379 B439378 B439478 B439377						
SKTA SKTB SKTC	5935-99-	<u>SOCKETS TEST</u> Type 8400S White Type 8400S White Type 8400S White					

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Change 2, 10.71COMPONENT LIST

AMPLIFIER A.F. LOOP 5820-99-972-2759

Fig. 5C.4.4

NOTE: Before ordering parts, refer to relevant E List and B.R.1923 - Substitution Guide

Cct. Ref.	NSN or other Ref. No.	Description	Value	Tol. ± %	Rating
	5910-99-	<u>CAPACITORS, FIXED</u>			
C1	013-0515	Tantalum	47	±20	35V
C2	013-0511	Tantalum	10	±20	35V
C3	012-0121	Paper	.003	±20	500V
C4	013-0511	Tantalum	10	±20	35V
C5	013-0500	Tantalum	47	±20	20V
C7	013-0500	Tantalum	47	±20	20V
C8	013-0511	Tantalum	10	±20	35V
C9	972-1835	Mica	100p	± 1	350V
C10	013-0511	Tantalum	10	±20	35V
C11	519-6687	Mica	110p	± 1	350V
C12	013-0406	Tantalum	0.1	±10	35V
C13	013-0405	Tantalum	100	±10	20V
C14	013-0405	Tantalum	100	±10	20V
C15		Tantalum Kemet	0.47	±20	20V
C16	016-0047	Variable, Air Dielectric	4-30p	-0 +20	
	5905-99-	<u>RESISTORS, VARIABLE</u>			
RV1	580-0030	Wirewound	10K	±5	1W
RV2	011-8264	Composition	50K	±20	1/4W
RV3	011-8259	Composition	1K	±20	1/4W
RV4	970-6848	Wirewound	100K	± 5	1W
R1	5905-99-	<u>RESISTORS, FIXED GRD.1</u> Electrothermal, Series G101 Type B505R	5Ω	±0.1	1/4W

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Cct. Ref.	NSN or other Ref. No.	Description	Value	Tol. ± %	Rating
R2 R3 R4 R5 R6	5905-99-	<u>RESISTORS, FIXED GRD.1</u> Metal Oxide Metal Oxide Metal Oxide Metal Oxide Metal Oxide	10K 390K 3•9K 3•9K 10K	± 5 ± 5 ± 5 ± 5 ± 5	$\frac{1}{2}$ W $\frac{1}{2}$ W $\frac{1}{2}$ W $\frac{1}{2}$ W $\frac{1}{2}$ W
R7* R8 R9 R10 R11		Metal Oxide Metal Oxide Metal Oxide Metal Oxide Metal Oxide	22K 1•8K 330Ω 1K 1K	± 5 ± 5 ± 5 ± 5 ± 5	$\frac{1}{2}$ W $\frac{1}{2}$ W $\frac{1}{2}$ W $\frac{1}{2}$ W $\frac{1}{2}$ W
R12 R13 R14 R15 R16†		Metal Oxide Metal Oxide Metal Oxide Metal Oxide Metal Oxide	220Ω 100K 47K 120K 3•9K	± 5 ± 5 ± 5 ± 5 ± 5	$\frac{1}{2}$ W $\frac{1}{2}$ W $\frac{1}{2}$ W $\frac{1}{2}$ W $\frac{1}{2}$ W
R17 R18 R19 R20		Metal Oxide Metal Oxide Metal Oxide Metal Oxide	22K 68K 1K 330Ω	± 5 ± 5 ± 5 ± 5	$\frac{1}{2}$ W $\frac{1}{2}$ W $\frac{1}{2}$ W $\frac{1}{2}$ W
R21	011-3203	Wirewound	4•7Ω	± 10	1•5W
VT1 VT2 VT3 VT4 VT5 VT6 VT7 VT8	5960-99-	<u>VALVES, ELECTRONIC</u> Transistor CV7440 Transistor CV7440 Transistor CV7440 Transistor CV7581 Transistor CV7334 Transistor CV7334 Transistor CV7371 Transistor CV7371			
D1 D2		Diode CV7040 Diode CV7040			
XL1	Q0 1653A/F	Crystal Marconi	20•0kc/s		
SKTA SKTB SKTC	5935-99-	<u>TERMINAL, TEST</u> Socket Socket Socket			

* R7 in later Converters may be 5905-99-013-6140 10k

+ Selected on test from values 3.9 to 6.8k

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Original 2.67.AMPLIFIER A.F. LOOP 5820-99-972-2759 (Contd.)

Cot. Ref.	NSN or other Ref. No.	Description	Value	Tol. ± %	Rating
T1	B459912	<u>TRANSFORMERS, INDUCTORS</u> Transformer			

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Original 2.67.COMPONENT LIST

CORRECTOR A.F. 5820-99-972-2761 Fig. 5C.4.5

NOTE: Before ordering parts, refer to relevant E List and B.R.1923 - Substitution Guide.

Cct. Ref.	NSN or other Ref. No.	Description	Value	Tol. ± %	Rating
	5910-99-	<u>CAPACITORS, FIXED</u>			
C2	519-6680	Mica C33E J.M.C.	•01904	±0.5	200V
C3	519-6681	Mica C33E J.M.C.	•009685	±0.5	200V
C4	519-6683	Mica A33E J.M.C.	•047	±0.5	200V
C5	519-6682	Mica A33E J.M.C.	•0323	±0.5	200V
C6	519-6683	Mica A33E J.M.C.	•047	±0.5	200V
C7	519-6683	Mica A33E J.M.C.	•047	±0.5	200V
C8		Tantalum Kemet Non-Pold	0.23	±10	35V
C9		Tantalum Kemet Non-Pold	0.11	±20	75V
C10		Tantalum Kemet Non-Pold	0.11	±20	75V
C11	519-6683	Mica A33E J.M.C.	•047	±0.5	200V
C12	519-6682	Mica A33E J.M.C.	•0323	±0.5	200V
C13	519-6683	Mica A33E J.M.C.	•047	±0.5	200V
C14	519-6683	Mica A33E J.M.C.	•047	±0.5	200V
C15	519-6680	Mica C33E J.M.C.	•01904	±0.5	200V
C16	519-6681	Mica C33E J.M.C.	•009685	±0.5	200V
C17		Tantalum Kemet Non-Pold	0.11	±20	35V
C18		Tantalum Kemet Non-Pold	0.11	±20	35V
C19	013-1697	Tantalum Kemet	3.3	±20	75V
C20	013-1697	Tantalum Kemet	3.3	±20	75V
	5905-99-	<u>RESISTORS, VARIABLE</u>			
RV1	580-5138	Wirewound, Painton-Bourne	5K	±5	1W
	5905-99-	<u>RESISTORS, FIXED GRD.1</u>			
R1	012-4721	R02-C	2.7K	±5	$\frac{1W}{2}$
R2	012-4721	R02-C	2.7K	±5	$\frac{1W}{2}$
R3	012-4721	R02-C	2.7K	±5	$\frac{1W}{2}$
R4	012-4721	R02-C	2.7K	±5	$\frac{1W}{2}$
R5	012-4775	R02-C	100K	±5	$\frac{1W}{2}$
R6	012-4775	R02-C	100K	±5	$\frac{1W}{2}$
R7	012-4775	R02-C	100K	±5	$\frac{1W}{2}$
R8	012-4775	R02-C	100K	±5	$\frac{1W}{2}$
R9	012-4775	R02-C	100K	±5	$\frac{1W}{2}$

Leaf 1

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Cct. Ref.	NSN or other Ref. No.	Description	Value	Tol. ± %	Rating
D1 D2 D3 D4 D5	5960-99-	<u>VALVES, ELECTRONIC</u> Diode CV7040 Diode CV7040 Diode CV7040 Diode CV7040 Diode CV7040			
D6 D7 D8	037-2016 037-2016 037-2016	Diode CV7040 Diode CV7040 Diode CV7040			
	5945-99-	<u>RELAYS</u>			
RLA RLB RLC RLD	580-5601 580-5601 580-5601 580-5601	2C 2C 2C 2C			
		<u>TRANSFORMERS & INDUCTORS</u>			
T1 T2	B459888 B459890	Transformer Transformer			
L1 L2	B459892 B459894	Inductor Inductor			
	5935-99-	<u>SOCKET, TEST</u>			
SKTA SKTB SKTC	947-2000 947-2000 947-2000	Type 8400S White Type 8400S White Type 8400S White			

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Change 2, 10.71

COMPONENT LIST

CONVERTER SINGLE SIDE BAND 5820-99-971-7205

Fig. 5C.4.6

Cat. Ref.	NSN or other Ref. No.	Description	Value	Tol. ± %	Rating
	5910-99-	<u>CAPACITORS</u>			
C1	016-0018	Variable, Air Dielectric	3.8-46,2p		
C2	011-9833	Paper, Fixed	0.5	± 20	200V
C3	012-4911	Electrolytic	250	+100 -20	50V
C4	013-0524	Tantalum Kemet	22	± 20	50V
C5	012-0112	Paper, Fixed	.005	± 20	250V
C6	013-0515	Tantalum Kemet	47	± 20	35V
C7	972-2207	Mica	.0041	± 0.5	200V
C8		Mica	.001125	± 0.5	200V
C9	972-2215	Mica	.0080	± 0.5	200V
C10		Tantalum Kemet	22	± 20	15V
C11		Mica	.001125	± 0.5	200V
C12	972-2207	Mica	.0041	± 0.5	200V
C13		Tantalum	220	± 20	10V
C14		Mica	.033	± 0.5	200V
C15		Mica	.025	± 0.5	200V
C16*	972-7697 or 972-8375	Ceramic	1500p	± 20	500V
	5905-99-	<u>RESISTORS, VARIABLE</u>			
RV1	580-5138	Wirewound	5K	± 5	1W
RV2	011-9856	Wirewound	100Ω	± 10	$\frac{1}{2}$ W
RV3	011-9847	Wirewound	500Ω	± 10	$\frac{1}{2}$ W
RV4	013-0272	Composition	100K	± 20	$\frac{1}{4}$ W
	5905-99-	<u>RESISTORS, FIXED</u>			
R1	012-4777	Metal Oxide GRD.1	120K	± 5	$\frac{1}{2}$ W
R2	012-4685	Metal Oxide GRD.1	390Ω	± 5	$\frac{1}{2}$ W
R3	021-6971	Film (Carbon) GRD.1	1.2M	± 5	$\frac{1}{4}$ W

* On later Converters only.

Leaf 1

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Cct. Ref.	NSN or other Ref. No.	Description	Value	Tol. ± %	Rating	
R4 R5 R6 R7 R8	5905-99-	<u>RESISTORS, FIXED</u> Metal Oxide GRD.1 Metal Oxide GRD.1 Metal Oxide GRD.1 Metal Oxide GRD.1 Metal Oxide GRD.1	27K 220Ω 390Ω 2.2K 4.7K	± 5 ± 5 ± 5 ± 5 ± 5	$\frac{1}{2}$ W $\frac{1}{2}$ W $\frac{1}{2}$ W $\frac{1}{2}$ W $\frac{1}{2}$ W	
R9 R10 R11 R12 R13		Metal Oxide GRD.1 Metal Oxide GRD.1 Metal Oxide GRD.1 Metal Oxide Metal Oxide GRD.1	2.2K 3.9K 2K 10K 10K	± 5 ± 5 ± 5 ± 5 ± 5	$\frac{1}{2}$ W $\frac{1}{2}$ W $\frac{1}{2}$ W $\frac{1}{2}$ W $\frac{1}{2}$ W	
R14		Wirewound Non Ins.	150Ω	± 5	2.6W	
R15		Metal Oxide GRD.1	10K	± 5	$\frac{1}{2}$ W	
R17 R18 R19 R20		Metal Oxide GRD.1 Metal Oxide GRD.1 Metal Oxide GRD.1 Metal Oxide GRD.1	4.7K 220K 4.7K 100Ω	± 5 ± 5 ± 5 ± 5	$\frac{1}{2}$ W $\frac{1}{2}$ W $\frac{1}{2}$ W $\frac{1}{2}$ W	
<u>VALVES, ELECTRONIC</u>						
VT1 VT2 VT3		Transistor CV7334 Transistor CV7581 Transistor CV7476				
D1 D2 D3 D4 D5		Diode CV7476 Diode CV7476 Diode CV7040 Diode CV7040 Diode, Zener CV7143				
D6 D7		Diode CV7040 Diode CV7040				
5960-99-						

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Original 2.67CONVERTER SINGLE SIDE BAND 5820-99-971-7205 (Contd.)

Cct. Ref.	NSN or other Ref. No.	Description	Value	Tol. ± %	Rating
PLA PLB	5935-99- 972-9112 580-7780	<u>PLUGS, ELECTRICAL</u> Fixed 6 Pole Fixed 3 Pole			
SKTA SKTB SKTC SKTCC SKTD	5935-99- 972-9119 972-8072 972-2016 972-2016 972-2016	<u>SOCKETS, ELECTRICAL</u> Fixed 6 Pole Fixed 1 Pole Fixed 22 Pole Fixed 22 Pole Fixed 22 Pole			
SKTE SKTF SKTFF	972-2016 972-2016 972-2016	Fixed 22 Pole Fixed 22 Pole Fixed 22 Pole			
	5930-99-	<u>SWITCHES</u>			
SA SB SC	B459883 972-5067 972-5066	Rotary, Wafer Rotary, Wafer Rotary, Wafer			
SD SE SF	051-0554 051-0554 051-0554	Lever DTDP Lever DTDP Lever DTDP			
RLA	5945-99- 580-1188	<u>RELAY MAGNETIC</u> 2C	675Ω		24V
FS1 FS2	5920-99- 059-0136 059-0136	<u>FUSE LINKS</u> Cartridge, Ferrule Cartridge, Ferrule	25mA 25mA		
M1	6625-99-519-4893	Meter Model 20 HS Scale 10.0.10	25-0-15μA		Terminal Res. Approx. 2K
LS1	5965-99-972-9307	Loudspeaker			

Leaf 2

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Cot. Ref.	NSN or other Ref. No.	Description	Value	Tol. ± %	Rating
ILP1	6240-99- 996-9215	<u>INDICATOR LAMPS</u> Neon			
JK1	5935-99-911-5733 5950-99-	Jack, Socket <u>TRANSFORMERS & INDUCTORS</u>			
T1	519-4034	Transformer DES37047			
T2	519-4037	Transformer DES37180/A			
T3	B459896	Transformer			
T4	B459898	Transformer			
L1	B459878	Inductor			
L2	B459880	Inductor			
L3	B459882	Inductor			
C1 (UNREC)	5335-99-943-7936	* KNOB, CIRCULAR.			

* Requires modifying to ASULC drawing N° A-59832 before fitting.

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