HANDBOOK FOR REDIFON COMMUNICATIONS RECEIVER TYPE R.50 M

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C O N T E N T S

F I G U R E S

T A B L E S

A P P E N D I X

1.0 INTRODUCTION

The Redifon R.50 M is a superheterodyne communications receiver of the highest grade and covers the frequency ranges 13.5 kc/s to 26 kc/s and 95 kc/s to 32 Mc/s in eight bands, detailed in para 4.3.1. It meets the requirements of Part Two of the Second Schedule of Ministry of Transport Merchant Shipping (Radio) Rules, 1952, and has received the Type Approval Certificate issued by the Post Master General. Both rack mounting and cabinet versions are available.

The receiver has a high discrimination logging scale. It employs two stages of signal frequency amplification, a hexode mixer with separate triode oscillator followed by three stages of intermediate frequency amplification. A double diode is employed as an A.G.C. rectifier and signal detector, the latter feeding a pentode amplifier resistance capacity coupled to the beam tetrode output valve, and a second double diode acts as a noise limiter. The A.G.C. voltage controls the gain of the two R.F., and the first two I.F. amplifiers. A high stability beat frequency oscillator is included for C.W. reception. Muting facilities are available should the receiver be used in conjunction with a nearby transmitter.

The intermediate frequency is 465 kc/s for six of the eight R.F. bands and 110 kc/s for the other two. Five switchable bandwidths are provided for each of the I.F. frequencies, the two narrowest bandwidths being crystal controlled.

The A.C. power unit has full-wave rectification with choke capacity smoothing and features a neon stabilised supply for the oscillator valves and the screen of the frequency changer. For D.C. mains, a DC/AC rotary converter is available for use with the A.C. power unit.

2.0 DESIGN FEATURES

2.1 Frequency Bands

Band	A	15.5 - 32	Mc/s
"	B	7.7 - 16	Mc/s
"	C	3.8 - 8	Mc/s
"	D	1.5 - 4	Mc/s
"	E	585 - 1550	kc/s
"	F	240 - 600	kc/s
"	G	95 - 250	kc/s
"	H	13.5 - 26	kc/s

2.2 Controls and Facilities

Slow motion and direct tuning controls

Full vision tuning and high discrimination logging scales

B.F.O.-Standby-Muting switch

Service meter and switch

A.G.C.-Noise Suppressor switch

Noise Suppressor control

A.F. Gain control

R.F.-I.F. Gain Control

Frequency range switch

Aerial trimmer

B.F.O. control

I.F. Bandwidth switch

Full muting facilities

The A.G.C. line is taken to an output socket to enable the receiver to be used in diversity.

2.3 Dimensions and Weights

	Height	Width	Depth	Weight
Chassis only	12½ in. 31.8 cm.	19 in. 48.3 cm.	21½ in. 54.6 cm.	52 lb. 23.6 kg.
Cabinet Model	14¾ in. 37.6 cm.	21 in. 53.5 cm.	21½ in. 54.6 cm.	89 lb. 40.5 kg.
A.C. Power Unit	6¼ in. 15.8 cm.	17 in. 43.2 cm.	7 in. 17.8 cm.	25 lb. 11.4 kg.

2.4 Valves

Receiver

V1 and V2, signal frequency amplifiers	EF39
V3, frequency changer,	ECH35
V4, oscillator,	L63 or 6J5G
V5, V6 and V7, I.F. amplifiers,	EF39
V9, detector and A.G.C. rectifier,	EB34 or 6H6
V10, noise limiter,	EB34 or 6H6
V8, B.F.O.,	EF37A or EF36
V11, A.F. amplifier,	EF37A or EF36
V12, output,	6V6G

A.C. Power Unit

V1, Neon stabiliser,	S/130
V2, Rectifier,	5Z4G

Substitution of equivalent types of valves will not cause any marked difference in performance but where the receiver is installed in a ship subject to the M.O.T. Merchant Shipping (Radio) Rules, 1952 however, it should be noted that the Type Approval Certificate is granted for the equipment using the types shown above and that the use of others may give rise to difficulties at the Marine Inspector's Survey in U.K. ports.

3.0 TYPICAL PERFORMANCE FIGURES

3.1 Sensitivity, Image Discrimination and I.F. Response

Details of sensitivity, image discrimination and I.F. response ratios are given in the table overleaf. Sensitivity is measured as the input required to give an output of 50 mW with a signal/noise ratio of 10 dB on Bandwidth 3. At 22 kc/s the figures are given for Bandwidth 2. Dummy aerials of 300 pF below 4 Mc/s and 80 ohms above this frequency were used. The MCW signal was 30% modulated at 400 c/s.

TABLE 1

Sensitivity, Image and I.F. Rejection Ratios

Band	Frequency	CW Sensitivity uV	MCW Sensitivity uV	Image Ratios dB	I.F.Rejection Ratios dB
A	25 Mc/s	<1.0	<1.0	40	>100
B	(15 Mc/s	<1.0	1.5	51	>100
	(8 Mc/s	<1.0	2.0	71	>100
C	4 Mc/s	<1.0	2.5	92	>100
D	2 Mc/s	<1.0	2.5	>100	>100
E	1500 kc/s	1.5	5.0	>100	>100
F	(650 kc/s	1.0	3.0	>100	>100
	(250 kc/s	3.0	10.0	>100	> 76
G	100 kc/s	4.0	15.0	>100	>100
H	22 kc/s	3.0	-	>100	> 75

3.2 Selectivity

110 kc/s I.F.

Attenuation	Typical overall Bandwidths in kc/s Switch position				
	1	2	3	4	5
6 dB ...	-	1.2	4	10	12
30 dB ...	1	4.5	8	13	16
60 dB ...	6	8	12	18	21

465 kc/s I.F.

Attenuation	Typical overall Bandwidths in kc/s Switch position				
	1	2	3	4	5
6 dB ...	-	1.2	4.5	12	17
30 dB ...	0.8	4	11	20	25
60 dB ...	6	8	18	27	32

Typical I.F. response curves will be found in the appendix to this handbook.

3.3 Automatic Gain Control

The A.G.C. characteristic is shown in Figure 1 below, and was measured at 2 Mc/s on Bandwidth 3.

An increase in the input of 20 dB results in an improvement in the Signal/Noise Ratio of approximately 19 dB.

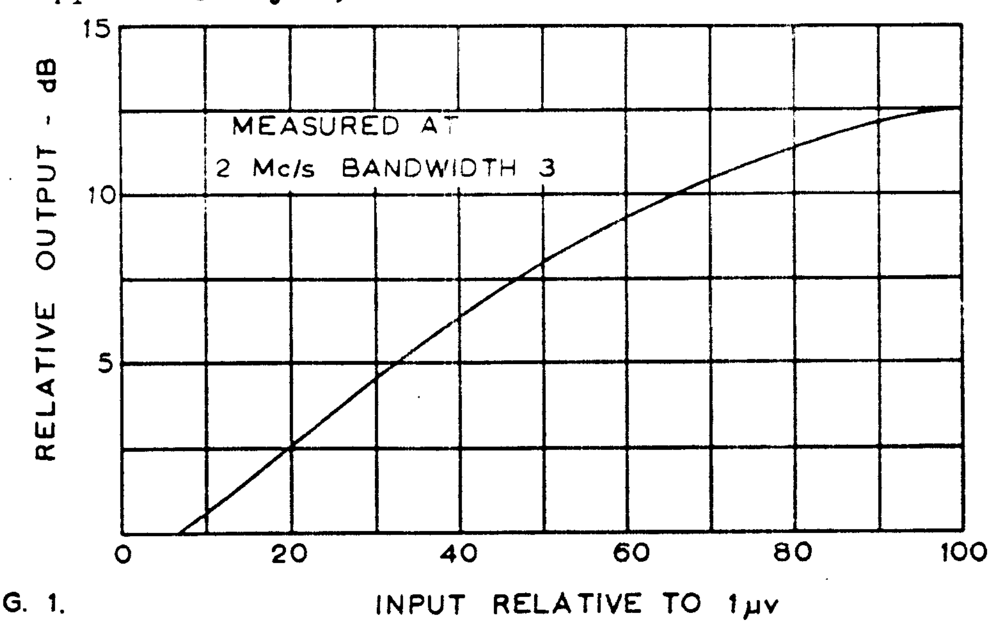


FIG. 1.

The time constants on "A.G.C." are approximately 0.1 seconds charge and discharge. On "N.S-A.G.C." they are 0.1 and 1.0 seconds respectively.

3.4 Stability

Between five and ten minutes after switching on the oscillator frequency will not change by more than one part in 10,000 over the range 1.5 to 25 Mc/s. Below 1.5 Mc/s, stability is of the order of 3 parts in 10,000 and the drift is negligible after approximately ten minutes. The stability is unaffected by supply variations up to 5%.

3.5 Audio Quality

The total harmonic distortion is less than 5% at 2 watts output and the hum level is at least 55 dB below this figure.

The response is within 3 dB from 250 to 4,000 c/s.

3.6 Power Consumption

The A.C. Power Unit consumes approximately 80 watts.

4.0 TECHNICAL DESCRIPTION

4.1 Mechanical Details

The basic chassis is designed to provide a strong light framework supporting the various units into which the receiver is divided, but which need not be disturbed for normal maintenance or servicing. The front panel, of ¼ inch aluminium plate, assists in producing a rigid structure.

The sub-assemblies are as follows:-

(a) The I.F. unit, comprising the components for both intermediate frequencies and their associated switches is mounted in the main chassis on the right hand side.

(b) The output stage, which is mounted in the main chassis, immediately behind the front panel.

(c) The aerial stage, R.F. amplifiers, oscillator and mixer units are mounted side by side and a light alloy casting of generous dimensions, on which the tuning condenser is mounted, is bolted across them. The whole is flexibly mounted to prevent the transference of any shocks or vibrations.

The complete chassis is normally housed in a sheet metal cabinet finished in grey crackle enamel. It has a flush hinged lid with quick release catch and openings at the rear for access to the input and output sockets.

The power unit is simple and robust, all the components are mounted on a single chassis and enclosed with an aluminium cover.

4.2 Electrical Details

All the components and wiring in the receiver and power unit comply with the normal Colonial and Service tropical requirements. No electrolytic condensers are used at high voltages, ceramic switch wafers and insulators are employed in critical circuits, and wiring is either bare tinned copper or insulated with P.V.C. or Polythene. The materials used in the framework and chassis are chosen and finished to produce the minimum contact potentials (not greater than 0.3 volts) between adjacent metals.

4.3 Circuit Details

4.3.1 Signal Frequency Amplifier

Two stages of signal frequency amplification provide adequate selectivity prior to the mixer stage, reducing cross modulation and blocking by strong interfering signals. At the same time, the higher signal level at the grid of the mixer valve, at which point valve noise is chiefly introduced in a superheterodyne receiver, results in a good overall signal/noise ratio.

The grid circuit of V1 and the grid/anode circuits of valves V1/V2 and V2/V3 each employ eight transformer couplings to cover the frequency range of the receiver and all coils not in use are short circuited by the range switch. The secondaries of the transformers are tuned by sections of the double four gang variable condenser, two sections in parallel being used on the long and medium wave bands D to H and one section only on the short wave bands A to C. Two series tuned I.F. circuits are provided to improve I.F. rejection on bands E and G.

Inductance and capacity trimming is provided in each tuned circuit, with the exception of the aerial coils which have no capacity trimmers apart from the common aerial trimming condenser. The latter has a control on the front panel of the receiver and tunes the aerial circuit which is designed for use with an 80 ohm unbalanced input on bands A B and C and an aerial of between 200 and 600 pF on the other bands. It is thus suitable for use with a ships open wire aerial.

4.3.2 Oscillator

The first heterodyne oscillator valve V4, is aligned to track with the signal frequency amplifier at a frequency 110 kc/s higher on bands F and H and 465 kc/s higher on bands A,B,C,D,E and G.

A separate oscillator valve is employed with a tuned grid circuit controlled by either one or two sections of the rear unit of the ganged variable condenser. A single section being employed on range A and two sections on ranges B to H.

Radiation is reduced to a very low level by isolating the signal frequency and oscillator circuits.

Inductance as well as capacity trimming is provided in all tuned circuits and on ranges D to H the padder condensers have trimmers.

To compensate for temperature changes and to improve frequency stability, condensers with a negative temperature co-efficient are connected in parallel with the grid coils and padding condensers; in addition, a temperature compensated stage is included between oscillator and mixer.

Frequency variations due to any mains supply fluctuation are minimised by stabilised H.T. supply.

4.3.3. Mixer

A triode hexode valve, V3, is used as a mixer and to ensure stability the hexode screen and triode anode are connected to the stabilised H.T. line. The oscillator output is fed to the triode grid, which in conjunction with the temperature compensated resistor, R26, between triode anode and cathode serves to minimise initial frequency drift.

4.3.4. Intermediate Frequency Amplifier

Three stages of I.F. amplification are provided by the variable mu R.F. pentodes V5, V6 and V7. Due to the wide R.F. range, it is necessary to provide two alternative I.F. frequencies; the appropriate one being automatically selected by the range switch.

Selectivity may be varied by means of the switch S5. Five bandwidths are available ranging from "Xtal" to "Broad". Typical response curves are shown in the Appendix.

The narrowest bandwidths employ high stability vacuum mounted crystals as coupling elements between the first I.F. amplifier and the mixer. A simplified circuit diagram is shown overleaf.

<u>F I G U R E 2</u>

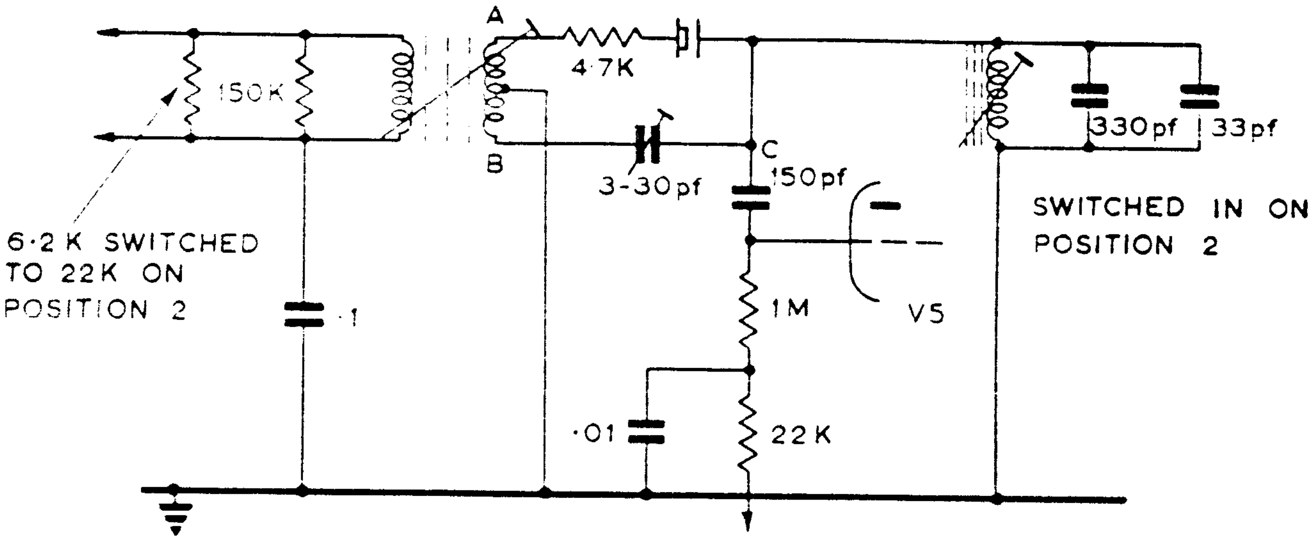


Figure 2 shows the 110 kc/s crystal filter when the selectivity switch is in Posn. 1. The changes when it is moved to Posn. 2 are indicated, but for simplicity the switches themselves are not shown.

The voltages induced in the secondary of the I.F. transformer are 180 degrees out of phase at the points A and B and if the preset phasing condenser is adjusted so that its capacity is equal to the crystal holder capacity, there will be no signal at C. At the resonant frequency, however, the crystal behaves as though it has a low resistance in parallel with it (say 5k ohms) and in this case there will be a resultant output which is fed to the 1st I.F. valve via the 150 pF condenser.

In posn. 2, the crystal damping coil in parallel with the two condensers is introduced between the point C and earth and has the effect of widening the response.

In Posn. 3, the crystal filter is removed completely, and in Posns. 4 and 5 the response is still further widened by increasing the coupling of the I.F. transformers of the second and third stages. The 465 kc/s arrangement is similar, but the filter employs two crystals.

4.3.5. Signal Detector and A.G.C. Rectifier

One diode of double diode V9 is connected to the secondary of the final I.F. transformer and acts as the signal detector while the other is connected to the anode of the final I.F. valve and produces a delayed A.G.C. voltage controlling the R.F. and the first two I.F. valves.

4.3.6. Beat Frequency Oscillator

The second heterodyne oscillator V8, of the electron coupled variety, is coupled to the detector by a 10 pF condenser.

A trimmer condenser C102, with a control on the front panel, enables the beat note to be adjusted to the desired audio frequency and a negative temperature coefficient condenser results in high stability.

4.3.7. Noise Suppressor

Noise suppression may be introduced with or without A.G.C. and is obtained by means of a double diode valve V10 and a limiter circuit of the shunt series type. On CW and when the 465 kc/s I.F. is in use a bias is applied to the diode anode to improve the signal/noise ratio.

4.3.8. Audio Frequency Amplifier

The audio frequency voltage amplifier V11 is resistance capacity coupled to the output valve V12. Negative feedback is applied to the grid of V12 to improve the audio response and reduce the effective output impedance.

The output valve, of the beam tetrode type, will deliver 2 watts into a 3 or 12 ohm load; the secondary of the output transformer being split into two separate sections of 3 ohms each, for connection in series or parallel. The 12 ohm arrangement constitutes a satisfactory low impedance source for feeding a 600 ohm line. A telephone jack is permanently connected across one winding of the output transformer with a 680 ohm series limiting resistor to give an output suitable for use with headphones of 50 to 120 ohms resistance.

4.3.9 Manual Gain Controls

There are two manual controls for adjustment of AUDIO and RF/IF gain.

The audio control, which is used to adjust the output level of the receiver, varies the input to the grid of the audio amplifier valve V11.

The RF/IF control adjusts the gain of the signal frequency stages and also that of the first two I.F. stages by varying the cathode resistance and hence the bias of these four valves.

5.0 INSTALLATION

5.1 Initial Adjustments

The receiver and interconnecting cable are packed in a carton; for export packing this is further protected by a wooden case lined with shock absorbing material, also containing the power unit. Having unpacked the equipment proceed as follows:-

Receiver in cabinet

(a) Remove the six panel retaining screws.

(b) Pull the chassis forward by means of the knobs provided.

(c) Remove the transit bracket, which is temporarily fitted to prevent undue movement of the main sub-assembly during shipment. Four screws hold the bracket to the angle bracket on the front panel and two hold it to the centre screen on the sub-assembly. Replace the screws in the centre screen after removing the bracket.

(d) Check that all valves are firmly in their sockets.

(e) Remove the power unit cover by withdrawing the four screws at the back and the one on the top, adjust the mains voltage tapping (see para 5.3) and replace the cover.

Receiver for 19" rack mounting

(a) Remove the two retaining screws at the back and slide off the top section of the cover.

(b) Remove the transit bracket, temporarily fitted to prevent undue movement of the main sub-assembly during transit. Four screws hold the bracket to the angle bracket on the front panel and two hold it to the centre screen on the sub-assembly. Replace the screws in the centre screen after removing the bracket.

(c) Check that all valves are firmly in their sockets.

(d) Remove the power unit cover by withdrawing the four screws at the back and the one on top, adjust the mains voltage tapping and replace the cover.

5.2 INSTALLING

The construction of the R.50 M ensures maximum rigidity and every care should be taken to ensure that no distortion takes place when installing the receiver. The cabinet version has four rubber feet which should stand on a level surface so that the weight is evenly distributed, whilst the rack mounted receiver should rest evenly on angle runners at each side. On no account should the front panel be used as a support, the panel screws are only to secure the panel to the rack.

The power unit may be installed where most convenient within the limits of the connecting cable.

5.3 A.C. Mains Supply

Check that the voltage and frequency of the supply is within the range covered by the power unit and adjust the mains transformer taps as shown in Table 2. All power units are adjusted for 240 volts working before leaving the works.

The value of fuses F1 and F2 is dependent upon the supply voltage and is 1 amp for 200 to 250 volts and 2 amps for 100 to 125 volts. The H.T. fuse F3 should be 250 mA in all cases.

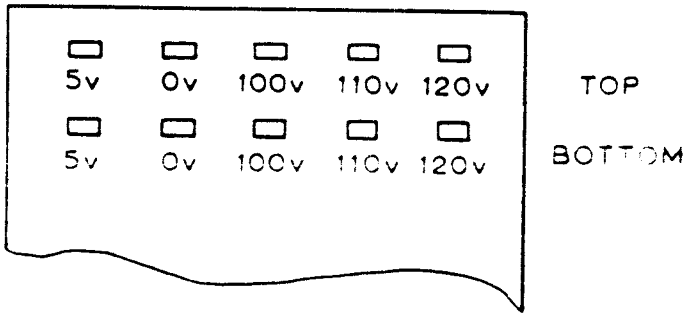
Connect the receiver to the power unit by means of the interconnecting cable provided. Insert the plug end of the cable into the socket at the back of the power unit marked P.O. and the socket into the plug marked R.I. at the back of the receiver.

The mains input plug is on the right hand side of the power unit, viewed from the rear.

TABLE 2

Mains Transformer Connections

Mains Volts	Interconnections	Connect Mains Wires to
100	0 to 0 and 100 to 100	0 and 100
105	5 to 5 " 100 " 100	5 " 100
110	0 to 0 " 110 " 110	0 " 110
115	5 " 5 " 110 " 110	5 " 110
120	0 " 0 " 120 " 120	0 " 120
125	5 " 5 " 120 " 120	5 " 120
200	0 top to 100 bottom	0 bottom 100 top
205	5 " " 100 "	0 " 100 "
210	0 " " 100 "	0 " 110 "
215	5 " " 100 "	0 " 110 "
220	0 " " 100 "	0 " 120 "
225	5 " " 100 "	0 " 120 "
230	0 " " 120 "	0 " 110 "
235	5 " " 120 "	0 " 110 "
240	0 " " 120 "	0 " 120 "
245	5 " " 120 "	0 " 120 "
250	5 " " 120 "	5 " 120 "



MAINS TRANSFORMER TAPPINGS

FIGURE 3

5.4 D.C. Mains Supply

For D.C. mains, the A.C. power unit is retained and a D.C. to A.C. rotary converter capable of providing a power of approximately 120 watts at 220 volts 50 c/s is provided. Rotary converters for 24, 110 or 220 volts can be supplied as standard and units for other voltages are available to special order.

When the equipment is fitted in British Registered Vessels under the Merchant Shipping Rules 1952, approved type machines must be specified. The following machines, supplied by Redifon, meet the requirements:-

24	volts	D.C.	input	Type RED 3
110	"	"	"	" RED 4
220	"	"	"	" RED 5

It is important to check that the input taps on the mains transformer ofthe A.C. power unit are adjusted to the voltage output of the converter. This is usually 230 volts. Filters for suppressing commutator interference are fitted.

5.5 Aerial

The receiver will function satisfactorily with any normal open wire aerial between 25 and 250 feet in length and a normal earth connection.

Above 4 Mc/s it is designed to match an aerial of 80 ohms impedance.

The aerial lead in should be passed through the hole in the back of the receiver and connected by means of the co-axial plug and socket mounted at the rear. The earth connection is also made at the rear of the unit.

There is no objection to a co-axial type aerial input being run from a single ended aerial switch, thus permitting the main transmitting aerial to be switched to the receiver for long distance working on the very low frequency band.

5.6 Loudspeaker and Headphones

When a loudspeaker is used, connections from the speech coil are taken from pins 1 and 3 on the 12 way socket at the rear of the receiver. The loudspeaker, supplied by Redifon, has a 3 ohm resistor which is connected when the speaker is switched off. This is necessary in order to avoid excessive voltages in the output transformer.

For an audio output of 3 ohms impedance, join terminals B to D and A to C on the output transformer which is situated in the power unit.

For 12 ohms impedance join terminals B to C on the output transformer. This may also be used for a 600 ohms line.

A headphone jack socket is provided on the front panel of the receiver for headphones of 120 ohms resistance. It is essential that the resistance is correct since the use of high resistance headphones will result in a considerable reduction in sensitivity.

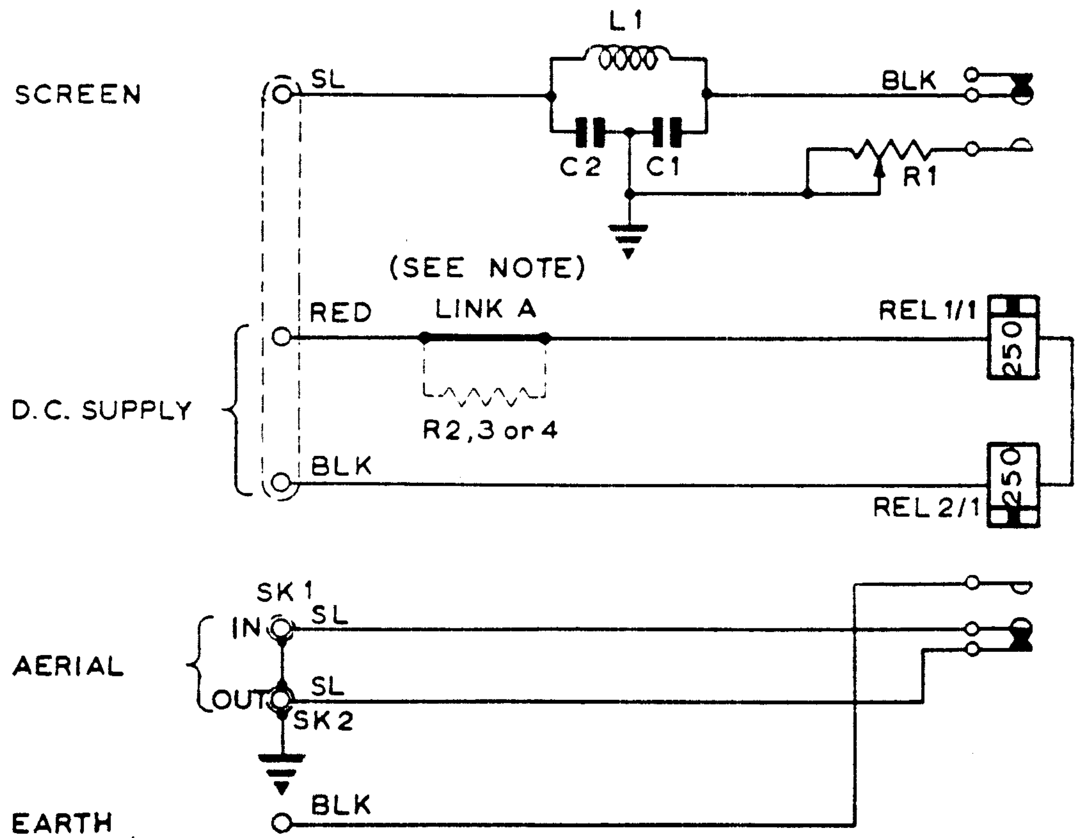
A 22,000 ohms resistor R2 is connected across the primary winding of the output transformer to minimise the risk of damage should the receiver be operated under no load conditions. Receivers prior to Serial No. 802 may be without this and it is recommended that such are modified in accordance with the power unit diagram and components list included at the end of this handbook.

5.7 Muting

A Redifon Relay Unit is available to provide muting facilities when the receiver forms part of a main installation and is used in conjunction with a transmitter.

The circuit diagram is given below. Muting is accomplished by earthing the screen supply line and receiving aerial during "mark" periods, the change-over being performed by the contacts of relays 1 and 2 respectively, both energised from a D.C. supply when the telegraph key or "press-to-talk" switch is depressed for transmission. The screen supply line is taken to earth via a variable resistor R1, thus affording a convenient control of received volume when monitoring out-going transmissions.

Where the receiver is operated from an A.C. mains supply, a D.C. voltage of 12, 24, 110 or 220V must be provided for energising relays 1 and 2.



MUTING CIRCUIT CONNECTIONS

FIGURE 4

NOTE

For 12 volts D.C. supply - Link A in position.

For 24 volts D.C. supply - Replace Link A with resistor R2.

For 110 volts D.C. supply - Replace Link A with resistor R3.

For 220 volts D.C.supply - Replace Link A with resistor R4.

Unless otherwise specified the 24 volts unit is supplied.

Muting Circuit Components

Ref:	Value	Description	Remarks
C.1	0.001uF	Condenser CM20N 20%	Ex T.C.C.
C.2	0.001uF	Condenser CM20N 20%	Ex T.C.C.
L.1		Choke H.F. SW 68	Ex Bulgin
R.1	5000ohm	Pot.HNAR 50250	Ex Morganite
Rel 1/1	250ohm	High speed relay H88T	Ex Siemens
Rel 2/1	250ohm	High speed relay H88T	Ex Siemens
R.2	470ohm	¼ watt	Ex Erie
R.3	3.9kohm	6 watt Resistor AW3111	Ex Welwyn
R.4	8.2kohm	10 watt AW 3112	EX Welwyn

6.0 OPERATION

6.1 General

Turn the switch below the meter to "C.W" for continuous wave working or to "MOD" for telephony and M.C.W. The dial lamps will indicate that the set is switched on and a period of five minutes should be allowed for the valves to warm up and the R.F. circuits to stabilise. If there is a rotary converter, this should be switched on first.

Set the A.G.C. NOISE SUPPRESSOR switch to "MAN" i.e. Manual gain control.

Switch the I.F. Bandwidth Control to Posn. 3.

Adjust the RF/IF Gain Control to maximum and the AF gain to give a reasonable noise level.

Turn the range switch to band required.

Tune in the signal using the large knob for coarse adjustment and the small one for fine. For C.W. rotate the B.F.O. trimmer knob until the pitch of the beat note is satisfactory.

Rotate the Aerial Trimmer for maximum signal.

The I.F. bandwidth switch should now be adjusted to givethe required degree of selectivity as detailed in para 6.3.

A.G.C., with or without noise suppression, may now be switched in, using the A.G.C. - N.S. switch and the suppressor control adjusted. Turn the N.S. control fully anti-clockwise and then advance it until the signal to noise ratio is at its optimum, or until distortion begins to appear. The noise suppressor should only be used, however, if conditions make it necessary.

If muting is required, turn the switch under the meter to "Muting C.W" for continuous wave reception, or to "Muting Mod" for telephony.

6.2 Automatic Gain Control

Maximum use should always be made of the A.G.C. since, not only does this circuit ensure that the output remains comparatively unchanged over a wide range of input levels, but it also maintains an optimum signal/noise ratio.

The exception to the use of A.G.C. is when listening to weak or elusive signals accompanied by static or signals of greater field strength, when the interference will operate the A.G.C. and may reduce the gain sufficiently for the wanted signal to be lost altogether.

6.3 I.F. Bandwidths

Five bandwidths are provided for each of the two intermediate frequencies. The bandwidth switch should be set to Posn. 3, when searching on the lower frequency ranges and to Posn. 4 on the higher ones.

The two narrowest bands give a high degree of selectivity for use on C.W. reception or whenever freedom from interfering signals on an adjacent frequency is required. Their use is not recommended for telephony.

The third position of the switch is suitable for the reception of C.W. under clear conditions and also for telephony subject to strong adjacent channel interference.

Posn. 4 should be used for telephony when some interference is experienced or when the signal is not strong, and Posn. 5 gives the best quality with strong signals.

6.4 Logging Scale

A spring loaded mechanism is employed and the logging scale is made up of two parts, a fixed coarse scale divided into twenty four parts and traversed by the hair line on the cursor, and a scale of one hundred divisions which rotates once for each division of the coarse scale. There is thus a total of 2,400 divisions over each frequency range.

To log a station, the fixed scale should be read first and then the rotating one. The same order of operations should be used when resetting.

6.5 Standby

If the receiver is operated for long periods on intermittent duty, it should not be switched off but left on the "Standby" position. This ensures maximum stability and freedom from frequency drift which would arise from the warming up and cooling down of the valves and other components.

6.6 Gain Controls

When receiving C.W. or telephony with a A.G.C. in use, the RF/IF gain control should be set at maximum for all but the strongest signals. The A.F. gain control should be used to give the output level required.

When receiving C.W. with the switch at "Manual" the A.F. gain control should be set to maximum gain and the RF/IF control used to give the required signal level.

6.7 Tuning Meter

The service meter has a switch position marked "Tuning" and with the switch set to this position and A.G.C. on it may be used as a tuning indicator, the tuning control being adjusted for minimum reading on the meter.

6.8 Muting

When the receiver is used in conjunction with a transmitter, the switch under the meter should be set to one of the muting positions. The muting relay described in para 5.7 will then reduce the gain of the receiver during "mark" to an extent depending on the setting of the side tone control R1 on the muting unit.

7.0 MAINTENANCE

7.1 Routine Servicing

Routine maintenance of the receiver should be limited to an occasional valve check with the service meter and the replacement of unservicable valves and dial lamps.

A table of average meter readings is given and space is left for the recording of the actual readings of the receiver with which this handbook is issued. If, on the routine checks, the reading of a valve is found to have fallen off appreciably, it should be changed and the new reading recorded once it has been ascertained that the change has restored the performance of the receiver to its original level. If this is not the case, then fault finding procedure should be carried out as detailed in para 7.2.

Access to the valves is obtained as follows:-

V1,2,3,4	by removing the centre cover plate over the gang condenser.
V5,6,7	by removing the right hand cover over the I.F. unit.
V8, 11	by removing first the tops and then the bodies of the circular screening cans.
V9,10,12	are directly accessible.

NOTE: V12 is very close to mains switch; disconnect mains from power unit before removing.

T A B L E 3

Service Meter Readings

Meter Switch Position	Full Scale Deflection	Average Readings	Actual Readings
V.1 Anode Current	10mA	5.7mA	
V.2 " "	10mA	5.7mA	
V.3 " "	10mA	2.8mA	
V.4 " "	10mA	4.0mA	
Tuning	10mA	5.7mA	
V.5 Anode Current	10mA	5.7mA	
V.6 " "	10mA	5.7mA	
V.7 " "	10mA	5.7mA	
V.8 " "	3mA	0.4mA	
V.11 " "	10mA	1.8mA	
H.T. volts	300 V	280 V	
V.12 Cathode Current	100mA	37mA	

NOTE:

The figures given are with no signal input, RF/IF gain control at maximum and frequency band switch at position E.

The three dial lamps for illuminating the scale are connected in parallel, with a resistance in series to reduce the current. If a lamp fails, unscrew the two pillars securing the dial lamp unit behind the front panel, move the unit away from the dial, replace the faulty lamp and refix the unit into position.

Replacement lamps should be 6 volt 0.3 amp minature Edison screw type. One spare lamp is supplied in a clip fixed to the top of the gang condenser cover inside the receiver.

7.2 Fault Finding

The following procedure should be adopted, should a fault be suspected, and will assist in locating and correcting the majority of faults likely to arise.

(a) Check the valve currents and H.T. voltage as indicated in Table 3 by means of the service meter.

(b) Ascertain whether the fault exists on all frequency ranges. Should it be only on one range, the appropriate oscillator and signal frequency section components and switches should be investigated.

(c) Note any unusual sound effects as these will often give an indication of the trouble.

(d) Make a visual examination for mechanical damage or broken components.

(e) If a test meter is available, make the voltage and resistance checks indicated in Table 4.

Measurements should be made on an Avometer Model 7, the anode and screen potentials on the 400 volt range and the cathode potentials on the 10 volt range. It should be noted that it is necessary to switch the receiver off before making the resistance checks.

T A B L E 4

Test Point Voltages and Resistances

Valves		V1&2	V3	V4	V5	V6	V7	V8	V11	V1
Anode	Volts to Chassis	250	250	95	250	250	250	70	70	27
	Ohms to H.T. Line	4.7K	4.7K	4.7K	4.7K	4.7K	4.7K	122K	105K	*
Screen	Volts to Chassis	95	104		95	95	95	45	130	28
	Ohms to H.T. Line	10K	4.7K		10K	10K	100K	100K	155K	0
Cathode	Volts to Chassis	2.4	2.4	0	2.4	2.4	2.4	0	4.8	1
	Ohms to Chassis	330	150	0	330	330	330	0	3.3K	47
Grid	Ohms to Chassis			68K				100K	100K	47

Main H.T. 280 volts, Stabilised H.T. 114 volts, H.T. current 100mA

* Open circuit when the receiver is in the OFF position. 180 ohms when ON. (withdraw the mains plug in order to measure)

One of the above tests should give an indication of the location of the fault and the appropriate section of the receiver should be investigated. Otherwise, the sections should be tested in order. Details of the tests for the various sections are given in the following paragraphs.

7.2.1 Power Unit

If no L.T. or H.T. is available from the power unit, check that the mains supply is through to the input plug. Examine the mains fuses on the front panel and make sure that the primary taps of the transformer are connected correctly. Check the input lead for broken wires.

If the L.T. is available but there is no H.T., examine the fuse F3 on the front panel. A burnt out fuse indicates a low resistance path to earth from the H.T. line, either in the power unit or the receiver. Test both the smoothing condensers for breakdown and measure the resistance from the H.T. line to earth. Using an A.C. voltmeter, check the rectifier heater and anode voltages. If these are normal, (5 and 365 volts A.C. respectively) the rectifier valve is probably at fault and should be replaced.

The stabilised H.T. supply is nominally 114 volts but if the stabiliser valve is open circuited or making bad contact in the holder, it may be almost 270 volts.

7.2.2 Audio Frequency Amplifier

A rapid test of the A.F. amplifier can be made by setting the gain control to maximum and touching the cathode (pin 6) of V11 intermittently with an earthed wire. A loud scratching noise will be heard in the telephone or loudspeaker if the stage is functioning.

When making tests involving the shorting out of bias resistors, the service meter should be switched to another stage or it may be damaged.

If an audio frequency oscillator is available, the output should be injected into the grids of V12 and V11 in turn. Lack of response to the former indicates a fault in the output transformer or the leads to it in the interconnecting cable, or in the loudspeaker or telephone. If no response is obtained in the case of V11, check the coupling condenser and the associated wiring for an open circuit.

7.2.3 Intermediate Frequency Amplifier

Again, a rapid test can be made by touching the cathode of the valves V5, V6 and V7, with an earthed wire. The gain controls should be set at maximum for this. If a valve fails to produce any noise, and normal readings are obtained on the test meter, examine the link mechanism to the I.F. changeover switch as this may have slipped (see para 7.3).

A signal generator and output meter, if available, can be used to measure the gain of each I.F. stage and the results compared with the average figures given below. The oscillator should not be stopped.

Valve	465 kc/s gain	110 kc/s gain
V3	2	1.5
V5	15	16
V6	15	16
V7 sensitivity	160 mV	100 mV

Sensitivity is given for 2 watts output with a signal modulated at 400 c/s to a depth of 30% and the selectivity switch to Posn. 3. This corresponds to 65 - 70uA current in the detector diode load R67. If the RF/IF gain control is tested with no aerial connected it will sound noisy due to the very high gain of these circuits. This type of noise should not be confused with that which will arise from a defective gain control.

7.2.4 Oscillator

Failure of the oscillator is usually indicated by a rise of anode current and reduced receiver noise, although there may be some signal heard. There will be no grid current. The anode current can be checked by means of the service meter while the grid current can be measured by inserting a meter in place of the shorting link across C61. It should be between 60 and 250 uA. Test earth connections and coils for continuity, fixed and variable condensers for short circuits and resistors for incorrect values.

7.2.5. Signal Frequency Amplifier and Mixer

Adjust the receiver to the setting for a strong signal and disconnect the aerial from its normal position. Touch it on the grids of V1, V2 and V3 in turn until the signal is heard. The fault lies on the aerial side of this point.

When a signal generator and output meter are available, they can be used to check the performance of each stage and the figures compared with table 5.

T A B L E 5

R.F. Amplifier Gain

Range	Frequency	Ae.Gain	V1 Gain	V2 Gain	V3 Sensitivity in uV		
A	24 Mc/s	6	6	6	320	Bandwidth	4
B	12 "	5	14	15	400	"	"
C	6 "	9	4	20	400	"	"
D	3 "	9	11	4.4	400	"	"
E	1 "	6	4.4	24	350	"	3
F	425 kc/s	1.8	6	5	600	"	"
G	170 "	1.8	2.5	10	350	"	"
H	20 "	1.8	5.6	33	600	"	2

Measured with dummy aerial of 80 ohms above 4 Mc/s and 300 pF below 4 Mc/s. V3 sensitivity is for 2 watts audio output on 400 c/s, 30% modulated signal. R.F. and A.F. gain controls are at maximum.

7.2.6. A.G.C. and Noise Suppressor

The A.G.C. and noise suppressor operation should be checked in the following manner:-

Set the meter switch to "Tuning".

Set the A.G.C - N.S. switch to N.S - A.G.C.

Connect the aerial, advance the gain controls, tune in strong carrier and note whether the meter reading falls.

Advance noise suppressor control when distortion and attenuation of a modulated carrier should result.

If the A.G.C. does not function correctly, check the continuity of the line from the diode (V9) to the grid return circuit of the R.F. and I.F. valves, including the decoupling resistances. The associated de-coupling condensers should also be tested as a breakdown in one of these would short to earth either the A.G.C. line or one of the valve grid returns.

Examine the switch contacts in the circuits i.e. on the A.G.C. - N.S. switch S2, and on S6/6 which effects the I.F. changeover and is mechanically coupled to the wave change switch.

Measure the delay at the cathode of V9 (pin 8). It should be 9 or 10 volts. If it is incorrect, check the values of R75 and R76 which forms a potential divider across the H.T.

If the noise suppressor is faulty, check the condensers,resistors and switches in this part of the circuit for breakdown, changed value and dirty contacts respectively.

7.2.7 Beat Frequency Oscillator

A high anode current reading when V8 is checked on the service meter, usually indicates that the valve is not oscillating and the associated components should be checked. If the valve appears to be oscillating but the beat note is still inaudible, adjustments to the preset tuning control may be necessary (see para 7.4).

7.3 Mechanical Adjustments

The switch on the I.F. unit for changing from 110 to 465 kc/s operation, is rotated by means of an insulated link operated by a cam on the wave band switch shaft. The insulated portion of this link has two slotted holes at one end for adjustment of length. If, for any reason, the I.F. switch is not operating on the correct contacts, slacken the lock nuts and screws on the links, adjust to the correct position and retighten.

It is essential that the bearings of this switch are lubricated, (Microtime Type C is suitable) and this necessitates the removal of the receiver from the housing. The side cover must be removed to render them accessible.

Should the clutch drive mechanism show a tendency to slip, which is indicated by an apparent sticking of the logging scale, this can be corrected as follows:-

The clutch is located between the dial drive mechanism and the variable condensers, immediately in front of the flexible coupling. Two O.B.A. hexagonal nuts in contact with plain washers at the rear ends of the clutch springs are provided for adjusting the tension. These should be moved about one sixth of a turn at a time until no slip is apparent. Each spring should be adjusted by an equal amount to avoid uneven pressure on the clutch plates.

Replacement of the glass tuning dial may be carried out in the following order, should it become necessary.

Remove the slow motion tuning knob from the main drive spindle by undoing the grub screws.

Remove the main tuning knob by unscrewing the two retaining bolts.

Remove the escutcheon.

The glass dial is held in position by two vertical metal strips, one on each side of the scale. Unscrew the bolts, top and bottom, and remove the strips and rubber packing. Clear out the broken glass and replace with the new scale. Replace the metal holding strips, taking care that the rubber packing is properly in position. Tighten the screws sufficiently to hold the glass in position and replace the main tuning knob.

The dial should now be aligned with the fine logging scale. This is done by obtaining a zero reading on the logging scale when the pointer on the dial lies in each of the following positions:-

(a) On the line between 1 and 2 of the coarse logging scale.

(b) On the line between 11 and 12.

(c) On the line between 22 and 23.

In the extreme positions, a mark will be found near the edge of the dial and the pointer should be lined up on this.

Gently tighten the screws so that the glass is held rigidly in position. Remove the main tuning knob and replace the escutcheon fastening the former back into position.

7.4 Circuit Alignment

No attempt should be made to re-adjust the preset inductance and capacity trimmers of the receiver unless the appropriate test equipment is available and alignment should be undertaken only by experienced personnel when there is definite evidence that this is required.

I.F. Amplifier and B.F.O.

For aligning the IF circuits a signal generator and 0-0.5 mA meter are required. If an oscilloscope is available and the generator can be frequency modulated, it will be easier to obtain symmetry on bandwidths 3, 4 and 5. Unless special D.C. coupled equipment is available with a very low sweep rate, widths 1 and 2 must be checked by setting the signal generator each side of the intermediate frequency and comparing the outputs.

Typical I.F. response curves are given in the appendix and should be referred to.

Free the I.F. cores with a solvent such as Amyl Acetate or Acetone and connect the output of the signal generator to the mixer grid and the 0-0.5 mA meter between the bottom of the resistor R67 and chassis. A deflection of 70 uA should be taken as standard.

NOTE

The oscillator should not be stopped or the valve removed as this will have a detrimental effect on the mixer valve. The A.G.C. should be switched off and gain controls set at maximum.

465 kc/s Channel

(a) Set the range switch to E.

(b) Set the bandwidth switch to Posn. 1 and the signal generator to 465 kc/s, trimming the latter for maximum deflection of the meter. This ensures that the generator is set to the crystal resonance frequency.

(c) Set the bandwidth switch to Posn. 3 and peak all 465 kc/s I.F. transformers except B and D.

(d) Set the bandwidth switch to Posn. 4 and adjust transformer B for symmetry of response with the oscilloscope across R67 and frequency modulating the generator.

(e) Set the bandwidth switch to Posn. 1 and adjust C65 for symmetry of response by rocking the generator frequency each side of the I.F.

(f) Set the bandwidth switch to Posn. 2 and adjust L9 and C67 until curve is both single humped and symmetrical in a similar manner.

(g) Set the bandwidth switch to Posn. 1, the B.F.O. panel control to its central position, check that this corresponds to half capacity and adjust L35 for zero beat on the oscilloscope.

There are two possible positions of the core and the inner one should be chosen.

110 kc/s Channel

(a) Set the range switch to F.

(b) Set the bandwidth switch to Posn. 1, the signal generator to 110 kc/s, and trim the latter for maximum deflection of the meter.

(c) Set the bandwidth switch to Posn. 3 and adjust L39 and L40 and then the cores of the transformers G and J between V6 and V7 for maximum response.

(d) Unscrew the top cores of the transformers G and J, between V5 and V6, and adjust the bottom cores for maximum response.

(e) Damp the grid of V6 using a 22K ohm resistor in series with a 0.1uF condenser.

(f) Adjust the top core of the V6 anode transformer J for maximum response. Remove the damper.

(g) Damp the anode of V5 and adjust the top core of the anode transformer G for maximum response. Remove the damper.

(h) Adjust the top core of the transformer for symmetry by rocking the generator frequency.

(i) Set the bandwidth switch to Posn. 4 and adjust the top core of transformer C for symmetry using the oscilloscope. (The dip, which can be seen here, will be filled by the R.F. response).

(j) Set the bandwidth switch to Posn. 1 and adjust C68 for symmetry by rocking the generator frequency.

(k) Set the bandwidth switch to Posn. 2 and adjust L10 for minimum height of peak. Care should be taken to adjust the generator continually to the resonance frequency as this is critical and varies slightly.

(l) Set the bandwidth switch to Posn. 5 and adjust C64 for symmetry using the oscilloscope.

(m) Set the bandwidth switch to Posn. 1, the B.F.O. panel control to the central position, and adjust L36 for zero beat, choosing the inner position of the core.

Signal Frequency Amplifier and Oscillator

Each range is aligned separatively, first the oscillator, then the two intervalve signal frequency circuits and finally the aerial coils.

The signal generator should be connected to the aerial input via an 80 ohm dummy aerial on bands A to C and via one of 300 pF on the remainder of the bands. The input level should be about 1mV and the RF/IF gain control should be adjusted to give some 70 uA current in the diode detector load. This should be measured by the 0-0.5 mA meter which should be connected between the diode load and earth.

The A.G.C. should be switched off and the gain controls set at maximum. The aerial trimmer should be at half capacity.

BAND A.

(a) Set the tuning control to 17 Mc/s and the bandwidth switch to Posn. 3. Adjust LO 8, LM 8, LR 8 and LA 8 for maximum on a 17 Mc/s signal.

(b) Set the tuning control to 31 Mc/s and adjust TO 8, TM 8 and TR 8, for maximum with the appropriate signal.

(c) Check that the image frequency lies 0.93 Mc/s above the correct signal by connecting the generator to the grid of the mixer and tuning it for maximum output.

(d) Repeat (a) and (b) until no improvement can be obtained. The final adjustment should be at 31 Mc/s.

BAND B.

(a) Set the tuning control to 8.5 Mc/s and adjust LO 7, LM 7, LR 7 and LA 7 for maximum on an 8.5 Mc/s signal.

(b) Set the tuning control to 15.5 Mc/s and adjust TO 7, TM 7 and TR 7 for maximum with the appropriate signal.

(c) Repeat (a) and (b) until no further improvement can be obtained. The final adjustment should be at 15.5 Mc/s.

BAND C.

(a) Set the tuning control to 4 Mc/s and adjust LO 6, LM 6, LR 6 and LA 6 for maximum on a 4 Mc/s signal.

(b) Set the tuning control to 7.8 Mc/s and adjust TO 6, TM 6 and TR 6 for maximum on the appropriate signal.

(c) Repeat (a) and (b) until no further improvement can be obtained. The final adjustment should be at 7.8 Mc/s.

BAND D.

(a) Set the tuning control to 1.7 Mc/s and adjust LO 5, LM 5, LR 5 and LA 5 for maximum on a 1.7 Mc/s signal.

(b) Set the tuning control to 3.8 Mc/s and adjust TO 5, TM 5 and TR 5 for maximum on the appropriate signal.

(c) Set the signal generator to 2.8 Mc/s and tune the receiver for maximum output. If the scale reading is higher than 2.8 Mc/s the capacity of padder, PO 5, should be increased slightly. If it is lower, the capacity should be reduced.

(d) Repeat (a), (b) and (c) until no further improvement can be obtained. The final adjustment should be at 3.8 Mc/s.

BAND E.

(a) Set the tuning control to 650 kc/s and adjust LO 4, LM 4, LR 4 and LA 4 for maximum on a 650 kc/s signal.

(b) Set the tuning control to 1,500 kc/s and adjust TO 4, TM 4 and TR 4 for maximum on the appropriate signal.

(c) Set the signal generator to 1,050 kc/s and tune the receiver for maximum output. If the scale reading is higher than 1,050 kc/s, the capacity of the padder PO 4, should be increased slightly. If it is lower, the capacity should be reduced.

(d) Repeat (a), (b) and (c) until no further improvement can be obtained. The final adjustment should be at 1,500 kc/s.

BAND F.

(a) Set the tuning control to 275 kc/s and adjust LO 3, LM 3, LR 3 and LA 3 for maximum on a 275 kc/s signal.

(b) Set the tuning control to 575 kc/s and adjust TO 3, TM 3 and TR 3 for maximum on the appropriate signal.

(c) Set the signal generator to 425 kc/s and tune the receiver for maximum output. If the scale reading is then higher than 425 kc/s, the capacity of the padder, PO 3, should be increased slightly. If it is lower, the capacity should be reduced.

(d) Repeat (a), (b) and (c) until no further improvement can be obtained. The final adjustment should be at 575 kc/s.

BAND G.

(a) Set the tuning control to 110 kc/s and the bandwidth switch to Posn. 2. Adjust LO 2, LM 2, LR 2 and LA 2 for maximum on a 110 kc/s signal.

(b) Set the tuning control to 240 kc/s and adjust TO 2, TM 2 and TR 2 for maximum on the appropriate signal.

(c) Set the signal generator to 170 kc/s, and tune the receiver for maximum output. If the scale reading is then higher than 170 kc/s, the capacity of the padder, PO 2, should be increased slightly. If it is lower, the capacity should be reduced.

(d) Repeat (a), (b) and (c) until no further improvement can be obtained. The final adjustment should be at 240 kc/s.

BAND H.

(a) Set the tuning control to 14 kc/s and the bandwidth switch to Posn. 1. Adjust LO 1, LM 1, LR 1 and LA 1 for maximum on a 14 kc/s signal.

(b) Set the tuning control to 25 kc/s and adjust TO 1, TM 1 and TR 1 for maximum on the appropriate signal.

(c) Set the signal generator to 20 kc/s and tune the receiver for maximum output. If the scale reading is then higher than 20 kc/s, the capacity of the padder, PO 1, should be increased very slightly. It it is lower, the capacity should be reduced. The padder adjustments are extremely critical on this band.

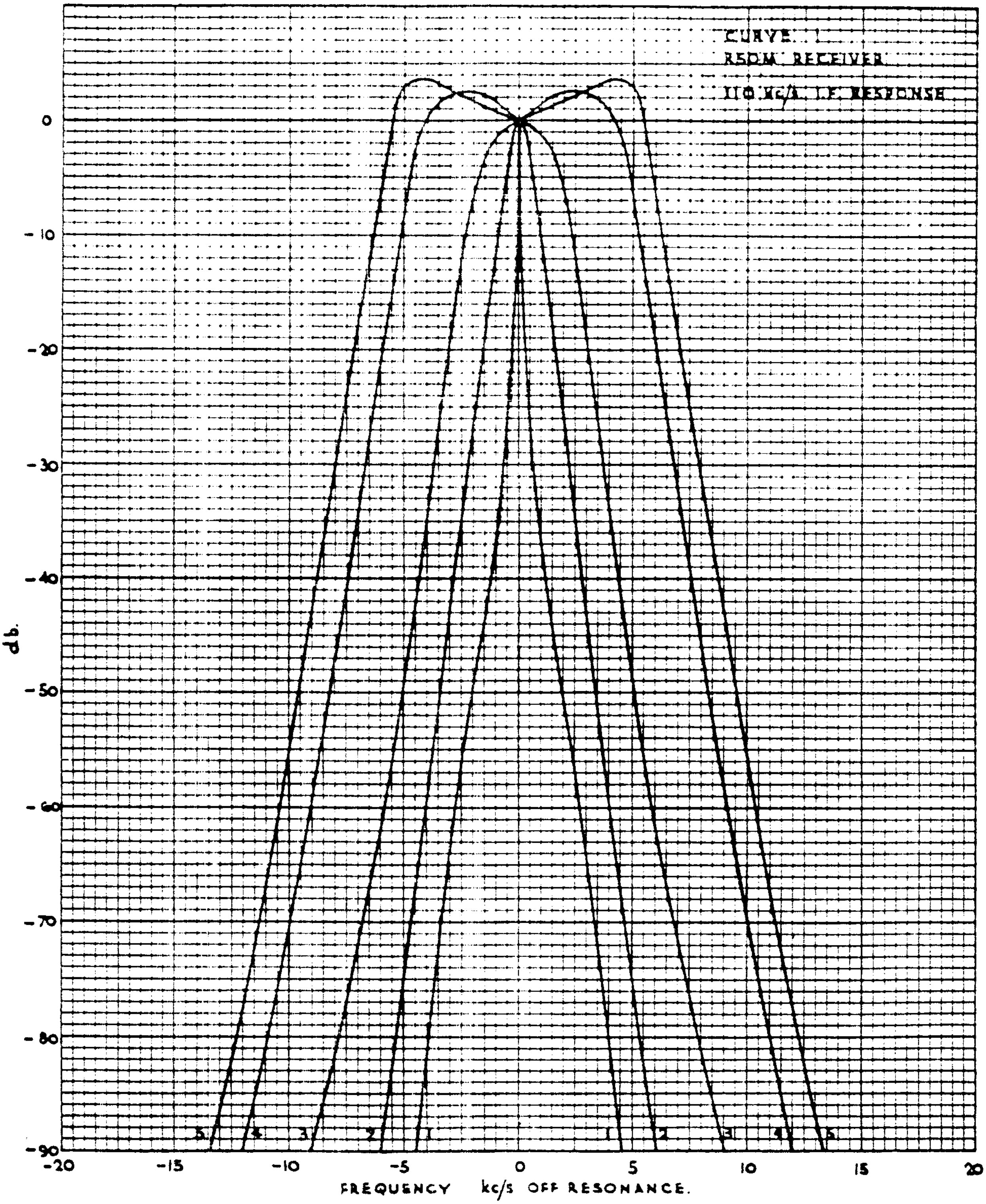
(d) Repeat (a), (b) and (c) until no further improvement can be obtained. The final adjustment should be at 25 kc/s.

Adjustment of the I.F. Rejectors

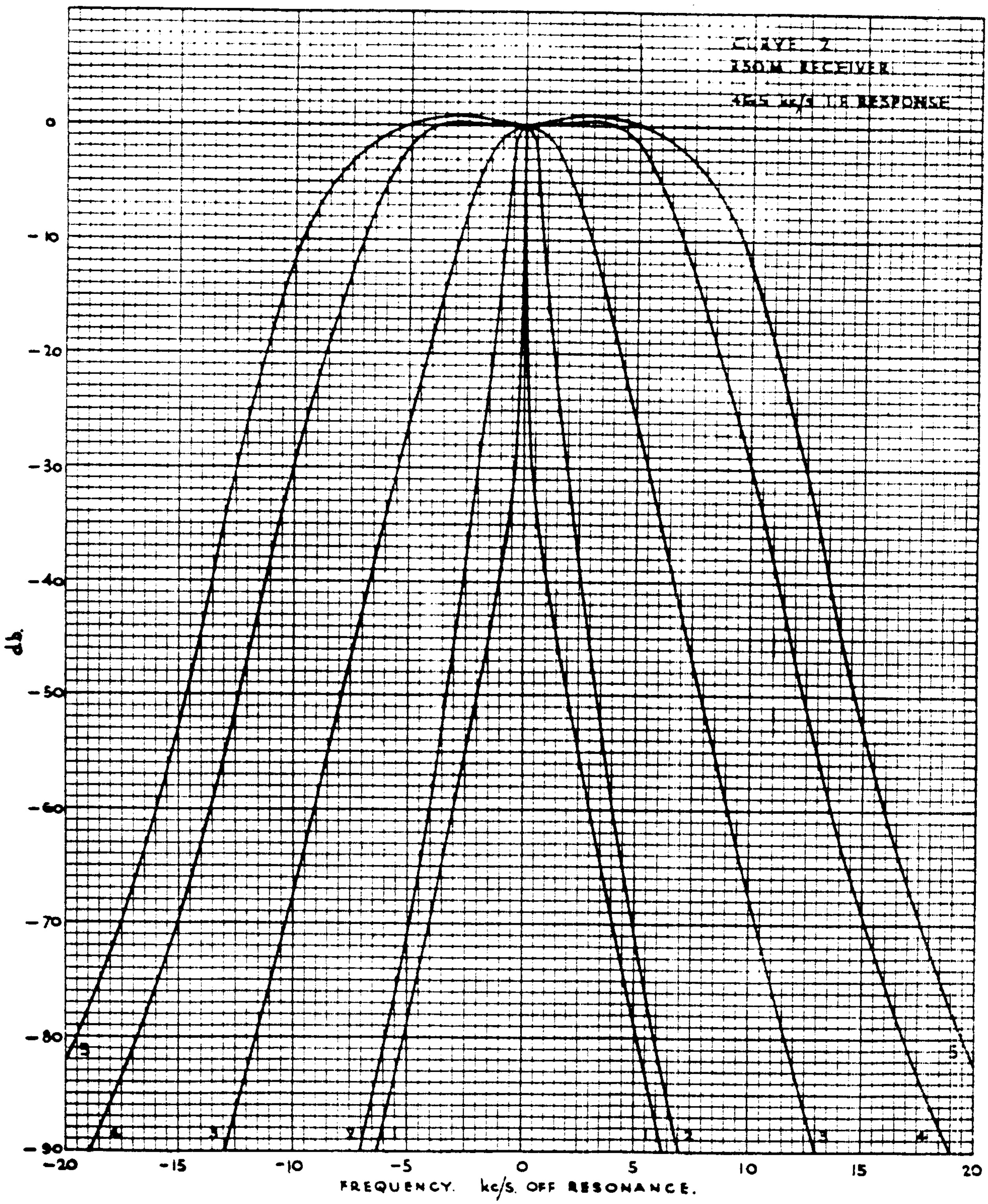
Set the signal generator to the exact intermediate frequency by connecting it to the mixer grid and tuning for maximum output with the bandwidth switch to Posn. 1.

Transfer the signal generator to the grid of V1 and adjust the appropriate I.F. rejector for minimum output. A high level of input will be necessary in order to do this.

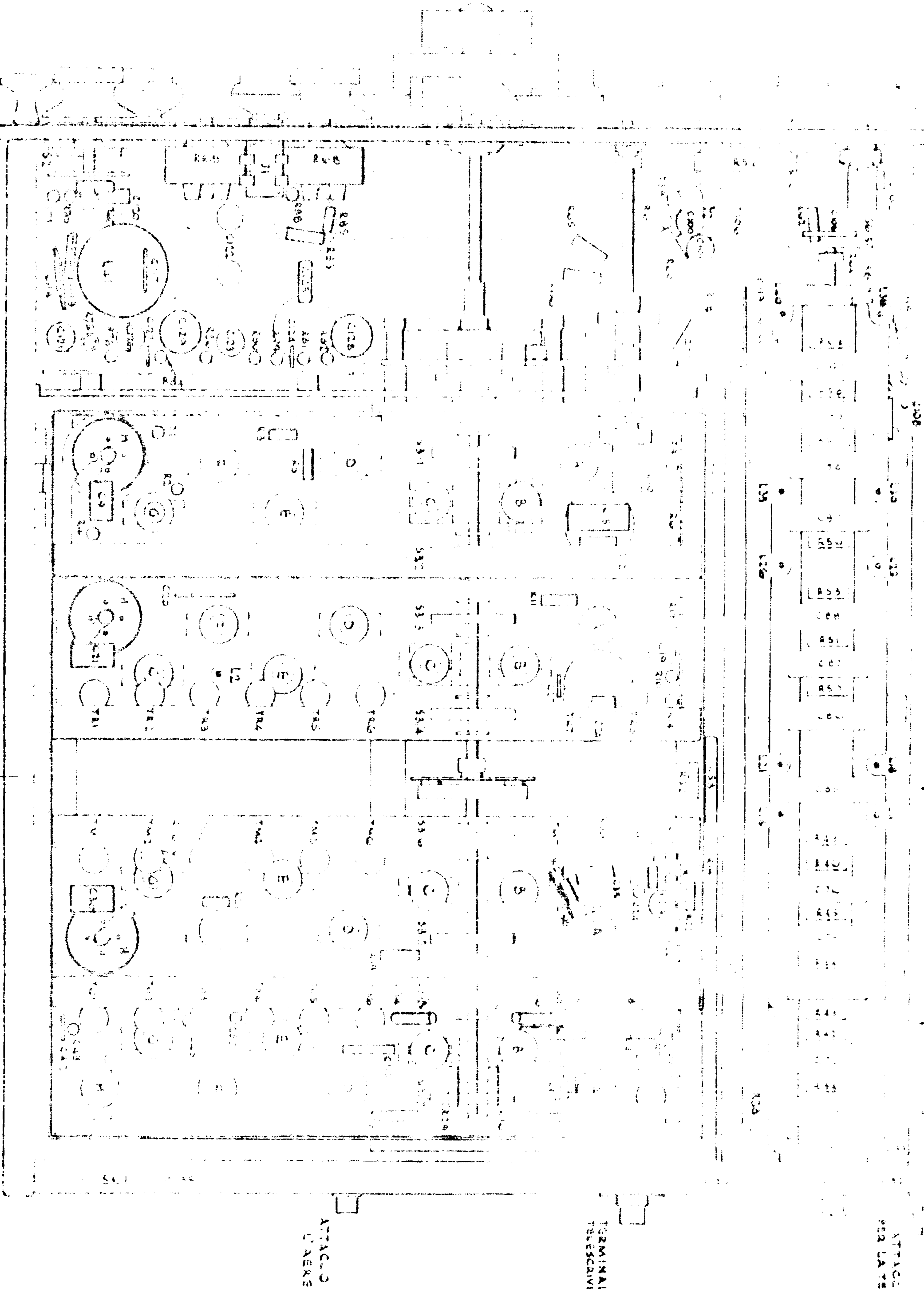
On range E adjust L 2 with the receiver tuning at the high frequency end ofthe scale. On range G adjust L 1 with the tuning at the low frequency end.

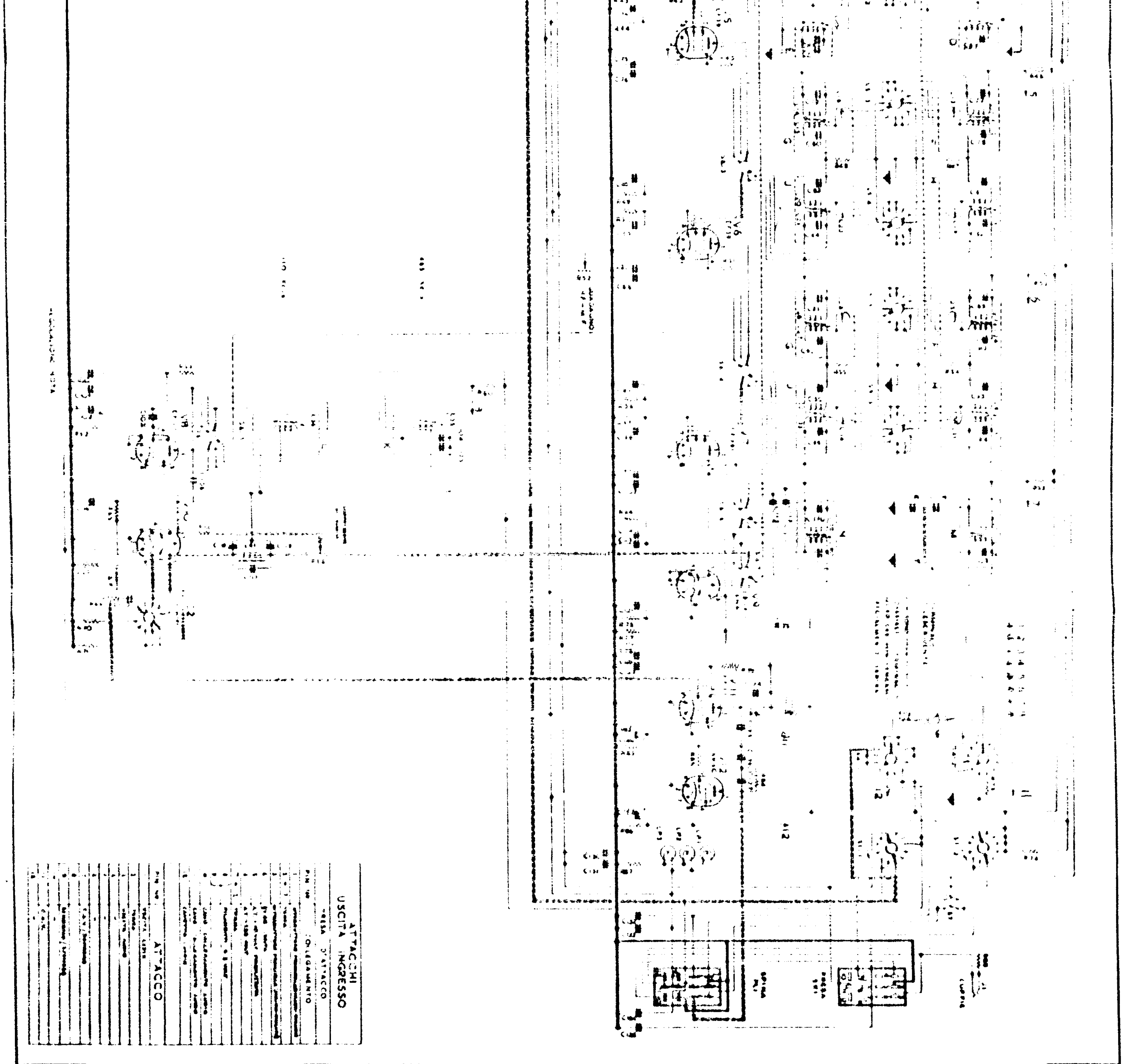


CURVE 1
R5DM RECEIVER
110 Kc/s. I.F. RESPONSE
db.
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
5 4 3 2 1 1 2 3 4 5
-20 -15 -10 -5 0 5 10 15 20
FREQUENCY kc/s OFF RESONANCE.

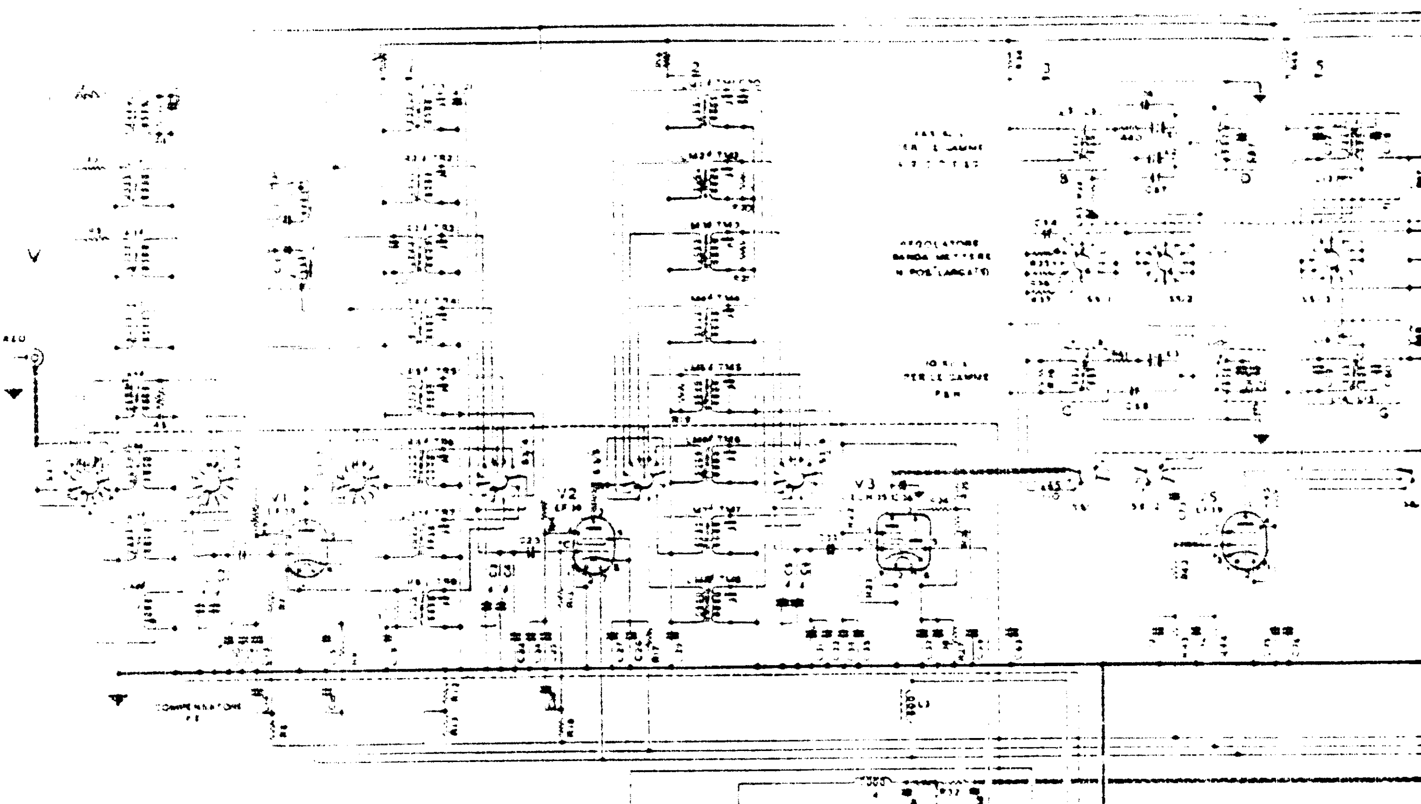


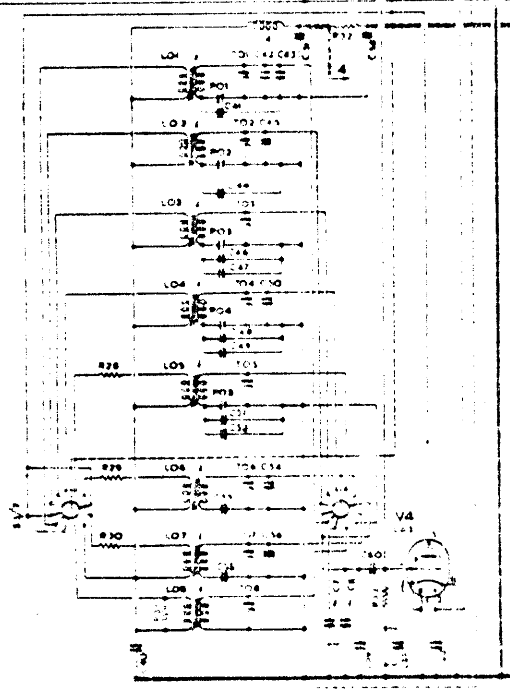
CURVE 2
150 M. RECEIVER
465 kc/s I.F. RESPONSE
d.b.
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-20
-15
-10
-5
0
5
10
15
20
FREQUENCY. kc/S. OFF RESONANCE.





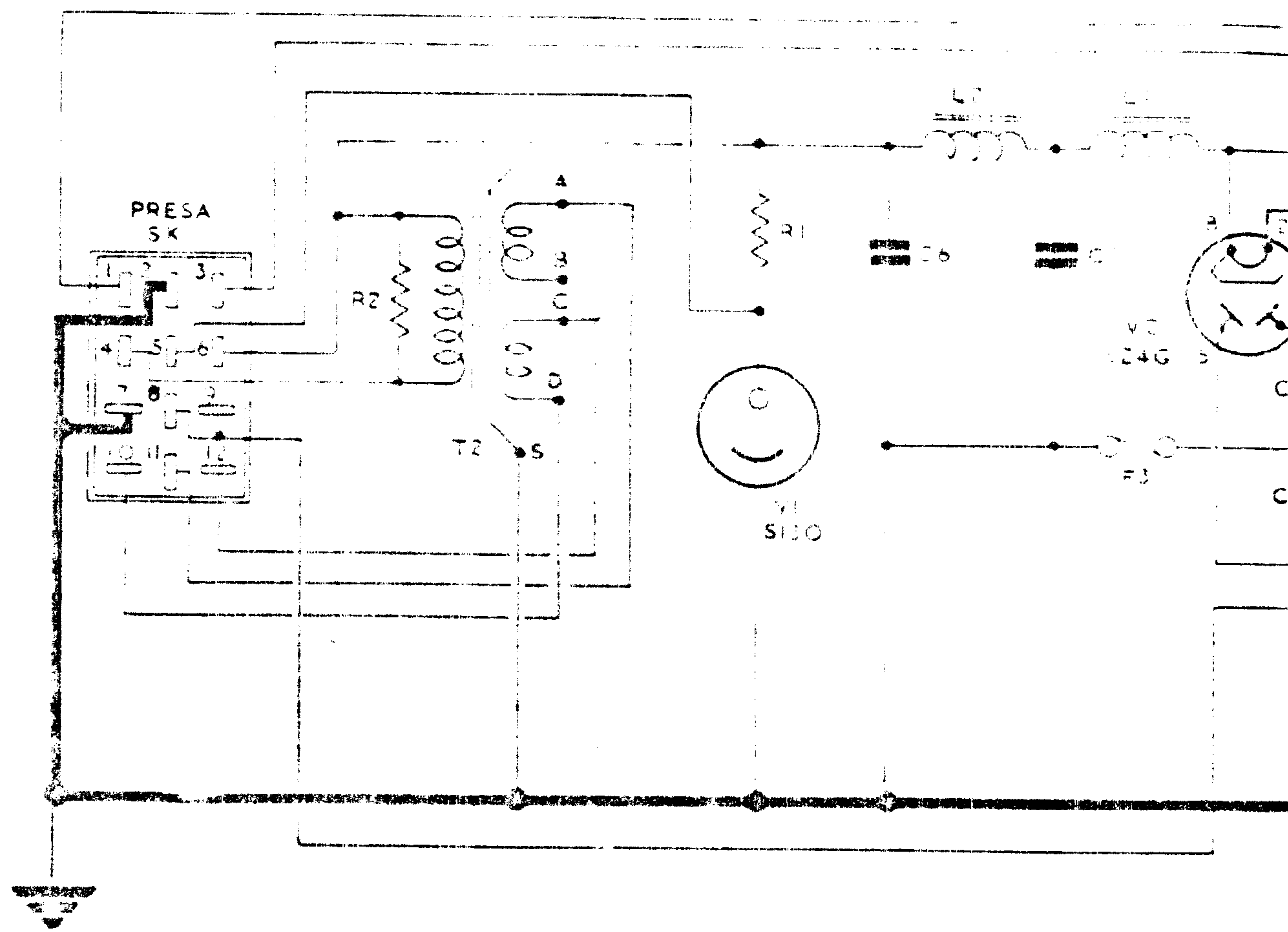
REDIFON LTD LONDON	TITLE R 50M-1 RICEVITORE	WD6/2719/L





VALORI DELLE COMPONENTI

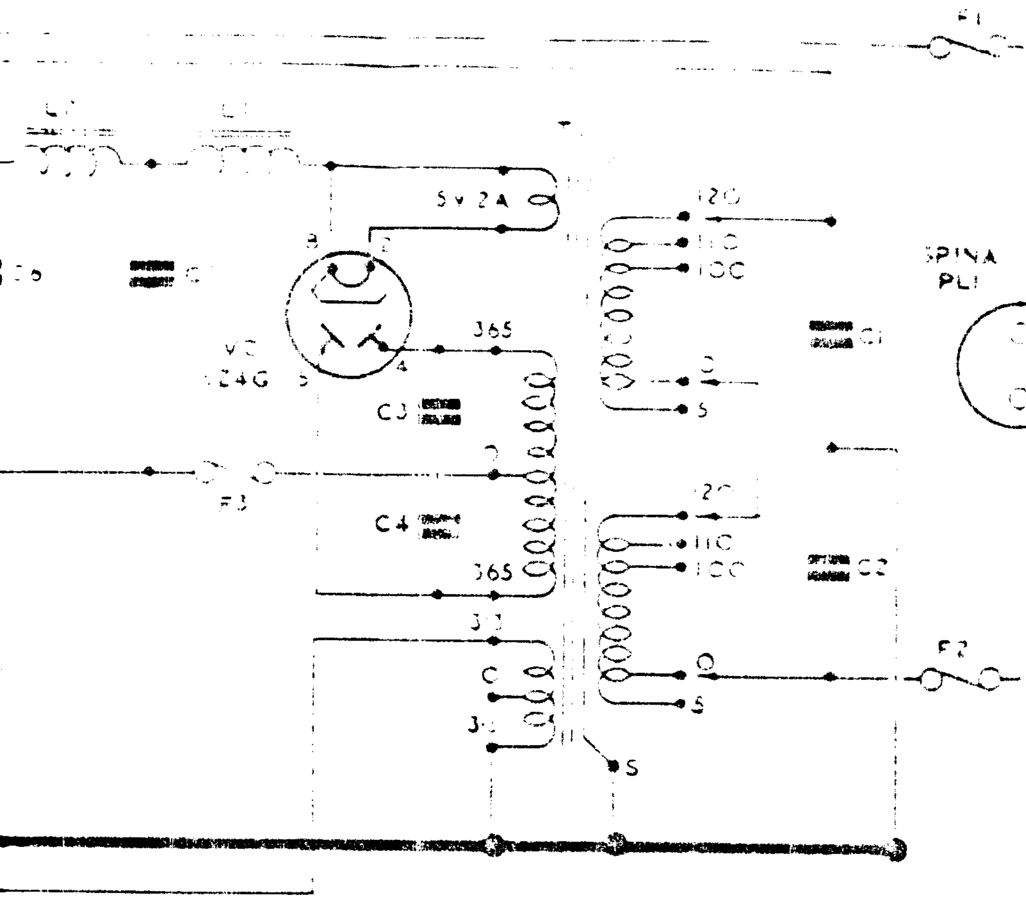
	CONDENSATORI	RESISTENZE
[illegible]	[illegible]	[illegible]



TRANSFORMATORE D'USCITA T2

PER 3 OHMS COLLEGARE B CON D, A CON C

PER 12 OHMS COLLEGARE B CON C



VALORI DELLE COMPONENTI

CONDENSATORI	
C1	.01μF
C2	.01μF
C3	.05μF
C4	.05μF
C5	8μF
C6	8μF

RESISTENZE	
R1	5KΩ
R2	22KΩ

FUSIBILI	
F1	1A 200-250v.2A.100
F2	1A 200-250v 2A.100
F3	250 mA

USCITA T2
E B CON D, A CON C
E B CON C

TATORE

DWG. N° WD 4/2767/M

COMPONENT LISTS.

REF	VALUE	DESCRIPTION	REMARKS
		Trimmers	
TR1	3-30 pfd	Mullard Type E.7864/01.	
TR2	3-30 "	" " "	
TR3	3-30 "	" " "	
TR4	3-30 "	" " "	
TR5	3-30 "	" " "	
TR6	3-30 "	" " "	
TR7	3-30 "	" " "	
TR8	3-30 "	" " "	
TM1	3-30 pfd	Mullard Type E.7864/01.	
TM2	2-8 "	" " E.7850.	
TM3	3-30 "	" " E.7864/01.	
TM4	2-8 "	" " E.7850.	
TM5	3-30 "	" " E.7864/01.	
TM6	3-30 "	" " "	
TM7	3-30 "	" " "	
TM8	3-30 "	" " "	
[illegible]	3-30 pfd	Mullard Type E.7864/01.	
[illegible]02	3-30 "	" " "	
TO3	3-30 "	" " "	
TO4	3-30 "	" " "	
TO5	2-8 "	" " E.7850.	
TO6	3-30 "	" " E.7864/01.	
TO7	3-30 "	" " "	
TO8	2-8 "	" " E.7850.	
		PADDERS	
PO1	4.8-100 pfd	Polar Type C8 - 01.	
PO2	4.8-100 "	" " " "	
PO3	4.8-100 "	" " " "	
PO4	4.8-100 "	" " " "	
PO5	4.8-100 "	" " " "	
		CONDENSERS	
C1	14-224 pF.	Polar 4 gang Type C60-14/5 (C1–C4)	
C2	14-224 "		
C3	14-224 "		
C4	14-224 "		
C5	14-224 pF	Polar 4 gang Type C60-14/5 (C5–C8)	
C6	14-224 "		
C7	14-224 "		
C8	14-224 pF.		
C9	33 pF ± 10%	T.C.C. Type 101 SMP.	350v. D.C. Wkg.
C10	3.8-50 pF	Polar Type C8-04	
C11	150 pF. ± 20%	T.C.C. Type 401 SMP.	350v. D.C. Wkg.

REF	VALUE	DESCRIPTION	REMARKS
C12	150 pF. ±20%	T.C.C. Type 401 SMP.	350v. D.C. Wkg.
C13	.1 uF.	T.C.C. " CP45N.	" " "
C14	.1 uF.	" " "	" " "
C15	270 pF ± 20%	T.C.C. Type 425 SMP.	" " "
C16	.1 uF.	T.C.C. Type CP45N.	" " "
C17	420 pF ± 2%	T.C.C. Type 501 SMP.	" " "
C18	420 pF ± 2%	T.C.C. Type 501 SMP.	" " "
C19	.1 uF	T.C.C. Type CP 45N.	" " "
C20	270 pF. ± 10%	T.C.C. Type 425 SMP.	" " "
C21	68 pF ± 5%	T.C.C. Type 101 SMP.	" " "
C22	5pF ± 20%	T.C.C. Type SCP7.	500v. D.C. Wkg.
C23	.01 uF ± 20%	T.C.C. Type SM3N.	350v. D.C. Wkg.
C24	150 pF. ± 20%	T.C.C. Type 401 SMP.	" " "
C25	.1 uF	T.C.C. Type CP45N.	" " "
C26	.1 uF	T.C.C. Type CP45N.	" " "
C27	150 pF. ± 20%	T.C.C. Type 401 SMP.	" " "
C28	.1 uF	T.C.C. Type CP45N.	" " "
C29	.1 uF	T.C.C. Type CP45N.	" " "
C30	[illegible] pF. ± 5%	T.C.C. Type 101 SMP.	" " "
C31	3-30 pF.	Mullard Type E.7864.	
C32	5 pF. ± 20%	T.C.C. Type SCP7.	500v. D.C. Wkg.
C33	150 pF. ± 20%	T.C.C. Type 401 SMP.	350v. D.C. Wkg.
C34	.1 uF.	T.C.C. Type CP45N.	" " "
C35	150 pF ± 20%	T.C.C. Type 401 SMP.	" " "
C36	360 pF ± 2%	T.C.C. Type 501 SMP.	" " "
C37	.1 uF.	T.C.C. Type CP45N.	350v. D.C. Wkg.
C38	150 pF. ± 20%	T.C.C. Type 401 SMP.	" " "
C39	.001 uF. ± 20%	T.C.C. Type CM20N.	" " "
C40	.01 uF.	Dubilier Type 691W.	" " "
C41	16 pF ± 10%	T.C.C. Type SCT1.	500v. D.C. Wkg.
C42	100 pF. ± 2%	T.C.C. Type 101 SMP.	350v. D.C. Wkg.
C43	32 pF ± 10%	T.C.C. Type SCT1.	500v. D.C. Wkg.
C44	33 pF ± 20%	T.C.C. Type 101 SMP.	350v. D.C. Wkg.
C45	10 pF ± 10%	T.C.C. Type SCT1.	500v. D.C. Wkg.
C46	190 pF ± 5%	T.C.C. Type SCT3.	" " "
C47	750 pF ± 1%	T.C.C. Type 601 SMP.	350v. D.C. Wkg.
C48	95 pF ± 5%	T.C.C. Type SCT2.	500v. D.C. Wkg.
C49	370 pF. ± 2%	T.C.C. Type 501 SMP.	350v. D.C. Wkg.
C50	5 pF ± 20%	T.C.C. Type SCP7.	500v. D.C. Wkg.
C51	250 pF. ± 5%	T.C.C. Type SCT3.	" " "
C52	1250 pF. ± 1%	T.C.C. Type 601 SMP.	350v. D.C. Wkg.
C53	3560 pF. ± 1%	T.C.C. Type 601 SMP.	" " "
C54	30 pF ± 5%	Erie Ceramicon Type N.220	
C55	8,000 pF. ± 10%	T.C:C. Type 901 SMP.	350v. D.C. Wkg.
C56	30 pF. ± 5%	Erie Ceramicon Type N.220	
C57	.01 uF.	Dubilier Type 691W.	350v. D.C. Wkg.
C58	.01 uF.	Dubilier Type 691W.	" " "
C59	5 pF. ± 20%	T.C.C. Type SCP7.	500v. D.C. Wkg.
C60	150pF ± 10%	T.C.C. Type SCT3.	500v. D.C. Wkg.
C61	.01 uF.	Dubilier Type 691W.	350v. D.C. Wkg.
C62	.01 uF.	Dubilier Type 691W.	" " "
C63	.1 uF.	T.C.C. Type CP45N.	" " "
C64	3-30 pF	Mullard Type E.7864.	
C65	2-8 pF	Mullard Type E.7851.	
C66	5 pF ± 10%	T.C.C. Type SCD1.	500v. D.C. Wkg.

REF	VALUE	DESCRIPTION	REMARKS
C67	2- 8 pF	Mullard Type E.7851.	
C68	3-30 pF	" " E.7864.	
C69	100 pF ± 5%	T.C.C. Type 101 SMP.	350v. D.C. Wkg.
C70	330 pF ± 2%	" " 501 "	" " "
C71	33 pF ± 10%	Erie Ceramicon Type N.750K.	
C72	.01 uF.	T.C.C. Type CP45W.	500v. D.C. Wkg.
C73	150 pF. ± 10%	T.C.C. Type 401 SMP.	350v. D.C. Wkg.
C74	.1 uF.	T.C.C. Type CP45N.	" " "
C75	.1 uF.	T.C.C. TypeCP45N.	" " "
C76	.1 uF.	T.C.C. Type CP45N.	" " "
C77	360 pF ± 2%	T.C.C. Type 501 SMP.	" " "
C78	360 pF ± 2%	T.C.C. Type 501 SMP.	" " "
C79	330 pF ± 2%	" " " "	" " "
C80	330 pF ± 2%	" " " "	" " "
C81	360 pF ± 2%	" " " "	" " "
C82	360 pF ± 2%	" " " "	" " "
C83	330 pF ± 2%	" " " "	" " "
C84	330 pF ± 2%	" " " "	" " "
C85	.01 uF.	T.C.C. Type CP45W.	1,000v. D.C. Wkg.
C86	.1 uF.	" " CP45N.	350v. D.C. Wkg.
C87	.1 uF	" " "	" " "
C88	.1 uF.	" " "	" " "
C89	360 pF. ± 2%	T.C.C. Type 501 SMP.	" " "
C90	360 pF ± 2%	" " " "	" " "
C91	330 pF. ± 2%	" " " "	" " "
C92	330 pF. ± 2%	" " " "	" " "
C93	360 pF. ± 2%	" " " "	" " "
C94	360 pF ± 2%	" " " "	" " "
C95	330 pF. ± 2%	" " " "	" " "
C96	330 pF. ± 2%	" " " "	" " "
C97	.1 uF.	T.C.C. Type CP45N.	" " "
C98	.1 uF.	" " "	" " "
C99	.1 uF.	" " "	" " "
C100	.1 uF.	" " "	" " "
C101	.1 uF.	" " "	" " "
C102	3.8-50 pF.	Polar Type C8-04.	
C103	100 pF ± 10%	T.C.C. Type 101 SMP.	350v. D.C. Wkg.
C104	330 pF. ± 2%	T.C.C. Type 501 SMP.	" " "
C105	33 pF. ± 10%	Erie Ceracimon Type N.750K.	
C106	10 pF. ± 10%	T.C.C. Type 101 SMP	350v. D.C. Wkg.
C107	.1 uF.	T.C.C. Type CP45N.	" " "
C108	360 pF. ± 2%	T.C.C. Type 501 SMP.	" " "
C109	360 pF. ± 2%	T.C.C. Type 501 SMP.	" " "
C110	330 pF. ± 2%	T.C.C. Type 501 SMP.	" " "
C111	330 pF. ± 2%	T.C.C. Type 501 SMP.	" " "
C112	150 pF. ± 10%	T.C.C. Type SCT3.	500v. D.C. Wkg.
C113	12 pF. ± 10%	T.C.C. Type SCT1.	" " "
C114	470 pF. ± 10%	T.C.C. Type 501 SMP.	350v. D.C. Wkg.
C115	150 pF. ± 10%	T.C.C. Type 401 SMP.	" " "
C116	.1 uF.	T.C.C. Type CP45N.	" " "
C117	150 pF. ± 10%	T.C.C. Type 401 SMP.	" " "
C118	680 pF. ± 10%	S.R.C. Type 508.	" " "
C119	680 pF. ± 10%	S.R.C. Type 508.	" " "

REF	VALUE	DESCRIPTION	REMARKS
C120	.01 uF. ± 20%	T.C.C. Type SM3N	350v.D.C. Wkg.
C121	.1 uF.	T.C.C. Type CP45N	" " "
C122	1 uF	T.C.C. Type 62 Inverted Mtg.	" " "
C123	.1 uF.	T.C.C. Type CP45N.	" " "
C124	150 pF. ± 10%	T.C.C. " 401 SMP.	" " "
C125	.005 uF. ± 20%	Hunts. Type H34C.	" " "
C126	.1 uF.	T.C.C. Type CP45N	" " "
C127	68 pF. ± 10%	T.C.C. Type 101 SMP.	" " "
C128	50 uF.	T.C.C. Type CE18C.	25v. D.C. Wkg.
C129	50 uF.	T.C.C. Type CE18C.	25v. D.C. Wkg.
C130	.1 uF	T.C.C. Type CP45N.	350v. D.C. Wkg.
C131	.1 uF	T.C.C. Type CP45N.	" " "
C132	.01 uF.	Dubilier Type 691W.	" " "
C133	.01 uF.	" " "	" " "
C134	.01 uF.	" " "	" " "
C135	.01 uF.	" " "	" " "

Jack

J1	2 point	Igranic Midget P.73	

Coils

LA1		Aerial Coil Range H.	A.3301 Edn. 'H'
LA2		" " " G	" " 'G'
LA3		" " " F	" " 'F'
LA4		" " " E	" " 'E'
LA5		" " " D	" " 'D'
LA6		" " " C	" " 'C'
LA7		" " " B	" " 'B'
LA8		" " " A	" " 'A'
LR1		R.F. Coil Range H.	A.3302 Edn. 'H'
LR2		" " " G	" " 'G'
LR3		" " " F	" " 'F'
LR4		" " " E	" " 'E'
LR5		" " " D	" " 'D'
LR6		" " " C	" " 'C'
LR7		" " " B	" " 'B'
LR8		" " " A	" " 'A'
LM1		Mixer Coil Range H.	A.3303 Edn. 'H'
LM2		" " " G.	" " 'G'
LM3		" " " F.	" " 'F'
LM4		" " " E.	" " 'E'
LM5		" " " D.	" " 'D'
LM6		" " " C.	" " 'C'
LM7		" " " B.	" " 'B'
LM8		" " " A.	" " 'A'

REF	VALUE	DESCRIPTION	REMARKS
L01		Osc. Coil Range H.	A.3304 Edn. 'H'
L02		" " " G.	" " 'G'
L03		" " " F.	" " 'F'
L04		" " " E.	" " 'E'
L05		" " " D.	" " 'D'
L06		" " " C.	" " 'C'
L07		" " " B.	" " 'B'
L08		" " " A.	" " 'A'
L1) L2)		Suppressor 465 kc/s	A.3297/A.
L3		R.F. Choke	151/2719/S.
L4		Bulgin SW.68 R.F.Choke	Waxed Finish
L5) L6)		Xtal Input Trfr.465 kc/s	A.3297/B.
L7) L8)		Xtal Input Trfr.110 kc/s	A.3297/C.
L9		Xtal Damping Coil, 465 kc/s.	A.3297/D.
L10		Xtal Damping Coil, 110 kc/s.	A.3297/E.
L11) L12) L13)		Anode Trfr. 465 kc/s.	A.3297/F.
L14) L15) L16)		Anode Trfr. 110kc/s.	A.3297/G.
L17) L18) L19)		Grid Trfr. 465 kc/s.	A.3297/H.
L20) L21) L22)		Grid Trfr. 110 kc/s.	A.3297/J.
L23) L24) L25)		Anode Trfr. 465 kc/s.	A.3297/F.
L26) L27) L28)		Anode Trfr. 110 kc/s.	A.3297/G.
L29) L30) L31)		Grid Trfr. 465 kc/s.	A.3297/H.
L32) L33) L34)		Grid Trfr. 110 kc/s.	A.3297/J.
L35		B.F.O. Coil 465 kc/s.	A.3297/K.
L36		B.F.O. Coil 110 kc/s.	A.3297/L.
L37) L38)		Diode Trfr. 465 kc/s.	A.3297/M.
L39) L40)		Diode Trfr. 110 kc/s.	A.3297/N.

REF	VALUE	DESCRIPTION	REMARKS
L41		A.F. Choke	A.3309/A.
		BULBS	
LP1		M.E.S. Bulb 6v. .3A.	
LP2		" " 6v. .3A.	
LP3		" " 6v. .3A.	
		METER	
MI.		Turner Meter Mod. W.909 0-1 mA F.S.D.100 ohm Calibrated 0-10 mA 0-30 mA.	
		PLUG	
PL1		Painton Plug 12 way 500479.	
		SOCKET	
SK1		Painton Socket 12 way 500482.	
		VALVES	
V1		EF39	
V2		EF39	
V3		ECH35	
V4		L63	
V5		EF39	
V6		EF39	
V7		EF39	
V8		EF37	
V9		EB34 or 6H6.	
V10		EB34 or 6H6.	
V11		EF37	
V12		6V6G.	
	OHMS	**RESISTORS**	
R1	10K. ± 10%	Erie R.M.A.9.	
R2	10K. ± 10%	" "	
R3	10K. ± 10%	" "	
R4	470K. ± 10%	" "	
R5	220K. ± 10%	" "	
R6	10K. ± 10%	" R.M.A.8.	
R7	1 M. ± 20%	" "	
R8	47K. ± 20%	" "	
R9	330. ± 10%	" "	
R10	4,700 ± 10%	" "	
R11	4,700 ± 10%	" "	
R12	1.5 M. ± 10%	" R.M.A.9.	
R13	1.5 M. ± 10%	" "	
R14	10K. ± 10%	" R.M.A.8.	

REF	VALUE	DESCRIPTION	REMARKS
R15	220K. ± 10%	Erie R.M.A.8.	
R16	47K. ± 20%	" "	
R17	330 ± 10%	" "	
R18	4,700 ± 10%	" "	
R19	2,200 ± 10%	" "	
R20	100K. ± 10%	" R.M.A.9.	
R21	100K. ± 10%	" "	
R22	4,700 ± 10%	" R.M.A.8.	
R23	1 M. ± 20%	" R.M.A.9.	
R24	1,500 ± 10%	" "	
R25	10K. ± 10%	" R.M.A 8.	
R26	Thermistor.	Mullard Varite V.A. 1003.	
R27	150 ± 10%	Erie R.M.A.9.	
R28	470 ± 10%	" R.M.A.8.	
R29	330 ± 10%	" "	
R30	100 ± 10%	" "	
R31	2,200 ± 20%	" " 9.	
R32	4,700 ± 10%	" " 8.	
R33	68K. ± 10%	" "	
R34	4,700 ± 10%	" "	
R35	120K. ± 10%	" R.M.A.9.	
R36	22K. ± 10%	" "	
R37	6,200 ± 10%	Erie R.M.A.9.	
R38	150K. ± 10%	" R.M.A.8.	
R39	1,800 ± 10%	" R.M.A.9.	
R40	1,800 ± 10%	" "	
R41	4,700 ± 10%	" "	
R42	1 M. ± 10%	" R.M.A.8.	
R43	22K. ± 20%	" "	
R44	330 ± 10%	" "	
R45	10K. ± 10%	" "	
R46	4,700 ± 10%	" "	
R47	10 ± 10%	" "	
R48	27 ± 10%	" "	
R49	22K. ± 20%	" "	
R50	330 ± 10%	" "	
R51	10K. ± 10%	" "	
R52	5K. Var.	Reliance Type T.W.	OP.1430/S.
R53	4,700 ± 10%	Erie R.M.A.8.	
R54	10 ± 10%	" "	
R55	30 ± 10%	" "	
R56	1 M ± 10%	" "	
R57	330 ± 10%	" "	
R58	100K. ± 10%	" "	
R59	100K. ± 10%	" "	
R60	22K. ± 10%	" "	
R61	100K. ± 10%	" "	
R62	100K. ± 10%	" "	
R63	4,700 ± 10%	" "	
R64	470K. ± 20%	" R.M.A.9.	

REF	VALUE	DESCRIPTION	REMARKS
R65	510K. ± 10%	Erie R.M.A.8.	
R66	680K. ± 10%	" R.M.A.8.	
R67	33K. ± 10%	" "	
R68	50K. Var.	Morganite HNAR.50310	OP.1198/S.
R69	100K. Var.	" " 10410	OP.1198/S.
R70	150K. ± 10%	Erie R.M.A.8.	
R71	22K. ± 10%	" "	
R72	42K. ± 10%	" "	
R73	250K ± 2%	Welwyn Type A.3634	
R74	20K. ± 10%	" " AW.3112	
R75	100K. ± 10%	Erie Type R.M.A.2.	
R76	3,300 ± 10%	" " R.M.A.8.	
R77	3 M. ± 10%	" " "	
R78	100K. ± 10%	" " "	
R79	150K. ± 10%	" " "	
R80	4,700 ± 20%	" " R.M.A.9.	
R81	100K. ± 10%	" " R.M.A.8.	
R82	3,300 ± 10%	" " "	
R83	470K. ± 10%	" " "	
R84	1.5 M. ± 10%	" " " 9.	
R85	1K. ± 10%	" " R.M.A.9.	
R86	470 ± 10%	" " R.M.A.8.	
R87	1	Welwyn AW. 3115.	
R88	680 ± 20%	Erie R.M.A.9.	

SWITCHES

REF	VALUE	DESCRIPTION	REMARKS
S1		B.N.S.F.2B. 4P. 6 pos.	OP.1188/S
S2		" 1B. 2P. 4 pos.	OP.1189/S
S3		" 8B. 3P.12 pos.	OP.1537/S. OP.1538/S
S4		" 2B. 1P.12 pos.	OP.1536/S
S5		" 6B. 2P. 5 pos.	OP.1192/S
S6		B.N.S.F. 7B.2P. 2 pos.	OP.1193/S
S7		Bulgin D.P. On-Off Type	S.282. Tropical.

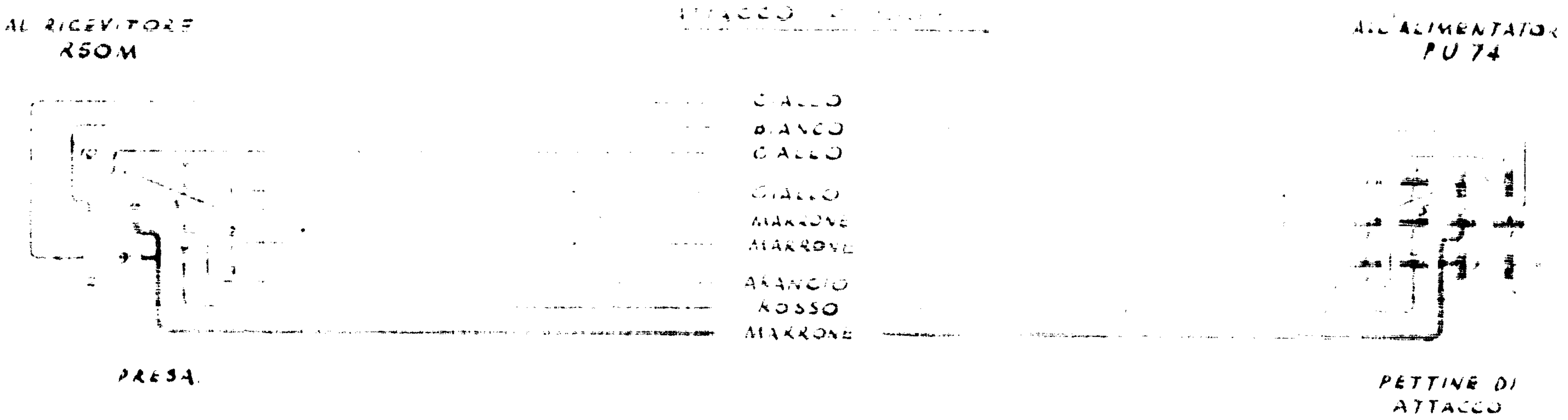
CRYSTALS

REF	VALUE	DESCRIPTION	REMARKS
X1.X2	465 kc/s App.	G.E.C. Double Quartz Crystal in common holder Type QC.197-JCF.	OP.1600/S

Crystals to differ in Frequency by from 950 to 1100 c/s.

REF	VALUE	DESCRIPTION	REMARKS
X3	110 kc/s ± .2%	G.E.C. Single Quartz Crystal in Holder Type QC.197-JCF.	OP.1601/S

DRAWN	CHECKED	ENGINEER	APPROVED



REDIFON LTD

A.C. POWER UNIT TYPE PU.74

COMPONENTS

REF	VALUE	DESCRIPTION	REMARKS
		CONDENSERS	
C1	.01 uF.	T.C.C. Type SM3N.	
C2	.01 uF.	" " SM3N.	
C3	.05 uF.	" " 648	
C4	.05 uF.	" " "	
C5	8 uF.	" " 82	Rolled Edges
C6	8 uF.	" " "	" "
		CHOKES	
L1	SR/T443.	Varley Type D.P.10 20H.	Less Case.
L2	SR/T443.	" " " " "	" "
		PLUGS	
PL1		Bulgin 2 pin Type P.74.	
		SOCKETS	
SK1		Painton 12 way Type 500482.	
		VALVES	
V1		S.130	
V2		5Z4G.	
		RESISTORS	
R1	5 k.ohm.	Welwyn Type AW.3112.	12 watt.
R2	22 k.ohm ± 20%	Erie Type R.M.A.8.	½ watt.
		TRANSFORMERS	
T1	SR/T. 881	Mains Transformer.	
T2	SR/T. 987	Output Transformer.	
		FUSES	
F1	1A.200-250v. 2A.100-125v.	1.1/4" Cartridge Type)	Mounted in 3
F2	1A.200-250v. 2A.100-125v.	1.1/4" " ")	Belling Lee
F3	250 mA	1.1/4" " ")	Holders L.356.