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BR 1565

HANDBOOK FOR

TYPE 618

&

RECEIVER OUTFIT CAS

1957

BR 1565

HANDBOOK FOR

TYPE 618

AND

RECEIVER OUTFIT CAS

ANY SUGGESTIONS FOR AMENDMENTS OR ADDITIONS
TO THIS BOOK SHOULD BE SUBMITTED TO THE
CAPTAIN SUPERINTENDENT, ADMIRALTY SIGNAL AND
RADAR ESTABLISHMENT, THROUGH THE USUAL CHANNELS

Radio Equipment Department, Admiralty,
1956 (RE 1058/56).

ADMIRALTY, S.W.1.

January 1957.

R.E. 1058/56.

B.R.1565 " Handbook for Type 618 and Receiver Outfit CAS, 1956" having been approved by My Lords Commissioners of the Admiralty.

By Command of Their Lordships.

J. E. Lang

To :-

Flag Officers and
Commanding Officers
of H. M. Ships and
Vessels concerned.

(AMDT 12)

~~CHANGES~~ AMENDMENTS

When a change to this handbook is incorporated the brief details required below are to be filled in.

CHANGE No.	AUTHORITY (P Series No.)	DATE OF INSERTION	INITIALS
Amendments 1 & 2 and Changes 1-11 incorporated in this reprint.			
AMDT 12	P 1588/72	11/6/75	MFR

CONTENTS

ILLUSTRATIONS

DIAGRAM

TYPE 618/H/L

SUMMARY OF DATA

PURPOSE

A general purpose low power transmitter fitted in all classes of ships to replace Types TCS, 607E, 608E and 60EQR.

TYPE OF TRANSMISSION

H.F. Transmitter C.W., M.C.W. and Voice

M.F. Transmitter C.W., and M.C.W.

Maximum keying speed of both transmitters 30 bauds.

FREQUENCY RANGE

H.F. Transmitter 1.5 - 16 Mc/s.

M.F. Transmitter 330 - 550 kc/s.

BRIEF TECHNICAL DESCRIPTION

<u>H.F. Transmitter AP 100333.</u>

Frequency Control	Crystal or Master Oscillator	
Frequency Stability	Crystal	± 0.02%
	M.O.	± 0.1%
Output	40 Watts.	
Audio Input	-15 dB to + 10 dB relative to 1 mW to 600 ohms.	

The oscillator stage is switchable between any of eight crystals or a variable frequency oscillator which covers the range in three bands. A buffer/multiplier stage feeds three CV428 valves in parallel which constitute the power amplifier. The A.F. section comprises a preamplifier, a driver and two CV428 modulator valves in push-pull. Modulation depth is maintained at a constant level by an automatic gain control circuit. An R.C. oscillator is provided for M.C.W. working.

<u>M.F. Transmitter AP 100334.</u>

Frequency Control	Master Oscillator
Frequency Stability	± 0.1%
Output	15 watts.

An electron coupled Hartley oscillator is used for the M.O. A buffer amplifier stage precedes the power amplifier which comprises three CV428 valves in parallel. Anode modulation for M.C.W. working is provided by a push-pull audio oscillator with a frequency of 800-1200 c/s.

Power Unit AP 100336

The unit contains three conventional rectifier and smoothing circuits driven from two mains transformers and provides all the power supplies for the receiver and one or other of the two transmitters. The main operating controls are located on the unit with a local/remote switch and an outlet for connections to a CCX, permitting full remote control of the equipment.

MAJOR UNITS

PHYSICAL DATA

Pattern No.	Description	Height	Width	Depth	Weight
1. 100333/A	Transmitter H.F.	14-1/16"	13-1/16"	14-1/2"	70 lb.
2. 100334/A	Transmitter M.F.	14-1/16"	13-1/16"	14"	73 lb.
3. 100336	Power Unit	14-7/8"	9-3/16"	22"	135 lb.
4. 103099	Dummy Load, Electrical	4-3/4"	7-1/2"	2"	3 lb.

(Dimensions include rack)

Type 618 comprises items 1, 2 and 3.
Type 618 H comprises items 1 and 3.
Type 618 L comprises items 2 and 3.

The associated receiver is Receiver Outfit CAS AP 100335 which also takes its power from AP 100336 Power Unit.

CONTROL CIRCUITS

In some installations the Dummy Load, Electrical is fitted in lieu of the Receiver CAS.

Type 618/H/L and Receiver Outfit CAS are designed to work with Control Outfits KH series.

POWER REQUIREMENTS AND CONSUMPTION

Input Voltages 110-120V or 220-245V A.C. 50 c/s single phase.

Loading:

M.F. Transmitter		H.F. Transmitter	
Receiver only	150W	Receiver only	150W
Standby	190W	Standby	200W
Ready	280W	Ready	360W
Key down C.W.	400W	Key down C.W.	445W
Key down M.C.W.	480W	Key down M.C.W.	495W

When a 50 c/s A.C. supply is not directly available, A.C. supply outfits DWH, DWJ and DWK will be used from the 24V, 110V and 220V D.C. supplies, respectively.

HEAT DISSIPATION.

Receiver, Power Unit and one Transmitter 450 Watts. (max) approximately.

AERIAL SYSTEM

Wire or whip depending on particular ship installation.

REMARKS

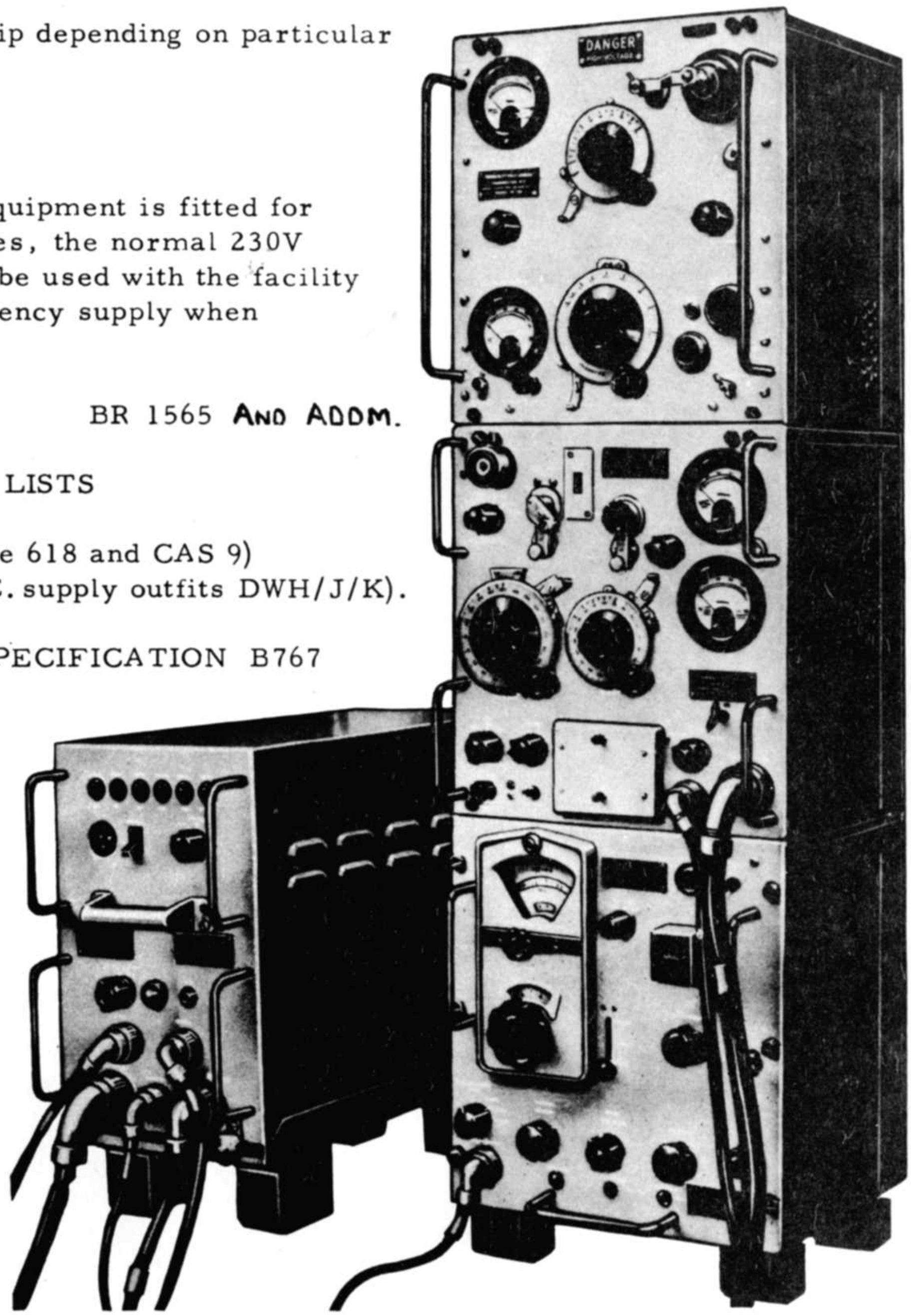
When the equipment is fitted for emergency purposes, the normal 230V 50 c/s supply will be used with the facility to switch to emergency supply when necessary.

HANDBOOK BR 1565 AND ADDM.

ESTABLISHMENT LISTS

E1049 (Type 618 and CAS 9)
E1051 (A.C. supply outfits DWH/J/K).

INSTALLATION SPECIFICATION B767



Type 618/H/L and Receiver Outfit CAS

RECEIVER OUTFIT CAS

SUMMARY OF DATA

PURPOSE

A general purpose receiver outfit for the reception of A.M. signals in the H.F. and M.F. bands; fitted in conjunction with Type 618 in all classes of ships.

TYPE OF RECEPTION

C.W., M.C.W. and Voice.

FREQUENCY RANGE

59 - 555 kc/s and 1.47 - 30 Mc/s in five bands.

BRIEF TECHNICAL DESCRIPTION

The receiver is a conventional superheterodyne communications set, employing two R.F. stages, followed by a mixer with separate local oscillator, three I.F. stages and three audio stages. Aerial connection is made via the H.F. or M.F. transmitter giving common aerial and break through working in each case. Power is obtained from the Power Unit, Patt. 100336, and the receiver audio output is taken back to it for connection to remote headphones or loudspeakers. Facilities are afforded for selectivity switching, (giving four band-widths including a 200 c/s audio filter), optional A.G.C., switched B.F.O. tuning, and crystal calibration checking on bands 3 and 4. The receiver may also be operated on a single crystal-controlled spot frequency by means of a plug-in crystal accessible from the front panel.

MAJOR UNITS		PHYSICAL DATA			
Patt. No.	Description	Height	Width	Depth	Weight
100335	Receiver H.F. M.F.	14-1/16"	13-1/16"	14½"	64 lb.
100336	Power Unit (Part of Type 618).	14-7/8"	9-3/16"	22"	135 lb.

ELECTRICAL CHARACTERISTICS.

Selectivity		Control Position	Bandwidth
	at 6 dB down	8 kc/s	± 4 kc/s from 1.5 Mc/s to 30 Mc/s.
		3 kc/s.	± 1.5 kc/s from 160 kc/s to 30 Mc/s.
		1 kc/s.	± 0.5 kc/s from 100 kc/s to 30 Mc/s.
		200 c/s.	± 100 c/s audio filter.

I.F. 800 kc/s.

Image Rejection

Below 7 Mc/s	at least 80 dB.
7 - 15 Mc/s.	at least 60 dB.
Over 15 Mc/s.	at least 40 dB.

I.F. Rejection

High impedance input greater than 80 dB.

Sensitivity 10 - 30 μV for 20 dB signal/noise ratio.

Power Output Headphones 62 mW in 100 ohms.

Loudspeakers 2W in 600 ohms.

CONTROL CIRCUITS

When fitted with Type 618, the KH series Control Outfits will be used.

POWER REQUIREMENTS

150V D.C.
250V D.C.
400V D.C.
6.3V A.C.

} Obtained from Power Unit AP 100336.

Total consumption 75 watts approximately.

HEAT DISSIPATION

60 Watts approximately.

AERIAL SYSTEM

A wire or whip aerial common to receiver and transmitter.

HANDBOOK BR 1565

ESTABLISHMENT LISTS

E1049 (Type 618 and CAS).
E1051 (A.C. Supply Outfits DWH/J/K).

INSTALLATION SPECIFICATION

B767.

CHAPTER I

TECHNICAL DESCRIPTIONS

H.F. M.F. RECEIVER	AP100335
H.F. TRANSMITTER	AP100333
M.F. TRANSMITTER	AP100334
POWER UNIT	AP100336
DUMMY LOAD, ELECTRICAL	AP103099

NOTE. This handbook has been amended to include Modifications up to No. 6.

CHAPTER 1.

H.F.M.F. RECEIVER AP100335

Introduction

1. The H.F.M.F.Receiver AP100335 is a communications receiver employing established techniques of radio design. It is usually employed in association with the transmitters and power unit described in paras. 20-75 of this chapter. The receiver tuning scale is directly calibrated in frequency, a shutter operated by the frequency band selector switch obscuring the parts of the dial not in use. A logging scale is also provided, and both this and the main scale are illuminated from the rear when the set is in operation. Manual I.F. gain may be used as an alternative to A.G.C. and there is also a separate A.F. gain control. The output may be taken to headphones or to a loudspeaker or to both simultaneously, a separate volume control being provided for the headphones.

2. Two R.F. stages are used followed by a heptode mixer with a separate local oscillator, and three I.F. stages. One half of a double-diode is used as the second detector, the other half developing the A.G.C. bias, and a similar valve is used as a noise limiter. Two audio amplifiers feed an output stage, giving a balanced output of high or low impedance for headphones or loudspeaker.

3. The selectivity of the receiver may be varied from a nominal bandwidth of 8 kc/s to 200 c/s by means of the selectivity switch, which brings into operation successive stages of I.F. tuning, crystal filters and audio filters. The local oscillator may be switched to crystal control (on bands 3, 4 and 5), for operation on a spot frequency and the control crystal may be easily changed by removing the crystal box cover on the front panel. The B.F.O. may be switched to frequencies a thousand cycles above or below the I.F. as well as operating at the intermediate frequency. A crystal control is also available for this oscillator to enable the frequency scale of the receiver (on bands 3 and 4) to be calibrated, the necessary adjustments being made by a small alteration in the position of the cursor by means of a knob above the dial.

4. The receiver is housed in a steel cabinet intended for tier mounting, from which it may be removed by loosening the six green painted studs at the sides of the front panel. All the controls and cable connections are at the front with the exception of the main ON/OFF switch, which is located on the power unit.

R.F. Unit.

5. Aerial input connections are brought out to the 4 pin plug at the top of the front panel. Pin A of this plug is connected to earth, Pins B and C are connected through the Switch SW101 to the primary of the aerial coupling transformer and are intended for the connection of an 80 ohm feeder. This feeder may be balanced or unbalanced, the necessary alteration being by

connecting Pin B to Pin A. Pin D of PL101 is connected via an I.F. rejector circuit to Pin C and is intended for the connection of a high impedance aerial. When the receiver is used in conjunction with either of the associated transmitters, its aerial connection is made via the transmitter through a coaxial cable. This enables the receiver and transmitter to be connected to the same aerial alternately by means of a changeover relay in the transmitter unit, working in conjunction with the keying relay. The operator is thus able to "listen through" the transmission on C.W. and M.C.W. working, and when the microphone pressel switch is not held down, on voice working.

6. The remainder of the R.F. unit follows established practice, various coupling transformers being switched into circuit by the operation of the wave-change switch SW101. It will be seen from the inset in the circuit diagram that different components are used in these transformers according to the band in use.

7. The R.F. stage primaries are arranged to resonate at a frequency immediately below the minimum frequency of the band in use. This tends to compensate for the normal increase in coupling efficiency of an R.F. transformer with rising frequency and to keep the gain constant over the band.

8. The anode and screen supplies of V101, and the screen supply of V102(CV131's) originate from a common source which is switched in the transmitter by a relay operated in conjunction with the keying relay. In this way, the H.T. to these electrodes is cut off when the transmitter is in operation, thus avoiding any possibility of the receiver being overloaded during transmission. When 'A' pattern transmitters are fitted, the receiver is muted by a muting relay fitted in the transmitter and the supplies to V101 and V102 are not interrupted.

9. The local oscillator V104 (CV138) and the screen of the mixer V103 are fed from the 150 volt stabilised H.T. supply, in order to minimise any possibility of pulling the oscillator and changes of frequency due to variations in the mains supply voltage.

Local Oscillator.

10. A Hartley oscillator is employed, the required frequencies being obtained by switching in different tuned circuits by means of SW101. Turning the crystal switch SW102 to the IN position disconnects the Hartley type tuned feedback circuit and brings a crystal tuned circuit into the cathode of V104, making the local oscillator crystal controlled, in either case the heterodyne voltage is coupled to the mixing grid via C129.

I.F. Stages.

11. Three I.F. stages V201 - 203 are employed, using CV131 valves with conventional tuned anode/tuned grid I.F. transformers having additional coupling loops to enable variations in selectivity to be made. The main coils are coupled to give a bandwidth of approximately 3 kc/s at 6 dB down with SW201 in the 3 kc/s position. Turning the switch to the

8 kc/s position brings the additional coupling loop into circuit. This increases the coupling to critical level, and the bandwidth becomes 8 kc/s. In the 1 kc/s position the switch brings into circuit between V201 and V202 a crystal bandpass filter which reduces the bandwidth to 1 kc/s. Contacts on the same switch vary the bias resistance in the cathode circuit of V202 and V203 so as to keep the gain of the I.F. unit substantially constant, irrespective of the selectivity.

Second Detector.

12. V204B (half CV140) works as the second detector feeding V205 (CV140), a double diode connected as a noise limiter. V204A (half CV140) is connected to the anode of the third I.F. stage (V203) and works as an A.G.C. rectifier, controlling the gain of the second R.F. stage and the two I.F. stages when automatic gain control is switched on. Very effective control of gain is achieved by feeding approximately half of the A.G.C. voltage to the first audio stage, as well as the full bias to the R.F. valves. Operation of the switch SW202 enables automatic gain to be switched off, and the bias of the same R.F. and I.F. stages is then controlled manually by RV101 in the R.F. unit.

Noise Limiter.

13. Demodulation by V204B of the I.F. signal results in a flow of current via the series chain R220,R221,R223,R227,R228 back to the cathode of V204B. This current consists essentially of a D.C. component corresponding to the "carrier" frequency and an A.C. component corresponding to the modulation frequencies. The direction of flow of the D.C. component is such as to make point A in fig. 2.1. more negative than point B.

14. In the presence of a steady signal, point C attempts to take up the potential of Point A by the charging of C230 through R222, but is prevented from doing so because it is connected to the cathode of V205B via R224: The anode of V205B is connected to B, more positive than A, and in consequence as soon as point C becomes more negative than point B, V205B will conduct, constraining point C to take up a potential midway between those of points A and B, and thus ensuring continous conduction by V205B. The other diode, V205A, is cut off, because its anode is connected to point C and its cathode to point B, i.e. its anode is negative to its cathode. It can therefore be represented as a stray capacity of a few picofarads in parallel with R224.

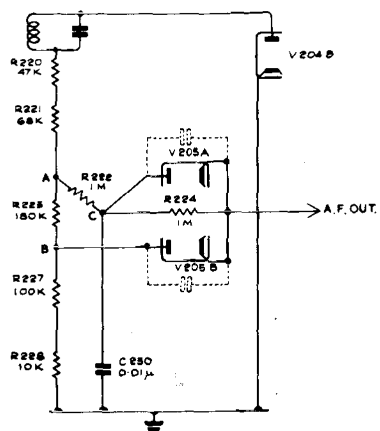


FIGURE 1.1.

STRAY CAPACITIES OF V205A & B DIVIDES, WHEN NOT CONDUCTING, SHOWN DOTTED.

15. The conducting diode V205B provides a direct connection for the modulation voltages developed across R227 and R228 to the A.F. stages of the receiver. R224, shunted by the stray capacity of V205A, both in series with C230, have a negligible shunting effect across the A.F. output. A secondary path for modulation frequencies exists from point A via R222, but severe attenuation is introduced in this path by C230, whose reactance at modulation frequencies is low compared with the resistance of R222, and by the fact that mutually-cancelling modulation frequency currents are circulating in R224 and the shunt stray capacitance of V205A-forward from point C to the A.F. output, and backwards from the cathode of V205B to point C, as described above. In consequence the modulation frequency circuit simplifies to Fig. 1.2. below

16. When a strong, isolated pulse of interference is superimposed upon the steady signal, the D.C. component of current through the resistor chain increases rapidly, driving points A and B more negative. Point C however cannot follow this change so rapidly because of the time constant R222, C230, (0.01 sec) nor can the cathode of V205B, since it is tied to point C by R224. In consequence V205B anode (point B) becomes negative with respect to its cathode and the diode ceases to conduct, for the whole duration of a pulse short in comparison with the time constant R222, C230. The modulation-frequency path from B to the audio stages is now effectively open circuited or rather is replaced by the stray capacity of the non-conducting V205B. Transfer of the pulse by this stray capacity to the cathode of V205A causes V205A to conduct its anode being now held positive by the slow change of potential to point C with respect to its pulse-driven cathode. In conducting, it shorts out R224 and connects the cathode of V205B to point C. The stray capacity of V205B and the capacitor C230 now form a capacity potential divider across R227 and R228 and hence reduce to almost negligible porportions the amount of interference (and wanted signal) reaching the A.F. stages for the duration of the pulse. The altennative path from point A via R222 remains open, but the heavy attenuation in this path provided by C230 remains at least as effective as it was in the presence of a steady signal only. The effective circuit for the A.C. components of an interfering pulse superimposed upon the wanted modulation frequencies is shown in fig. 2.3.

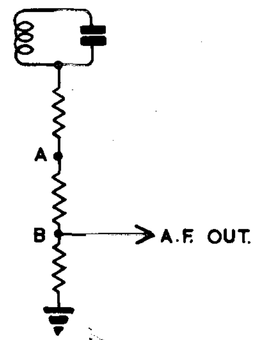


FIGURE 1.2.

17. Another way of looking at the action of V205A when conducting is that it connects point C, in the top plate of C230 to the A.F. output line, i.e. C230 of low reactance, is shunted across the input to the audio amplifier and in consequence the amplifier receives very little drive.

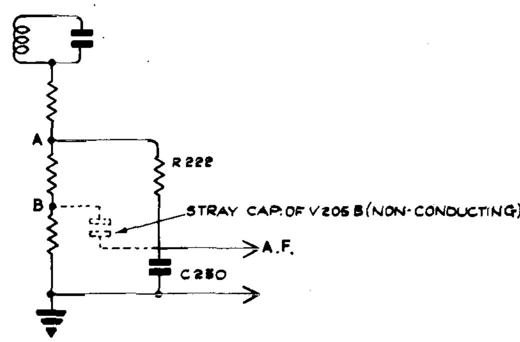


FIGURE 1.3.

18. The B.F.O. is arranged to run at the intermediate frequency and at frequencies 1,000 cycles above or 1,000 cycles below the I.F. A crystal, oscillating at the intermediate frequency is provided for calibration purposes. The basic oscillatory circuit L202/C 237 is tuned to oscillate at 801 kc/s. Turning the switch SW203 to the tune position brings into circuit a pre-set trimmer C240 which is adjusted to alter the freqeuncy to 800 kc/s. The same switch in the LOW position brings C239 into circuit giving a frequency of 799 kc/s. At CAL this switch brings a crystal into the B.F.O. circuit, giving a frequency of 800 kc/s precisely, and at the same time switches off the H.T. to the first R.F. stage and increases the voltage of the H.T. supply to the B.F.O. so that the B.F.O. may be used for calibration of the receiver on bands 3 and 4. The increase of H.T. to the B.F.O. enables it to generate high harmonics of sufficient amplitude to be fed via C116 to the grid of the second R.F. These harmonics are not of sufficient amplitude to provide reliable calibration points on band 5, and bands 1 and 2 are lower in frequency than the oscillator. Calibration is achieved by beating the I.F. with the crystal controlled B.F.O. and tuning for zero beat.

Audio Stages.

19. Three audio stages are employed, two pre-amplifiers V301 and V302 (CV131's) feeding an output stage (CV2136). V301 is normally fed from the audio gain control RV201 and passes amplified signals to V302, which feeds V303. This circuit is conventional in every way, the feedback network C307, R308, R305, being provided to keep the output power constant when different loads are used in the output circuit. The transformer TR301 provides output impedances of 100 ohms and 600 ohms, for use with headphones or loudspeakers. Turning the switch SW201 in the I.F. Unit to 200 c/s brings into circuit the audio filter networks L301, L302 in addition to the 1 kc/s crystal filter mentioned in paragraph 11. This reduces the effective bandwidth of the receiver to 200 c/s.

H.F. TRANSMITTER TYPE 618/H AP100333.

Introduction

20. The transmitter is a high frequency sender capable of radiating continous C.W., M.C.W. or Voice signals as desired. It is normally associated with the receiver described in Chapter 1 for two way communication and may be associated with an M.F. transmitter AP 100334 described in Chapter 3.

21. The receiver and either of the transmitters may be run from the Power Unit AP 100336 but it is not intended that all three equipments should be used simultaneously.

22. The Transmitter tunes over the frequency range 1.5 - 16 Mc/s in three bands and is also capable of being controlled by any one of eight crystals, giving spot frequencies within the same limits. A buffer stage working also as a frequency multiplier, separates the Master Oscillator from the three CV428 valves in parallel which constitute the power amplifier.

23. The A.F. section comprises a pre-amplifier, a driver and two CV428 modulator valves in push-pull. Modulation depth is maintained at a constant level by an automatic gain control circuit or Vogad. An R.C. Oscillator is provided for M.C.W. working.

General Description

24. The transmitter is housed in a metal cabinet intended for tier mounting from which it may be withdrawn forward after releasing the six green painted studs at the corners of the front panel.

25. All the tuning controls, cable fittings and meters are mounted on the front panel, the functions of each one being clearly marked. Dial locks are provided to retain the controls in position when the correct settings have been found.

26. Eight plug in Crystals are housed under a detachable metal cover at the bottom of the front panel so that they may be easily changed if different channels are required.

27. The transmitter follows conventional practice throughout, so that this manual will not describe in detail the functions of every component but give only a broad outline of the working of the stages.

Master Oscillator.

28. With SWA in the M.O. position the CV2136 pentode V3 operates as a conventional Hartley electron coupled oscillator. When SWA is turned to one of the crystal positions the oscillator becomes crystal

controlled. In both working conditions the circuit follows conventional lines as may be seen from the circuit diagram at the rear of the manual.

Stability.

29. Special precautions have been taken to ensure frequency stability and a level output as far as possible over the frequency range. The two Neon stabiliser valves V1 and V2 ensure that there is no variation in the H.T. supply to the M.O. stage, and to ensure that the screen voltage of V3 also remains constant, it is fed from the potentiometer R79, R80, from the stabilised H.T.

30. The grid coil L1 is wound under tension on a ceramic former so as to minimise distortion due to changes of temperature, thus helping to keep the M.O. stable.

31. The resistor R81 at the grid of V3 serves to reduce the tendency of the oscillator output to increase with frequency. At low frequencies the effect of R81 is negligible, but as the frequency rises the value of the resistance becomes comparable with the reactance of the grid cathode capacity with which it is in series. Thus the grid is effectively tapped down by a potentiometer and the applied voltage tends to remain constant as the frequency rises.

Keying (for keying of "A" pattern transmitters, see Addendum No. 1).

32. The transmitter is keyed by the combined action of the relays B and C. Relay C is of the heavy duty type and its contacts, which perform the aerial changeover and receiver muting functions, take about 20mS to move. Relay B is a high speed relay and its operating coil is divided into two windings connected so as to ensure a good waveform in the output on C.W. and M.C.W.

33. For these types of transmission pressing the key in the power unit energises the relay C, and one coil of the Relay B. Relay B immediately closes and its changeover contact B1 removes the bias from V3 so that oscillation may start, at the same time removing the earth from V12 grid permitting the M.C.W. oscillator output to reach the modulator. By the time the 20 mS required for the contacts of relay C to move over has elapsed the oscillator is in operation and a pulse with a sharp leading edge is transmitted.

34. The contacts RLC2 apply 250V positive to a potentiometer feeding a backing off bias to V4 grid, thus permitting the M.O. output to reach the driver stages and at the same time the second operating coil of Relay B is energised via the 18K resistor R28. Thus Relay B remains closed, even if the key is released, untilthe Relay C opens. When this happens the transmitter output is cut off instantly, since the aerial is disconnected from the P.A. and at the same time the M.O. is shut down,

giving a sharp trailing edge to the output pulse.

35. On Voice working the second coil of the relay B is not energised and the transmitter is controlled by the pressel switch on the microphone. Under these conditions the radiated carrier is delayed 20 mS after the making of the switch.

Buffer Stage.

36. V4 (CV2129) constitutes a tuned anode buffer stage working also as a frequency multiplier on Bands 2 and 3, the necessary circuit changes to effect the multiplications being made by the operation of SWB. On Band 1 no multiplication of the fundamental frequency takes place. On Band 2 the anode of V4 is tuned by means of L6 to double the fundamental frequency. On Band 3, L4 and C1 are connected to the grid of V4, tuned to double the fundamental frequency, whilst L7 tunes the anode circuit to 4 timesthe fundamental frequency.

37. The anode coils of the buffer stage in use on each range are tapped to match the grid impedance of the P.A., the grid being connected to the appropriate coil by operation of Section C of SWB. At the same time, Section D of the switch varies the voltage at the screen of V4 by selecting a different tapping on the screen supply potentiometer. This change in screen voltage, together with the setting of the coil taps, ensures that the drive to the P.A. is as nearly as possible the same for each frequency range.

38. The frequency multiplication at each stage on the three bands is shown in the table below. :-

BAND	MASTER OSCILLATOR	BUFFER GRID	BUFFER ANODE	POWER AMP
Band 1 1.5 - 3.5 Mc/s.	Fundamental	Fundamental	Fundamental	Fundamental
Band 2 3.5 - 8 Mc/s.	Fundamental	Fundamental	Fundamental X 2	Fundamental X 2
Band 3 8 - 16 Mc/s.	Fundamental	Fundamental X 2	Fundamental X 4	Fundamental X 4

Power Amplifier

39. The three CV428 tetrode valves, V5, V6, and V7, in parallel comprise the power amplifier, feeding the aerial through the variable coupling coil L9 and the aerial loading coil L10. The H.T. supply for this stage is fed from the power unit via the secondary of the modulation transformer TR3, the R.F. choke L14 and the meter A,

reading P.A. Anode Current, R25 is a shunt external to the meter case. Bias voltage is fed from the power unit via choke L8.

40. Tuning of the stage is effected by C20, together with the aerial coupling coil L9, part of the stator of which is shorted out by sections E and F of SWB on Bands 2 and 3. The inductance remaining in circuit is arranged so that the coil is in tune when the reading on the scale attached to C20 is of the same order as that on the M.O. tuning control. This tends to avoid the possibility of a wrong harmonic being selected at the P.A. anode when the buffer is acting as a multiplier.

Aerial Capacitor Switch SWC

41. L10 is connected to the aerial via SWC which enables capacitors of various values to be switched in series or in parallel with the aerial circuit. This system enables the set to work under optimum conditions into different types of aerial. Some indication is given in the table below of the type of aerial with which the various capacitor combinations may be expected to operate satisfactorily, but it will be necessary in practice to find the optimum combination for each individual installation by trial and error.

Position of SWC.	Capacitors		Aerial Type
	Series	Parallel	
1. Dummy Load		700 ohms 100 pF	
2. Par. 1		250 pF	High Imp. R & Large L.
3. Par. 2		50 pF	High Imp. R & L.
4. OFF			Low Imp. R & Large C.
5. Ser. 1	250 pF		Low Imp. R & C.
6.Ser. 2	50 pF		Low Imp. Resistive.

Aerial Current Meter.

42. The low potential end of L9 is earthed via the primary of the transformer TR4 feeding the Aerial Current Meter V. This primary consists solely of a 4 BA screw which passes through the centre of the iron dust annular former on which a toroidal secondary is wound and the passage of R.F. through this screw is sufficient to set up

a current in the secondary which is passed via SWD through one or more of the resistors R27, R26, R29 to the rectifier MR5. The D.C. output from the rectifier is indicated on the meter, the value of resistance in series as selected by SWD determining the sensitivity of the circuit and enabling a reasonable indication to be obtained for aerials of any impedance likely to be encountered.

Aerial Coupling

43. The inductance L9 is made in two sections, the stator portion wound on a cylindrical former mounted at an angle of 45^{o} from the horizontal, with its base towards the front panel and a rotor portion mounted within the cylinder on a shaft passing horizontally through the front panel. This rotor portion is set at an angle of 45^{o} to the shaft in such a manner that as the shaft is turned the coil changes from concentric with the stator coil to a position at right angles to it, thus giving maximum control of the coupling between the P.A. and the aerial circuit.

Aerial Loading Coil.

44. The aerial loading coil L10 is wound on a cylindrical former carried on a insulating shaft passing horizontally through the front panel, and has mounted above it a small pulley wheel running on the surface of the inductance wire. As the coil is turned by the shaft the pulley is driven along it in the manner of a screw thread, shorting out a portion of the coil. This gives continous control of the inductance for aerial loading purposes.

M.C.W. Oscillator.

45. V8 (CV131) is a conventional phase shift oscillator producing a sinusoidal output at a nominal 1000 c/s (permissable variation 800-1200 c/s). When SWE is turned to the M.C.W. position, the output of V8 is fed to the grid of V10 via C38, so that the H.T. to the P.A. is modulated at the frequency of the oscillator. When the transmitter is used for voice modulation the M.C.W. oscillator output is disconnected and the microphone output is fed to the primary of the transformer TR1 by turning SWE to the voice position. At the same time the Relay MC1 in the power unit is energised, causing one pair of its contacts to open cutting off the H.T. to V8, and stopping the oscillation.

Audio Stages.

46. Voice frequencies are fed from the transformer TR1 through V10, V11 (CV131's) and V12 (CV2136) to V13 and V14 (CV428's). The functions of these stages are mentioned briefly below but the operation of V9 and V10 is discussed in more detail in paragraphs 49 and 50.

47. V11 is a conventional pentode audio amplifierfeeding V12, a tetrode audio amplifier working as a driver for the modulator valves V13 and V14, via the phase splitting transformer TR2. The filter network in V12 anode circuit restricts the audio response of the system to

2500 c/s giving a rapid fall above this frequency. V13 and V14 comprise a push-pull modulator stage working through the transformer TR3, the secondary of which is in the H.T. line to the anodes and screens of the P.A. valves. On C.W. working the grid of V10 is earthed via C38 and SWE (d) thus rendering the modulator inoperative.

Voice Operated Gain Adjusting Device.

48. The VOGAD circuit is designed to control the amplification of the audio stages of the transmitter so as to provide a modulation depth of between 85 - 90% for an input range of $\pm$ 6 dB, which may in turn be adjusted over the range -15 + 10 dB relative to 1mV in 600 ohms. The device consists essentially of the triode-connected pentrode amplifier V9(CV138) feeding a voltage doubler circuit which provides bias to a variable - mu stage V10 (CV131) and to the audio amplifier stage V11.

Vogad Action.

49. In-coming audio signals appear across RV2, where the required proportion is tapped off and passed to the grid of V10 via R45. The amplified signal from V10 is passed through the audio amplifier stages and a proportion of the modulation transformer output is tapped off the secondary of TR3 by C72, R85 and R86. This proportion is passed to the grid of V9.

50. After amplification in V9, the signal is applied through C35 to the rectifiers MR3, MR4 which constitute, together with the capacitors C33, C34 and C36, a voltage doubling circuit. The negative D.C. output from this circuit is developed across C32 and applied to both the control grid of V10 and the suppressor grid of V11, thus providing a bias proportional to the output of the modulator and keeping that output constant over the required range of microphone input.

51. By adjusting the setting of RV2 according to the microphone input voltage, the system may be set to give the required 80 -90% modulation over the 6 dB range. The level at which the bias circuit comes into operation may be adjusted by means of RV1 so as to compensate for small changes in valve and circuit characteristics. Thus together RV1 and RV2 provide the means of setting up the circuit to give the automatic control required over the range -15 + 10 dB.

52. The rectifier MR2 provides a rapid charging path for C32 by-passing R39 so that the bias builds up rapidly. The discharge path for C32 is through the resistor so that the bias leaks away slowly, ensuring quick build-up and slow decay of the VOGAD action.

53. MR1 is connected to the grid through R38 to ensure that any positive transient arriving before the bias has had time to build up does not affect the circuit, since the presence of the rectifier substantially prevents the grid from going positive. R38 is necessary to restrict the action of MR1 to some extent so that low level audio signals insufficient to build up the bias are not distorted by the action of the rectifier.

Chapter 1.

M.F. TRANSMITTER AP100334

General Description

54. The M.F. Transmitter AP100334 is intended for the transmission of C.W. and M.C.W. radio signals in the Band 330-550 kc/s. It is normally associated with the Power Unit AP100336 and H.F.M.F. Receiver AP100335. The Transmitter is housed in a steel cabinet intended for tier mounting, from which it may be removed after the six green painted screws in the front panel have been loosened. All the cable connections, controls and meters are on the front panel, with the exception of the main switch which is situated on the power unit.

Master Oscillator.

55. The tetrode V3 constitutes the Master Oscillator functioning as an electron coupled Hartley Type oscillator tuned by the main tuning capacitor C1. The H.T. supply for this stage is held at 255V by the two Neon stabilisers V1 and V2 to minimise any variation in frequency which may be caused by alterations in the nominal H.T. voltage.

Buffer Stage.

56. V3 is coupled to the buffer stage V4(CV428) in the conventional manner by means of the damped tuned circuits L2, C3 at the anode of V3, and L3, C27 at the grid of V4. These tuned circuits resonate at 330 kc/s and 550 kc/s respectively, and are in some degree overcoupled by C6, C7 so that together they produce a response curve accentuated at the ends of the band. In the anode of V4, L4 resonates at 400 kc/s, and this together with the heavy damping caused by the resistors across all the circuits, gives the system a substantially flat response over the whole band producing a drive at the P.A. grid of 14 - 17 mA at all frequencies.

Power Amplifier and Aerial Connection.

57. The three CV428 valves, V5, V6 and V7, comprise the power amplifier, feeding the aerial from the choke L5, via the aerial loading system, made up of the switched capacitors controlled by SWA and the variometer coil L8.

58. The switch SWA connects capacitors across the P.A. so that in conjunction with the variations of inductance obtained by switching L8, any normal aerial may be brought into resonance with the transmitter for more efficient working. The capacity added across C15 by SWA in its various positions is as follows.

Switch Position	Capacity mfd.
1	NIL
2	0.0005
3	0.001
4	0.0015
5	0.002
6	0.0025
7	0.003
8	0.004
9	0.005
10	0.006
11	0.007

59. L8 is constructed in three sections, two of which are wound on large cylindrical formers situated parallel to the front panel. The third section of the coil is wound upon an iron dust core mounted between the other two sections and pivoted in a shaft through the panel, so that the coupling between it and the other two sections may be varied. The switch SWB connects this rotor section of the coil in series or in parallel with the various tappings on the stator portion of the coil, so as to give varying overall values of inductance. This switching system (details of which are given in the inset on the circuit diagram) and the rotor coil together provide a continous variation of inductance for tuning purposes from 80 to 3,500 mH enabling the sender to operate satisfactorily into any aerial capacity between 70 and 750 pF.

Meters.

60. The P.A. anode current meter gives an indication of the current in the P.A. anode circuit by measuring the D.C. voltage across the shunt resistor R18 in the normal way. The aerial voltage indicator is fed by the capacitor C36 which comprises two adjustable plates carried on threaded rods passing through an insulated bracket. R.F. passing this capacity is developed across the choke L7 and fed to the rectifier MR1, the D.C. output of which operates the meter M2 to give an indication of aerial voltage. C36 is adjusted so as to give convenient readings on the meter scale under all operating conditions.

Dummy Load.

61. The dummy load consists of 750pF capacitor C34 in series with a 60W lamp to earth, and serves to enable the sender to be tested without being connected to an outside aerial. This lamp is designated R47 on the circuit diagram.

62. V8 and V9 (CV428's) together form a push-pull audio oscillator with a frequency of 800 to 1200 c/s. The oscillatory circuit is formed by theprimary of the modulation transformer TR1 together with the 0.04 mfd capacitor C24. The use of "Caslam" material for the transformer core gives the circuit a very high Q and ensures that the oscillation is substantially sinusoidal.

63. On C.W. working RLC1 short circuits the secondary of the transformer to avoid surge effects, and no H.T. is applied to V8 and V9 because contacts RLC2 are open. On M.C.W. working RLC1 is open and RLC2 closed, so that H.T. is applied to the audio oscillator, and the supply to the P.A. is modulated at the audio frequency by the action of TR1.

KEYING

63a. The transmitter is keyed by relay RLA/2; wafer RLA2 connecting the 300 V h.t. supply to the M.O. valve V3 for transmission or to the receiver for reception. Wafer RLA1 transfers the aerial from the receiver to the transmitter during "Mark" periods. For keying of "A" pattern transmitters, see Addendum No. 1.

POWER UNIT AP100336.

General Description

64. The Power Unit AP100336 provides all the necessary H.T., L.T. and bias supplies for the receiver and either of the transmitters described in paras. 1 - 4. It is intended to work the receiver and eitherof the transmitters at the same time, but not to run all three simultaneously, and for this reason only one set of connectors for the transmitter supplies is provided.

65. The main switch for the equipment is located on the power unit, which also carries the key jack and microphone input socket. The microphone socket has a number of spare contacts, two of which are fed with the receiver output.

66. To facilitate the use of the equipment with control circuit exchanges the necessary leads are brought out to a plug marked "Control Unit" and a "Local/Remote" switch is provided. In addition certain internal connections are made through a tag panel on which easily altered linking is employed.

67. The power unit is mounted on a substantial chassis assembly, divided into two sections, arranged one on top of the other, and connected by two multiple plugs and sockets. This chassis assembly also carries at the front, all the cable outlets, fuses and switches, the front panel being a separate face plate only, upon which the markings are engraved.

68. Although the circuits are conventional , the circuit diagram appears complicated owing to the necessity of showing the plug and socket contacts.

69. Six fuses, mounted in clearly marked flush fitting holders at the top of the front panel, are provided for the protection of the apparatus as follows:

	FUSE	POSITION IN CIRCUIT
F1	3 or 5 amp, anti-surge,	TR1 mains supply 230 V or 115 V
F2	3 or 5 amp, anti-surge,	TR1 mains supply 230 V or 115 V
F3	1.5 or 3 amp, anti-surge,	TR2 mains supply 230 V or 115 V
F4	1.5 or 3 amp, anti-surge,	TR2 mains supply 230 V or 115 V
F5	1 amp	400 volt h.t. supply
F6	500 milliamp	300 volt h.t. supply

H.T. Supplies.

70. The main H.T. supplies are derived from the three CV378 Rectifier Valves V1, V2 and V3 fed from the transformer TR1, V1 and V2 together constitute one full wave rectifier circuit, providing about 400V D.C. for

the P.A. valves in the Transmitter, whilst the other lower voltage supplies are obtained from the normal full wave rectifier V3 by means of tappings at various points in the chain of smoothing chokes and resistors. At the end of this chain the CV395 Neon Stabilizer valve V4 is used to provide a steady 150V supply for the local oscillator in the H.F. M.F. Receiver AP100335. The circuit diagram shows clearly the points at which the various tappings are made.

L.T. Bias and Rectifier Supplies.

71. The Transformer TR2 provides all the filament voltages for the power unit and the associated equipment, and also the bias and rectifier actuating supplies.

Bias Supply.

72. MR1 is a normal bridge rectifier connected with its positive end to earth and delivering about - 75V to the bleeder resistance chain R11 - 13 from which the bias supplies and the energising voltage for relay RLC are taken.

Relay Actuating Supply.

73. Power for the relays RLA and B is derived from a different point in the same rectifier circuit. Two of the sections of the rectifier MR1 are used in what may be regarded as a conventional full-wave rectifier system with cathodes earthed, in addition to their role in the normal bridge circuit the output from this secondary system is taken from the centre of the main winding on TR2.

Indicator Lamp.

74. The indicator lamp LP 1 is connected across the 230V winding of the primary of transformer TR2, in series with the dropping resistor R17.

Relays.

75. Three relays are included in the circuit of the power unit, as follows:

(a)RELAY RLA/4

The four contacts of this relay are wired in pairs in the H.T. leads from the secondary of the transformer TR1. These contacts are normally open and are closed when the relay is energised. The energising voltage is applied when SWB is turned to TRANS READY, the earthy side of the relay being grounded through the Local/Remote switch SWC in the LOCAL position, or via PL 4N when SWC is at REMOTE.

(b) RELAY RLB/2

When SWC is at REMOTE this relay operates with Relay A4, but when SWC is at LOCAL the relay cannot be energised.

Its contacts are associated with the remote control circuit to facilitate indication of the state of the transmitter at the distant point.

(c) RELAY RLC/3

This relay has two "make" contacts and one "break" contact. The "break" contact C1 removes the H.T. from SK 3S and the M.C.W. oscillator in the H.F. transmitter. The contact C3 joins pins V and T of PL4 and contact C2 is in series with PL 4X.

Energising voltage supply is taken from a potentiometer R18, R19/R9 across the - 75 bias supply. The relay may be energised only when the transmitter H.F. is on Voice working, by joining pins PL 4S and PL 4R when SWC is at REMOTE or pins 3 and 7 of SK6 when SWC is at LOCAL. Either of these pairs of pins may be joined through a carbon microphone which is then energised by the same supply as the relay.

Dummy Load, Electrical AP 103099

76. In Type 618 installations where the Receiver CAS is not fitted the absence of the receiver load results in an appreciable rise in the transmitter H.T. supplies, which are derived from Rectifier V3 in the Power Unit (see Figure 20).

In such installations the Dummy Load, Electrical is fitted to simulate the receiver load and maintain these H.T. supplies at the approximately correct nominal value.

The Dummy Load consists of two 30 watt resistors one of 6.8 kohms being connected to terminal H of SK5 and the other of 10 kohms to terminal D of SK5. (Figure 20). Terminal E of SK5 provides the common return path to earth.

The AP 100291 Connector 9 feet long used for connecting the receiver when fitted is used to connect the dummy load to the power unit.

Heat dissipation of the dummy load is 24 watts and it is important that the unit be mounted in a well ventilated site.

CHAPTER 2

INSTALLATION

CHAPTER 2.

I N S T A L L A T I O N.

General

1. The cases of the receiver and the two transmitters have reinforcing bands with holes at the top and bottom to take securing bolts. The cases should be removed from the unit by loosening the green painted screws at the edges of the front panels. The units, which may include only one transmitter, will normally be mounted either individually or in tiers, on anti-shock mounting brackets which should first be placed in position. The cases may then be bolted into place in the structure and the units replaced after the cases have been secured. When tier mounting is adopted it will generally be found convenient to have the transmitter M.F. at the top.

2. The power unit is provided with a separate rack from which it may be detached by loosening the two milled nuts on the base of the front panel, so that the rack may be secured in position before the unit is replaced. The rear of the power unit chassis is provided with two small rollers to assist in sliding the unit on the rack.

WARNING : The power unit weighs 128 lbs.

3. Before sliding the power unit into position any necessary alteration must be made to the connections of the links on the tag panels mentioned previously to suit the control circuit requirements of the particular installation, and the voltage tapping of the transformers must be adjusted to suit the supply.

4. It is also necessary to make the aerial connection. It should be noted that when a high impedance aerial is in use (which is to connected to Pin D of the receiver input socket) pin B of that socket must be earthed by connecting it to Pin A.

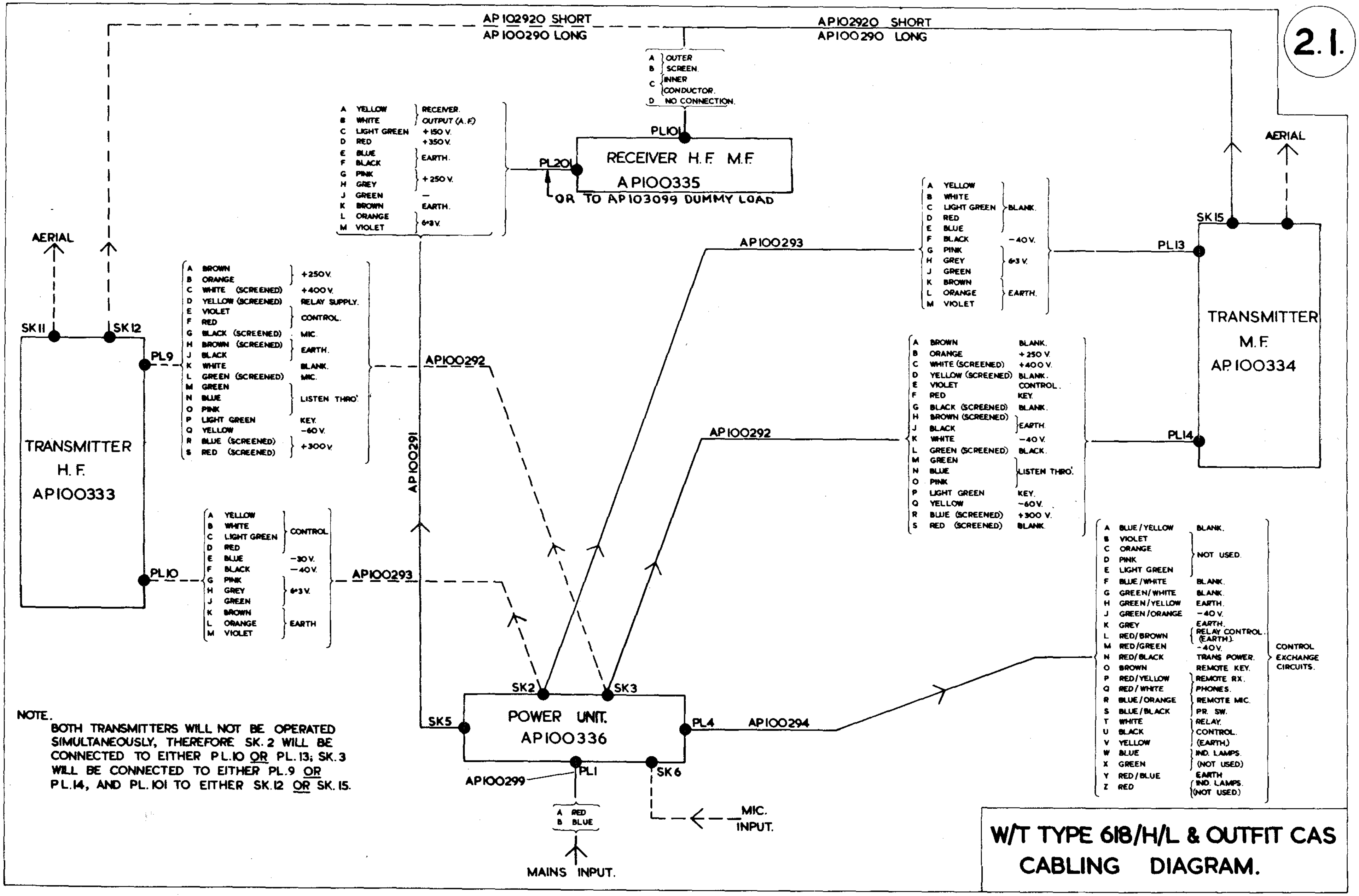
5. The Power Unit as supplied will normally be set and fused for 230 volts a.c. mains. If the unit is to be used from 110/120 volts a.c. mains the transformer tappings and mains input fuses must be altered accordingly. The correct fuses are as follows:-

For 220/245 volt supply
F1 and F2, 3 amp anti-surge, 5920-99-972-6150
F3 and F4, 1.5 amp anti-surge, 5920-99-972-6912
For 110/120 volt supply
F1 and F2, 5 amp anti-surge, 5920-99-972-7865
F3 and F4, 3 amp anti-surge, 5920-99-972-6150

Later models of the Power Unit will be fitted with a reversible label indicating the alternative voltages and fuses. This label is to be set with the correct side outwards.

CABLE			FROM			TO	
Admy Part No.	Name	Unit	Plug or Socket		Unit	Plug or Socket	
			Label	Code No.		Label	Code No.
100290	Rec. Aerial	Trans H.F. Trans M.F.	Rec. AE Rec. AE	SK12 SK15	Receiver H.F/M.F.	Aerial	PL101
100291	Rec. Power Input	Power Unit	Rec.	SK5	Receiver H.F./M.F. or DUMMY LOAD ELECTRICAL	Power Input	PL201
100292	Trans. Power Input	Power Unit	Trans Power Input	SK 3	Transmitter H.F. Transmitter M.F.	Power Input Power Input	PL 9 PL14
100293	Trans Heater	Power Unit	Trans Heaters	SK 2	Transmitter H.F. Transmitter M.F.	Heaters Heaters	PL10 PL13
100294	Control Circuit	Power Unit	Control Circuits	PL4	Control Circuit Exchange	-	-
100299	Mains Input	Mains Supply	-	-	Power Unit	Mains	PL1

NOTE: The Power Unit is intended to supply the working voltages for the receiver and either of the transmitters. It is not intended to operate the receiver and both transmitters simultaneously. There is therefore only one set of transmitter connectors.



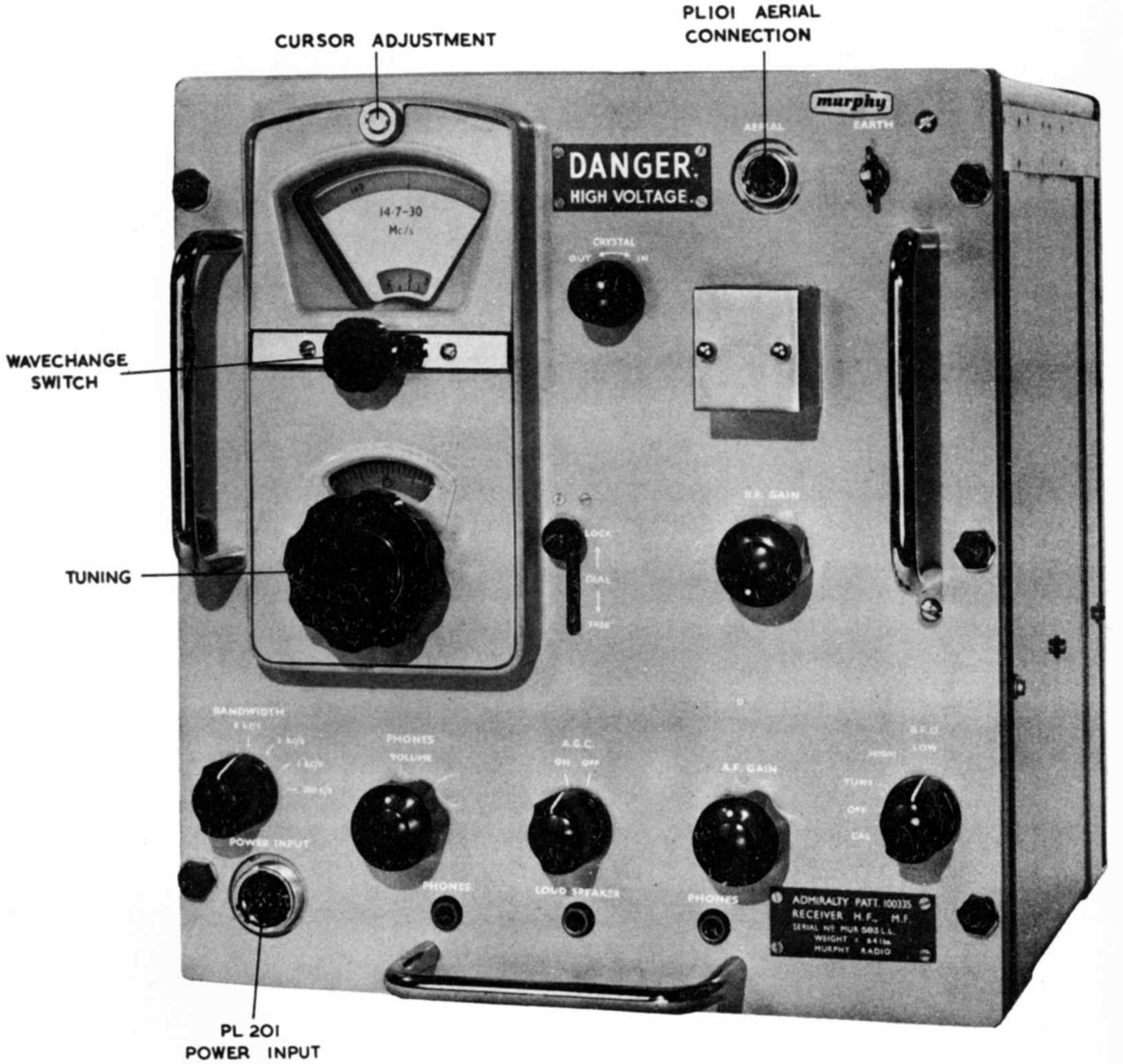
W/T TYPE 618/H/L & OUTFIT CAS CABLING DIAGRAM.

NOTE.
BOTH TRANSMITTERS WILL NOT BE OPERATED SIMULTANEOUSLY, THEREFORE SK. 2 WILL BE CONNECTED TO EITHER PL.10 OR PL.13; SK.3 WILL BE CONNECTED TO EITHER PL.9 OR PL.14, AND PL.101 TO EITHER SK.12 OR SK.15.

CHAPTER 3

OPERATING INSTRUCTIONS

H.F.M.F.RECEIVER	AP100335
H.F. TRANSMITTER	AP100333
M.F. TRANSMITTER	AP100334
POWER UNIT	AP100336



H.F. M.F. RECEIVER AP100335

H.F. M.F. RECEIVER AP100335.

Introduction

1. It will be assumed that the receiver has been properly installed as mentioned in Chapter 2. The setting up and operating procedure for local working will be described, but it may be necessary to interpret these instructions to suit the particular installation if the equipment is remotely controlled.

H.F. M.F. Receiver AP100335.

(2.) The functions of the various switches are as follows:

Cct. Ref. No.	Control	Function	
SW101	Wave Band Switch	Switches in the necessary tuned circuits for the various frequency bands.	
SW102	Crystal Switch (IN, OUT)	Switches the local oscillator to crystal control.	
SW201	Selectivity (8 kc/s, 3 kc/s, 1 kc/s 200 c/s).	Sets the bandwidth of the receiver.	
SW202	A.G.C. (On, Off).	Switches the automatic gain control on and off.	
SW203	B.F.O.	Mode of operation.	
	CAL	B.F.O. crystal controlled at 800 kc/s beating with I.F. to produce audible calibration points on bands 3 and 4.	
	OFF	B.F.O. off.	
	TUNE	B.F.O. frequency 800 kc/s.	Beating
	HIGH	B.F.O. frequency 801 kc/s.	with I.F.
	LOW	B.F.O. frequency 799 kc/s.	signal

3. In addition, a normal tuning control, band switch, R.F. and A.F. gain controls and a volume control for the headphones, are provided. The loudspeaker output requires a separate volume control associated with the speaker. The R.F. gain control operates only when SW202 is in the 'OFF' position. A lock to hold the tuning control in any desired position is fitted adjacent to the tuning knob, and provision is made for small adjustments of the cursor of the tuning dial for calibration purposes.

TUNING INSTRUCTIONS.

4. For the reception of C.W. Signals, the operation of the receiver alone is as follows:-

(a) Set the Mains Switch on the Power Unit to the 'ON' position and note that the Indicator Lamp lights.

(b) Set the H.T. supply switch on the Power Unit to 'REC', and note that the receiver dial is illuminated.

(c) Plug in a loudspeaker or a pair of telephones.

(d) The following switches should be set to initial positions as shown:

(1) Crystal Switch to -'OUT' (fully anticlockwise).
(2) Bandwidth Switch to '3 kc/s' which is the C.W. Searching position.
(3) A.G.C. Switch to 'ON'.
(4) B.F.O. Switch to 'CAL', to use the internal calibration check on bands 3 and 4. On bands 1, 2 and 5, set the B.F.O. switch to TUNE and then proceed as in para. 6 (below).
(5) A.F. Gain Control to a comfortable level. 'Phones volume control, fully clockwise.
(6) Wavechange Switch to the required frequency band.

<u>THE RECEIVER IS NOW READY FOR CALIBRATION ON BANDS 3 AND 4.</u>

To Calibrate the Receiver.

5. It will be noted that the Tuning Scales for bands 3 and 4 have a number of points indicated by dots at 800 kc/s intervals. These are provided for internal calibration purposes, the procedure for which is as follows:

(a) Turn the Main Tuning Control to the Calibration dot on the scale NEAREST to the required frequency. At this point a whistling note will be heard in the headphones. Adjust the Main Tuning Control very carefully across the note until the "Dead Space" or "Zero Beat" is found. This is the point where the note is no longer audible, and where a slight movement of the Main Tuning Control in either direction will allow the note to be heard.

(b) Lock the Main tuning control.

(c) Turn the Cursor Adjustment Knob until the Cursor Pointer is directly over the spot on the dial.

The receiver is now accurately calibrated and the correct frequency of any signal adjacent to this point may be read from the dial.

NOTE: The calibration crystal does not operate on bands 1 and 2. On Band 5 when B.F.O. (SW203) is in position CAL, some calibrating notes may be heard, but, in general, the notes are not strong enough to provide a reliable method of calibration and the check points are not marked on the scale of band 5.

To Search for the required Signal.

6. (a) Set the B.F.O. Switch to TUNE.

(b) With the Main Tuning Control, search to-and-fro across the required frequency until the wanted signal is heard.

(c) Tune very carefully to the "Dead Space" of the signal.

(d) Set the B.F.O. Switch to the HIGH or LOW position. In either position a clearly audible signal will be heard, but the position selected should be the one which gives the least interference from stations transmitting on frequencies adjacent to the wanted signal. The correct position is found by trial and error.

NOTE If the required signal is very weak, or a strong unwanted signal is causing the A.G.C. circuits to operate at the expense of the wanted signal, the A.G.C. Switch should be set to OFF and the volume of the receiver adjusted manually by the A.F. and R.F. Gain Controls. If any unwanted station interference is still being experienced, the Bandwidth Switch should be turned to "1 kc/s" or "200 cycles" to increase further the selectivity of the receiver but it will be found necessary slightly to retune the Main Tuning Control after every increase of selectivity on this switch.

To Receive Voice or M.C.W. Signals.

7. (a) Proceed as for C.W. reception in paragraphs 4 and 5.

(b) Set the Bandwidth Switch to "8 kc/s".

(c) Set the B.F.O. Switch to the OFF position.

(d) With the the Main Tuning Control, search to-and-fro across the required frequency until the wanted signal is heard, Tune for best results.

(e) Clear interfering stations by the use of the Bandwidth Switch as necessary. It is inadvisable to reduce the bandwidth below "3 kc/s" for the reception of music, or below "1 kc/s" for the reception of normal speech. For the reception of M.C.W. however, the bandwidth may be reduced to "200 cycles".

(f) Use the A.G.C. Switch as previously described.

Crystal Controlled Operation of the Receiver.

8. (a) Remove the cover marked "XTAL" and plug in a crystal of the appropriate frequency and replace the cover.
(b) Set the Crystal Switch to IN (fully clockwise).
(c) Set the Wavechange Switch to the required frequency band.

(d) Adjust all other controls as previously described for the system of reception required i.e. C.W., M.C.W. or Voice.

NOTE: The crystal which will be required for any frequency can be calculated as follows:

BAND 3.

1.47 to 4.8 Mc/s. Crystal Fundamental = Fs + 800 kc/s.

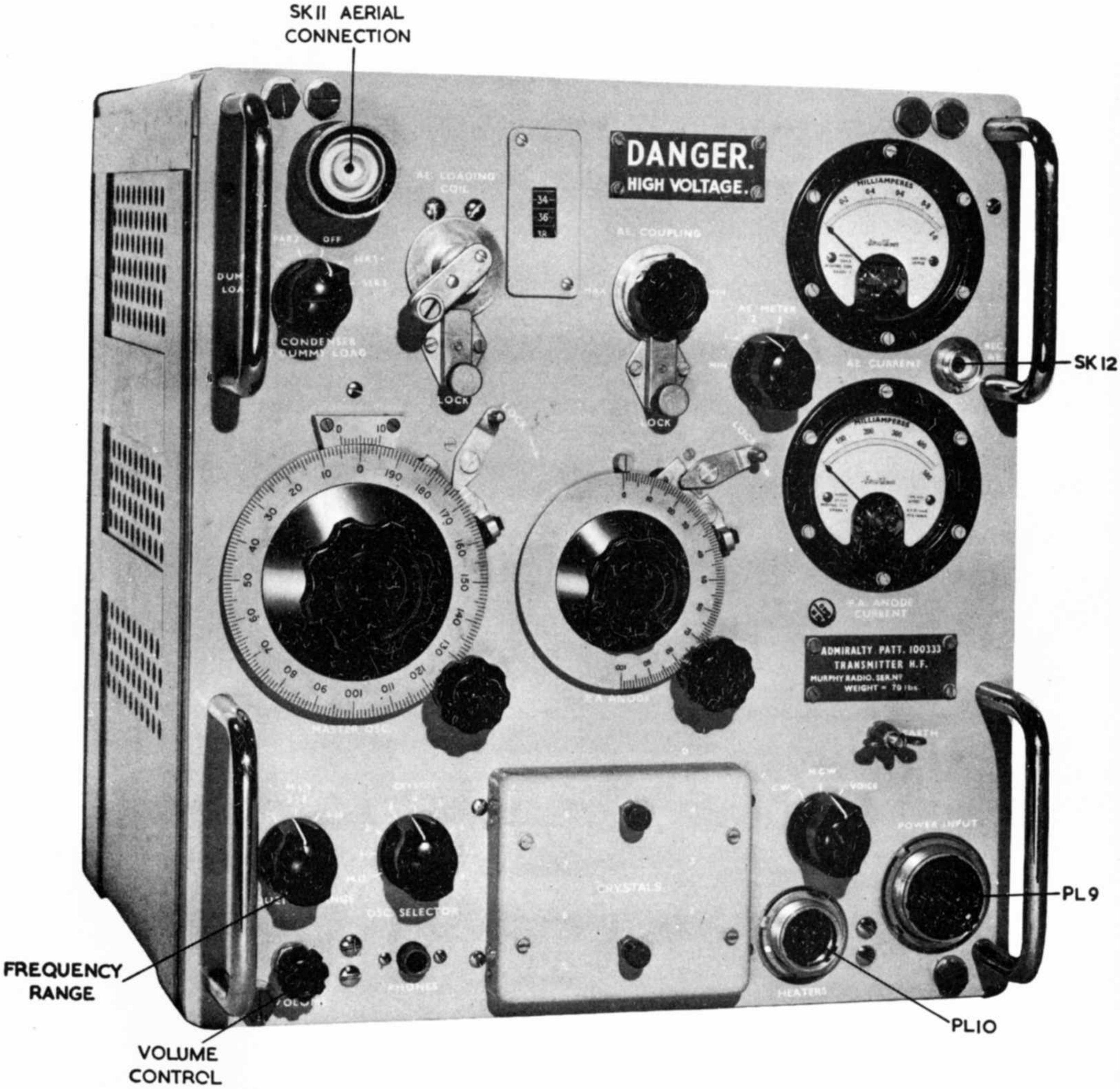
BAND 4.

4.6 to 7 Mc/s. Crystal Fundamental = Fs + 800 kc/s.
7 to 15 Mc/s. CrystalFundamental = $\frac{\text{Fs + 800 kc/s.}}{2}$

BAND 5.

15 to 30 Mc/s. Crystal Fundamental = $\frac{\text{Fs + 800 kc/s.}}{2}$

9. In carrying out the tuning procedure, care must always to taken to view the dial from a point immediately opposite the pointer, preferably with one eye closed in order to avoid parallax errors.



H.F TRANSMITTER AP100333

H.F. TRANSMITTER AP100333.

General.

10. It is assumed that the transmitter forms part of a normal installation and has been properly connected to the power unit as described in Chapter 2. It is also assumed that a loudspeaker or headphones is connected to the receiver in use.

11. The functions of the various controls on the transmitter are set out below:

Cct. Ref. No.	Control	Function
SWC	AE Capacitor and Dummy Load Switch	Passes transmitter output to Dummy Load or via capacitors in series or parallel.
L10	AE Loading Coil	Tunes the transmitter output circuit with the aerial.
L9	AE Coupling	Varies the coupling between the P.A. Anode circuit and the aerial loading coil.
SWD	AE Meter Switch	Controls the range of the AE Current Meter.
C1 A-B-D	Master Oscillator/Buffer	Tunes the Master Oscillator
C20	P.A. Anode	Tunes the Power Amplifier Anode.
SWB	Frequency Range Switch	Selects the frequency band.
SWA	Osc. Selector Switch	Changes from variable frequency to desired control crystal.
SWE	C.W./M.C.W./Voice Switch	Selects the system of transmission (C.W., M.C.W. or Voice).

A volume control for the local headphones socket is also provided.

Tuning Instructions.

12. Adjust the controls listed below to the following starting positions:

(a) H.T. Supply Switch on the Power Unit to 'REC'.

(b) Mains Supply Switch to 'ON' and note that the Indicator Lamp lights.

(c) H.T. Supply Switch to 'STAND-BY'.

(d) Local/Remote Switch to "LOCAL".

(e) Frequency Range Switch to required range.

(f) Oscillator Selector Switch to 'M.O.'

(g) M.O. Dial to the frequency required from the Calibration Chart provided.

(h) P.A. Anode Control to the same setting as that of the M.O. Control.

(i) Aerial Loading Coil to Zero.

(j) Aerial Coupling Control to mid-position.

(k) Aerial Meter Switch to position 1.

(l) Aerial Capacitor Switch to 'DUMMY LOAD'.

(m) C.W./M.C.W./VOICE Switch to C.W.

After a delay of about 30 seconds, set the H.T. Supply Switch to 'TRANS READY'.

Tuning.

13. Plug a Morse Key into the Key Jack and press the key each time for all tuning adjustments below.

(a) Adjust the M.O. control to the exact frequency required, either by Wavemeter or a Calibrated Receiver.

(b) Adjust the P.A. Anode Control until the P.A. Anode Meter indicates a dip. Note that the dial reading is roughly of the same order as that of the M.O. control; if not readjust until such a point is found.

(c) Check that there is a reading in the Aerial Current Meter. If there is not, turn the Aerial Meter Switch one step at a time towards 'MAX' until a small reading is obtained. Do not overdo this, otherwise the Aerial Ammeter may be damaged.

(d) Adjust the aerial loading coil for a maximum reading in the Aerial Ammeter reducing the Aerial Meter Switch as necessary as the Aerial Current rises. If necessary also reduce the coupling.

(e) Set the Aerial Capacitor Switch to the 'OFF' position

(f) Readjust the P.A. Anode control for a dip in the P.A. Meter

(g) Readjust the Aerial Loading Coil for a peak reading in the Aerial Meter, increasing the coupling and dipping the P.A. Anode Control as necessary until the Aerial Current is a MAXIMUM or the P.A. Anode Meter is reading 200 milliamps whichever occurs first.

(h) If no loading condition is achieved, repeat (f) to (g) with the Aerial Capacitor Switch, first in SERIES 1 and 2, then in PARALLEL 1 and 2 until optimum output is achieved.

(i) Note the dial readings for future reference.

(j) Switch to M.C.W. or VOICE as required.

NOTE : It should be remembered that the best power output is obtained when the aerial current is at a MAXIMUM, even though the P.A. loading figure is less than 200 milliamps. However, care must be taken not to exceed 200 milliamps at resonance in the P.A. Anode Meter.

Crystal Operation.

14. Adjust the controls listed below to the following starting positions:

(a) Oscillator Selector Switch to the desired Crystal position

(b) Frequency Range Switch to the correct range for this frequency.

(c) M. O. Control to the approximate setting from the Calibration. Chart.

(d) All other controls as for paragraphs 13 (h) to (j) .

(e) Press the Key and adjust the M.O. control for MAXIMUM in the P.A. Anode Meter - lock the dial.

(f) Proceed as for normal tuning i.e. from paragraphs 14 (b) onwards.
NOTE : The crystal fundamental frequencies must be kept between 1.5 and 4 Mc/s.

On Ranges 2 and 3 the Transmitter operates by frequency multiplication as shown below.

Range One	Crystal of V.F.O. = Output Frequency
Range Two	Crystal or V.F.O. = $\frac{1}{2}$ Output Frequency
Range three	Crystal or V.F.O. = $\frac{1}{4}$ Output Frequency.

M.F. TRANSMITTER AP100334

General

15. It will be assumed that the transmitter forms part of a normal installation and that it has been properly connected, as indicated in Chapter 2. It is also assumed that the headphones or loudspeaker connected to the receiver are in use. The functions of the various transmitter controls are as follows:-

Cct. Ref. No.	Control	Function.
C1	Master Oscillator	Tunes the Master Oscillator.
L8	P.A. Anode	Fine tuning of the P.A. and the aerial.
SWA	AE Loading	Matches the P.A. circuit to the aerial.
SWB	AE Reactance	Coarse tuning of the P.A. and the aerial.
SWC	CW/MCW Switch	Switches on the MCW oscillator.

A phone jack fed from the receiver and a local volume control are also provided.

16. (i) Connect the aerial to the glass terminal, set the M.O. control to the required frequency and lock the dial.

(ii) Turn the AERIAL LOADING SWITCH and the AERIAL REACTANCE SWITCH to position 1, and the C.W./M.C.W. SWITCH to the type of transmission required.

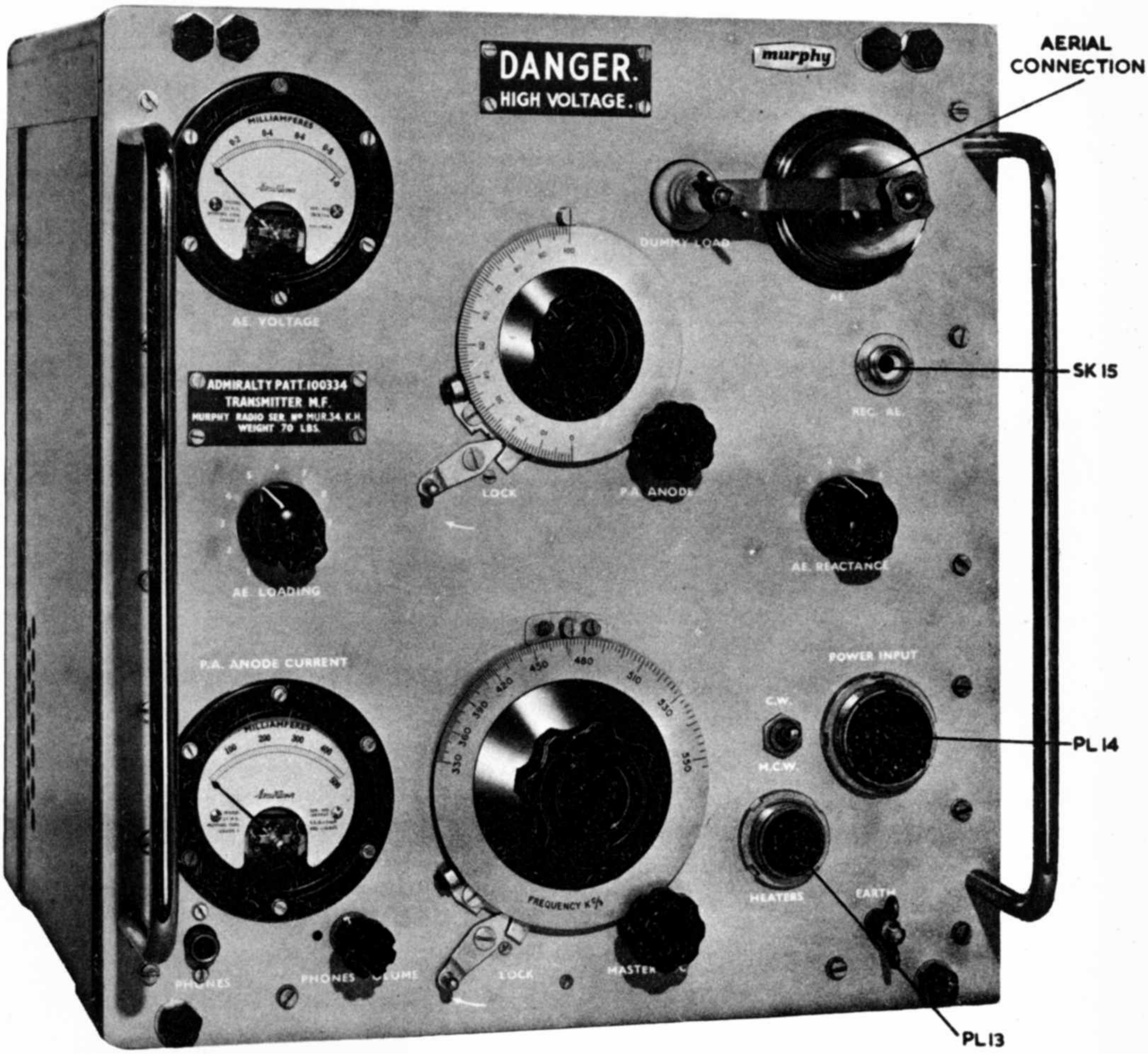
(iii) Check the power unit to ensure that the H.T. SUPPLY SWITCH is at STANDBY, set the LOCAL/REMOTE SWITCH to LOCAL, plug the key into the jack on the power unit and close the MAINS SWITCH.

(iv) After a delay of 30 seconds, turn the H.T. SUPPLY SWITCH on the power unit to "TRANS READY" and press the key.

(v) Adjust the P.A. ANODE CONTROL in conjunction with the AERIAL REACTANCE SWITCH for minimum reading in the P.A. ANODE METER.

(vi) Adjust the AERIAL LOADING SWITCH for a maximum reading on the AERIAL VOLTAGE METER provided that the P.A. ANODE current does not exceed 220 milliamps.

(vii) Repeat (v) and (vi) above for optimum output, keeping the P.A. ANODE current at 220 mA or less.



M.F TRANSMITTER AP100334

NOTE: Under certain conditions when using the high reactance position of the Aerial Reactance Switch at low frequencies the transmitter frequency may be double the indicated frequency. Care must be taken that this does not occur, by starting with the AERIAL LOADING and AERIAL REACTANCE switches anti-clockwise and working on the first P.A. anode current dip obtained by the above procedure.

POWER UNIT AP 100336.

Working Instructions.

17. It is assumed that the unit has been properly installed and connected, as detailed in Chapter 2. Operational use of the power unit is largely covered in the preceding chapters, which deal with the working of the other units in the installation, but for convenience a list of controls is given below.

18.

Circuit Reference Number.	Control	Function.
SWA	MAINS SWITCH (ON-OFF)	Turns on the Main Supply in the unit.
SWB	H.T. SUPPLY	Turns on supplies as follows:
	(REC)	All receiver operating voltages.
	(STAND BY)	Transmitter heaters and receiver operating voltages.
	(TRANS READY)	All transmitter and receiver operating voltages.
SWC	LOCAL/REMOTE	Changès over from local to to remote working.

19. In addition to the power outlets for the remainder of the equipment, a socket for the microphone connection and a key jack are provided on the power unit.

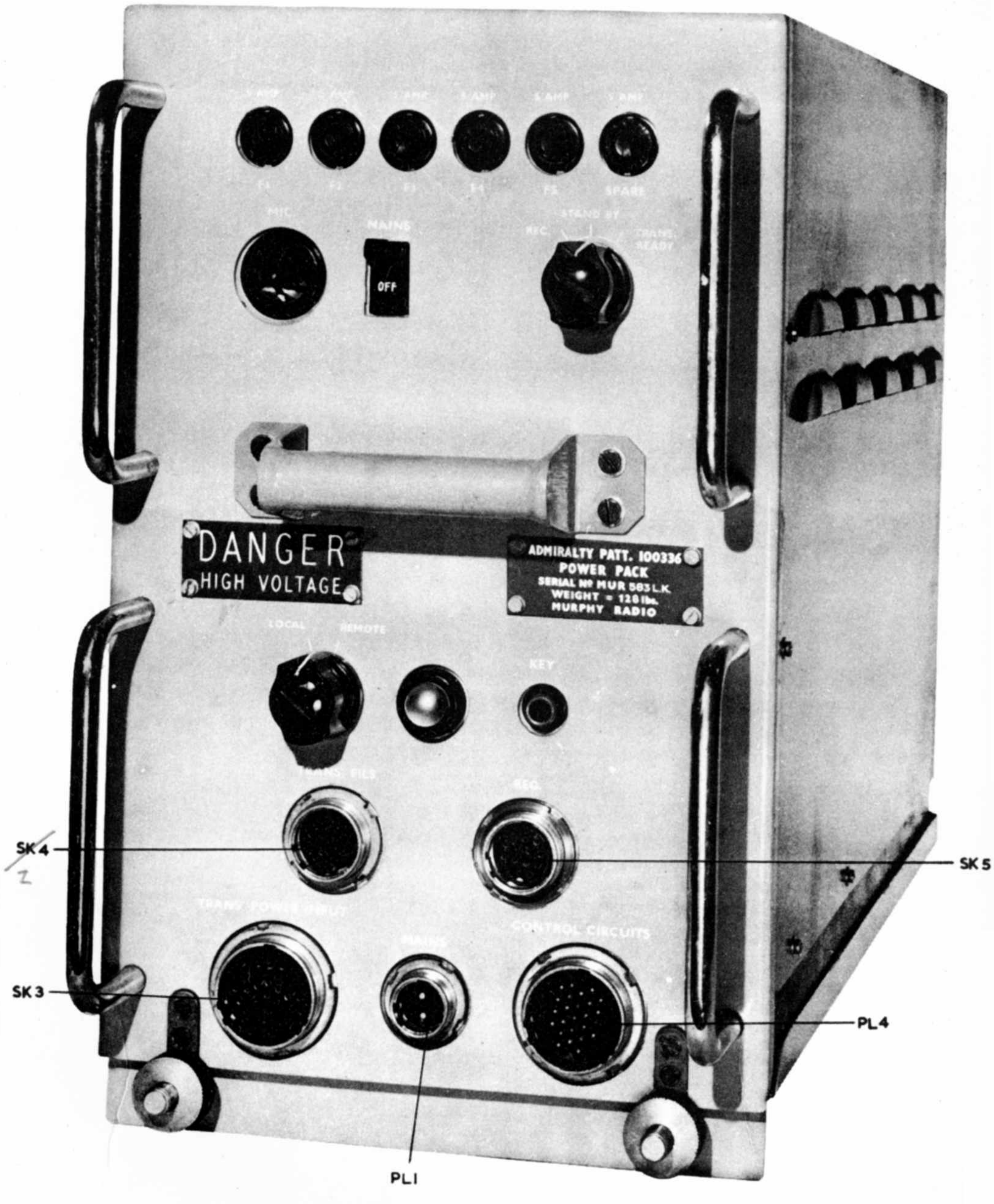
Operation

20. (a) Receiver Only.

(i) Check that SWB is at REC.
(ii) Turn SWA to ON.
(iii) Allow about 30 seconds for the equipment to warm up.

(b) Receiver and Transmitter.

(i) Set SWB to STAND BY.
(ii) Turn SWA to ON.
(iii) Allow about 30 seconds for the equipment to warm up and turn SWB to TRANS READY.



POWER UNIT AP100336

NOTE: The receiver may be operated 20 seconds after stage (b) (iii) above. Only one warming up period is necessary when SWB is at STAND BY.

No damage will result to the equipment if the main switch SWA is turned ON with SWB at TRANS READY but the above procedure is preferable and should be adopted when conditions permit.

CHAPTER 4

MECHANICAL DESIGN
AND
CIRCUIT ALIGNMENT

INTRODUCTION

H.F.M.F.RECEIVER	AP100335
H.F. TRANSMITTER	AP100333
M.F. TRANSMITTER	AP100334
POWER UNIT	AP100336

CHAPTER 4.

MECHANICAL DESIGN AND CIRCUIT ALIGNMENT

General

1. This chapter deals with two aspects of the equipment, namely: mechanical design and assembly, and circuit alignment procedures.

Each unit is dealt with separately but it is assumed that it forms part of a normal, complete, working installation. Where it is necessary to make any alteration in procedure due to the unit being under test in a workshop, a note will be included giving details.

It will be seen that the Test Gear listed below is divided into two sections, viz: Routine Test Gear and Full Test Gear. The Routine Test Gear is available and sufficient for all daily, weekly and monthly checks: the Full Test Gear, enables the complete alignment procedures to be carried out, BUT IT IS EMPHASISED THAT THE RE-ALIGNMENT OF THE EQUIPMENT SHOULD ONLY BE CARRIED OUT AS AN EMERGENCY MEASURE, AND THIS SHOULD BE CHECKED BY THE DOCKYARD AT THE FIRST OPPORTUNITY.

Mechanical Design.

2. The Receiver and both Transmitters are housed in steel cabinets reinforced by two bands around the outside running parallel with the front panel. Ventilating louvres are cut into cabinets, which, while not water-tight provide good protection from the weather. It is intended that the cabinets are bolted into the installation and remain in position when the units are temporarily removed.

The Power Unit is similarly protected by a steel cabinet but is provided with a separate mounting rack so that it may be easily removed from the installation complete with its cover.

Test Gear

3. The following Test Gear is required when servicing the equipment.

(1) Routine Test Gear

Avometer Model 7X	A.P.32144
Noise Generator 15 kc/s - 100 Mc/s CT.82.	A.P.67166

3. (2) Full Test Gear

Avometer Model 8	A.P.12945
Noise Generator 15 kc/s -100 Mc/s CT.82	A.P.67166
Signal Generator 85 kc/s -30 Mc/s CT.218	10S/16780
OR	
Oscillator, Test, Portable 85 kc/s -32 Mc/s, CT.212	ZD.00784
Oscillator G205	A.P.W.7252
OR	
Oscillator (Advance J1)	A.P.014290
Oscilloscope Type 13A	A.M.10S/831
OR	
Oscilloscope Miniature CT.52	A.P.68622
Valve Voltmeter CT.54	A.P.67921
Wattmeter A.F.	A.P.54708

H.F. M.F. RECEIVER AP100335.

Mechanical Description.

4. The receiver chassis is divided into four main units comprising the front panel and bracket, the R.F. unit, the I.F. unit and the A.F. unit. The three latter units are attached to the front panel so that this panel carries the whole assembly. The necessary electrical connections are made by means of multi-way plugs and sockets through an internal cabling system.

Removal of Units.

5. The method of removal of all the units is dealt with in Chapter 6.

R.F. Unit

6. This sub-chassis carries the main tuning capacitor gang, together with the R.F. and local oscillator valves, the signal frequency and local oscillator tuned circuits for the five wavebands, and the first I.F. transformer TR106. The R.F. tuned circuits are contained within the screening cans at the rear of the chassis, which may be detached after removal of the two milled nuts on each can. TR106 is contained within the I.F. screening can mounted adjacent to the valves. The remainder of the small components are enclosed within the cover on the front side of the unit.

7. The unit is provided with a test point strip adjacent to the valve holders on the valve deck to which are connected the electrodes indicated on the chassis alongside the strip. These test points are marked with a * on the table of voltage tests. The I.F. and A.F. chassis are mounted below the bracket on the front panel, the I.F. being close to the panel and the A.F. unit behind it. The A.F. unit is removed by loosening the two milled screws at the rear of the unit, detaching the connecting plug and withdrawing it to the rear.

I.F. Unit.

8. This sub chassis carries on its forward side the I.F. transformers TR201 - TR204, together with the crystal filter and B.F.O. tuned circuits, all in similar screening cans, and the associated valve stages and small components. At the rear of the sub-chassis, are the selectivity (SW201) and BFO (SW203) switches mounted parallel to the front panel and driven at right angles by bevel gears on the switch operating spindles. Removal of all the units enables all components to be easily reached for servicing.

A.F. Unit.

9. This sub-chassis carries the audio stages V301 - V303, together with the 200 c/s filter chokes L301 - L302, the output transformer TR301 and the small components associated with the audio stages.

Chapter 4.

Circuit Alignment

10, Remove the receiver from its case, detach the various sub-chassis from the front panel and then replace the control knobs and remake all plug and socket connections. Switch on the receiver and signal generator and allow them to warm up.

11. Unless otherwise stated, the testing and alignment will be carried out under the following conditions;

Signal Generator	Output impedance 80 ohms	
Receiver	Input Impedance 80 ohms	
	Output impedance 500 ohms (Loudspeaker Jack).	
	Standard Output 2W into 600 ohms	
Connections	Signal Generator	Pins B & C of PL101
	Output Meter	Loudspeaker Jack.

Signal Generator Adjustments.

12. The receiver contains a crystal controlled B.F.O. which may be used to ensure accurate alignment. It is necessary to have the B.F.O. coils approximately aligned before this can be done. The following procedure will ensure that the B.F.O. will operate, and check the signal generator.

(i) Switch SW203 to TUNE and SW201 to 3 kc/s.

(ii) Connect the signal generator to the control grid(pin 1) of the last I.F. stage V203 and feed in a signal at 800 kc/s.

(iii) Adjust B.F.O. coil L202 for zero beat.

(iv) Switch SW203 to CAL and adjust the signal generator for zero beat.

The signal generator is now correctly set to 800 kc/s.

I.F. Alignment.

13. (i) Set the Selectivity Switch to SW201 to 3 kc/s.
Set the Wave Band Switch SW101 to Band 3.
Set the A.G.C. Switch SW202 to OFF.
Set the B.F.O. Switch SW203 to OFF.
Set the Tuning Dial to about 2 Mc/s and C211.
to about half capacity.

(ii) Connect the signal generator to the Test point marked "L.O. Volts" at the grid of V103.

(iii) Turn the R.F. and A.F. gain controls fully clockwise.

(iv) Turn on signal generator with modulation (30%) and adjust output for a convenient reading.

(v) Trim all I.F. coils (two in each screening can) for maximum output in the followingorder:

TR204, 203, 202, 201, TR106 (Primary) (Top Core).

connecting the signal generator to the preceding valve control grid if necessary. (TR204 should be tuned to the second peak found by screwing the core inwards).

(vi) Finally adjust the secondary of TR106 for minimum output. (Bottom core).

Note: *TR106 is mounted on the R.F. unit. The alignment of this transformer is facilitated by starting with both cores right out and tuning the top core for first peak and the bottom core for the first dip.*

Crystal Filter Alignmant.

14. (i) Connect a 200 microammeter across R228, positive terminal to chassis, and switch SW201 to 1 kc/s.

(ii) Feed in 800 kc/s unmodulated determined by the receiver CAL method as before, and adjust the top trimmer of the crystal can for maximum reading of microammeter.

(iii) Offset the frequency of the signal generator 1.5 kc/s and adjust the trimmer at the side of the can for minimum reading, increasing the signal generator output as necessary.

B.F.O. Adjustment.

15. (i) Feed in 800 kc/s unmodulated signal, to the oscillator injector grid of V103 determined by the receiver CAL method as before.

(ii) Set signal generator output to approximately 100 microvolts.

(iii) Switch SW201 to 200 c/s and SW203 to High.

(iv) Adjust bottom core of BFO coil (L202) for maximum output, turning to first peak in.

(v) Switch SW203 to Low and tune C239 for maximum output.

(vi) Switch SW201 to 1 kc/s and SW203 to Tune. Adjust C240 for zero beat.

(vii) Check that the note does not change appreciably when switching from High to Low.

R.F.Alignment.

16. (i) Set SW101 to Band 1.

(ii) Set SW203 to OFF.

(iii) Set SW201 to 3 kc/s and SW202 to OFF.

(iv) Connect signal generator output to Pins B and C of PL101.

The table below gives the alignment and tracking points for the receiver.

TABLE 1.

Frequency - Mc/s			
Band	Trim Inductance	Mid Band Tracking Point	Trim Capacitor
1	0.063	0.118	0.170
2	0.186	0.344	0.505
4	1.520	2.910	4.300
4	5.00	8.80	13.600
5	16.00	21.000	27.500
Dial Mark	+	NONE	+

In order to avoid the possibility of spurious oscillations which might affect the alignment it is advisable to turn down the receiver gain and use a large output from the signal generator.

17. The procedure is as follows :

(i) Turn the dial to 63 kc/s mark, feed in a signal at 63 kc/s, preferably modulated at 400 c/s 30%, and adjust the following coils for maximum output in the order indicated.

L 101
TR 121
TR 111
TR 101

(ii) Turn the dial to the 170 kc/s mark, set the signal generator to 170 kc/s and similarly adjust in the order given.

C 134
C 125
C 115
C 106

(iii) Re-set the signal generator and dial to 63 kc/s and re-adjust the coils mentioned in paragraph (i) for maximum output.

(iv) Re-set the signal generator and dial to 170 kc/s and similarly re-adjust the capacitors mentioned in paragraph (ii).

(v) Repeat these adjustments until no further improvement can be made.

18. Make similar adjustments to the following coils and capacitors on the other wavebands as shown below, adjusting the coils at the lower frequency and the capacitors at the higher frequency on each band in the order given, repeating the adjustment at each end of the band as necessary until no further improvement can be obtained.

NOTE: *If the set is very far off alignment it may be necessary to adjust each stage in turn.* The valve grids are inaccessible but the signal may be injected through the gang capacitor cover, or at anode test points via a suitable capacitor.

TABLE 2.

Band	Frequency Mc/s.		Component.			
2	0.186 0.505	Inductance Capacitor	L102 C159	TR122 C 151	TR112 C 147	TR102 C 142
3	1.52 4.3	Inductance Capacitor	L103 C160	TR123 C 152	TR113 C 148	TR103 C 143
4	5.0 13.6	Inductance Capacitor	L104 C161	TR124 C 153	TR114 C 149	TR104 C 144
5	16.0 27.5	Inductance Capacitor	L105 C162	TR125 C 154	TR115 C 150	TR105 C 145

I.F. Rejector Circuit Alignment.

19. (i) Transfer the signal generator to between Pin D of PL101 and Earth (Pin A). Feed in a 30% modulated signal at 800 kc/s.

(ii) Set SW101 to Band 2 and tune to 550 kc/s.

(iii) Adjust C102 for minimum output.

Signal to Noise Ratio.

20. The overall performance of the R.F. section may now be checked as follows:

(i) Connect the signal generator to the 80 ohms input via a 20dB attenuator pad and set its output level to 1µV + 40dB.

(ii) Set: A.G.C. Switch SW202 to OFF.
SW101 to Band 1.
SW203 to TUNE.

(iii) Tune signal generator at 118 kc/s (CW) for zero beat.

(iv) Turn B.F.O. (SW203) OFF and turn on signal generator modulation (400 c/s, 30%).

(v) Set SW202 to ON.

(vi) Set output to the standard figure using the A.F. gain control.

On switching off the signal generator modulation a reduction in output not less than the figures given in TABLE 3 below should be obtained.

21. TABLE 3.

Signal Frequency (Mc/s).	Drop in output (dB) at least.
0.118	30
0.344	30
2.91	30
8.8	26
21.0	24

Note: The above table shows figures for M.C.W. only.

I.F. Unit Performance.

22. Check that the following sensitivity figures are obtainable.

(i) Overall Sensitivity. For standard output the minimum input must not exceed:

200 Microvolts at 3 kc/s bandwidth.
300 Microvolts at 8 kc/s bandwidth.

(ii) I.F. Rejection. Transfer the signal generator to Pin D of PL101 and feed in a signal of 550 kc/s. Tune the receiver and adjust for standard output. Re-tune the signal generator to 800 kc/s using the receiver CAL method as before, and check that at least 80dB increase signal is necessary to give the standard output.

(iii) Bandwidth. Re-tune the receiver to about 2 Mc/s and apply signal via a 0.01μF capacitor to the mixer grid (V103). Adjust gain controls to maximum and with input to give the standard output at each bandwidth position, check that the total bandwidth at the various settings of SW201 are as follows:-

23.

SW101	Input	Bandwidth.
3 kc/s	-6dB	not less than ± 1.5 kc/s.
3 kc/s	-30dB	not more than ± 6 kc/s.
8 kc/s	-6dB	not less than ± 4 kc/s.
8 kc/s	-30dB	not more than 12 kc/s.

(iv) Crystal Response. With standard 800 kc/s input and micro-ammeter connected to the junction of R227/R228, switch between 3 kc/s and 1 kc/s positions of SW201 check that there is not much more than 2:1 difference in readings. With SW201 set to 1 kc/s adjust signal input to give 40μA reading on the meter. Increase input 6 dB and offset tuning high and low, checking that total spread to reduce reading to 50μA exceeds 1 kc/s. Repeat with 30dB increase of signal and check that spread is less than 5 kc/s.

(v) B.F.O. Output. With the B.F.O. Switch SW203 in the HIGH position a reading of not less than 5 microamps should be obtained on the meter connected across R228. During this test the grid of V203 should be earthed via a 0.01μF capacitor.

Automatic Gain Control.

24. With the same test conditions, and the signal generator connected to Pins B and C of PL101, but with the A.G.C. switch(SW202) turned off and the input frequency 2 Mc/s, adjust the signal generator to give 1μV+50dB output. Switch A.G.C. ON and adjust the audio gain control to give standard output. Increase the signal input 60dB and check that the output change is not more than 10dB.

Image Rejection.

25. Set the signal generator at the mid band frequency as set out in the table below and adjust for standard output. Check that the image rejection at each frequency is not less than the figure shown.

TABLE 4.

Band	Receiver Frequency.	Image Frequency	Rejection.
3	2.91 Mc/s	4.51	80 dB
4	8.8 Mc/s	10.4	60 dB
5	21.0 Mc/s	22.6	40 dB

Chapter 4.

Audio Stages.

26. To check the audio stages the following apparatus will be required:

Audio Oscillator	AP104290
Wattmeter A.F.	AP54708

Audio Gain

27. The signal should be fed to Pin 6 of SK301.

(i) Turn SW202 off, SW201 to 3 kc/s and the A.F. gain control to maximum.

(ii) Short V203 grid to earth with a 0.01µF capacitor.

(iii) Check that with an input of 0.3V at 1000 c/s the standard output may be obtained.

Audio Frequency.

28. With the above test conditions the following figures should be obtainable:

SW201 at 200 c/s. Resonance between 900 and 1,100 c/s. The bandwidth should be less than 700 c/s at 20dB down.

SW201 at 3 kc/s.

Frequency c/s.	Response
300	Flat between +1 and -8dB.
1,000	0 dB.
2,500	Flat between +1 and -4dB.

Typical Voltage Readings.

29. The following tables give an indication of the voltage which may be expected at various points on the circuit, under the conditions stated below. It must be remembered that these are average figures obtained from a small number of sets so that a variation in the reading of up to $\pm$ 15% from the figures given will not necessarily indicate a fault.

Test Conditions.

Signal Input	Nil
R.F. Gain	Max.

A.F. Gain	Max.
SW101	
SW102	OUT
SW201	3 kc/s.
SW202	OFF
SW203	OFF

All readings are taken between the circuit point indicated and earth.

R.F. Unit.

30. TABLE 5.

Unit	Valve	Test Point	AVO 7X Range	P.D.	Remarks.
	V101 CV138 1st R.F.	A * Sc * C *	400 400 10	236 178 1.7	
	V102 CV131 2nd R.F.	A * Sc * C *	400 400 10	240 224 3.6	R.F. Gain Min.
R.F.	V103 CV453 FC	A * Sc * C *	400 400 10	228 97 1.5	
	V104 CV138 L.O.	A Sc C	400 400 10	146 146 0.5	
	V103	With valve voltmeter at the following frequencies: 0.118 Mc/s, 0.344 Mc/s. 2.91 Mc/s, 8.8 Mc/s, 21 Mc/s.			
	G3 *	11 8.2 7.2 8.5 5.5			

* These points are brought out to the test panel on the R.F. stage valve deck.

Chapter 4.

I. F. Unit.

31. TABLE 6.

Unit	Valve	Test Point		AVO 7X Range	AVO 7X P.D.	Remarks.
	V201	A		400	233	
	CV138	Sc		400	233	
	1st I.F.	C		10	5.7	
	V202	A		400	233	
	CV138	Sc		400	233	
		C		10	4.8	
	2nd I.F.	C		10	5.2	Bandwidth 8 kc/s.
		C		10	4.6	Bandwidth 1 kc/s.
	V203	A		400	230	
I.F.	CV138	Sc		400	220	
		C		100	10	
	3rd I.F.	C		100	11.5	Bandwidth 8 kc/s.
		C		100	14	Bandwidth 1 kc/s.
	V204A	C		100	14.	
	CV140	(Delay)				
	A.G.C.					
	V206	SW203	A	400	157	
	CV131	Cal.	Sc	400	177	
			C	10	1.2	
	B.F.O.	SW203	A	400	218	
			Sc	400	111	
	With G1					
	connected	Off	C	10	4.5	
	to earth					
	via a	SW203				
	.01µF		A	400	211	
	capacitor	High	Sc	400	99	

A.F. Unit.

32. TABLE 7.

With A.F. Control at Min.					
			AVO 7X		
Unit	Valve	Test Point	Range	P.D.	Remarks
	V301	A	400	91	
		A	400	240	
	CV131	Sc	400	133	Bandwidth 200 c/s
	1st A.F.	C	10	3.30	
			10	3.57	
	V302	A	400	93	
A.F.	CV131	Sc	400	61	Bandwidth 200 c/s
	2nd A.F.	C	10	1.72	
	V303	A	400	337	
	CV2136	Sc	400	307	Bandwidth 200 c/s
	A.F. O/P	C	100	19.3	

H.F. TRANSMITTER AP100333.

Mechanical Description

33. The transmitter is built in three main sections carried on chassis mounted behind the front panel. The majority of the components are mounted on the lower chassis which runs the whole width of the front panel, to which it is attached at its forward edge.

34. Viewing the unit from the front, the M.O. tuning capacitor C1 A-D is to the left with V3, V4 and Relay RLB2 between it and the lefthand edge of the chassis, Valves V2, V1, V5, V6 and V7 are arranged in that order along the rear of the chassis with V14 in the rear righthand corner, separated from the rest by a screen which runs from front to rear along the righthand side of the chassis. V8, V11 and V12 are mounted from front to rear adjacent to this screen, and V9, RV2, V10, RV1 in another row outside them: the transformer TR2 and V13 are situated behind the valves. The P.A. Anode tuning capacitor C20 is mounted between C1 and the screen. In 'A' pattern transmitters, relays RLB and RLD are mounted together beneath the lower chassis.

35. Above these components are mounted two small sub-chassis at the left and right of the aerial coupling coil which is set at an angle of 45° to the front panel in the centre. The lefthand chassis carries the aerial capacitors and the aerial loading coil, whilst the righthand chassis carries the aerial current meter transformer and, at rear, TR3.

Circuit Alignment.

36. It will be assumed that power supplies to work the set are available with facilities for keying. It will be convenient to use the power unit normally associated with the transmitter, but in workshops a plug should be inserted into the control circuit socket shorting together the following pins to simulate LOCAL working.

Short together as separate groups.	HKVY JM LTU

In addition a switch connected across the appropriate type of jack plug may be plugged into the keying socket on the power unit.

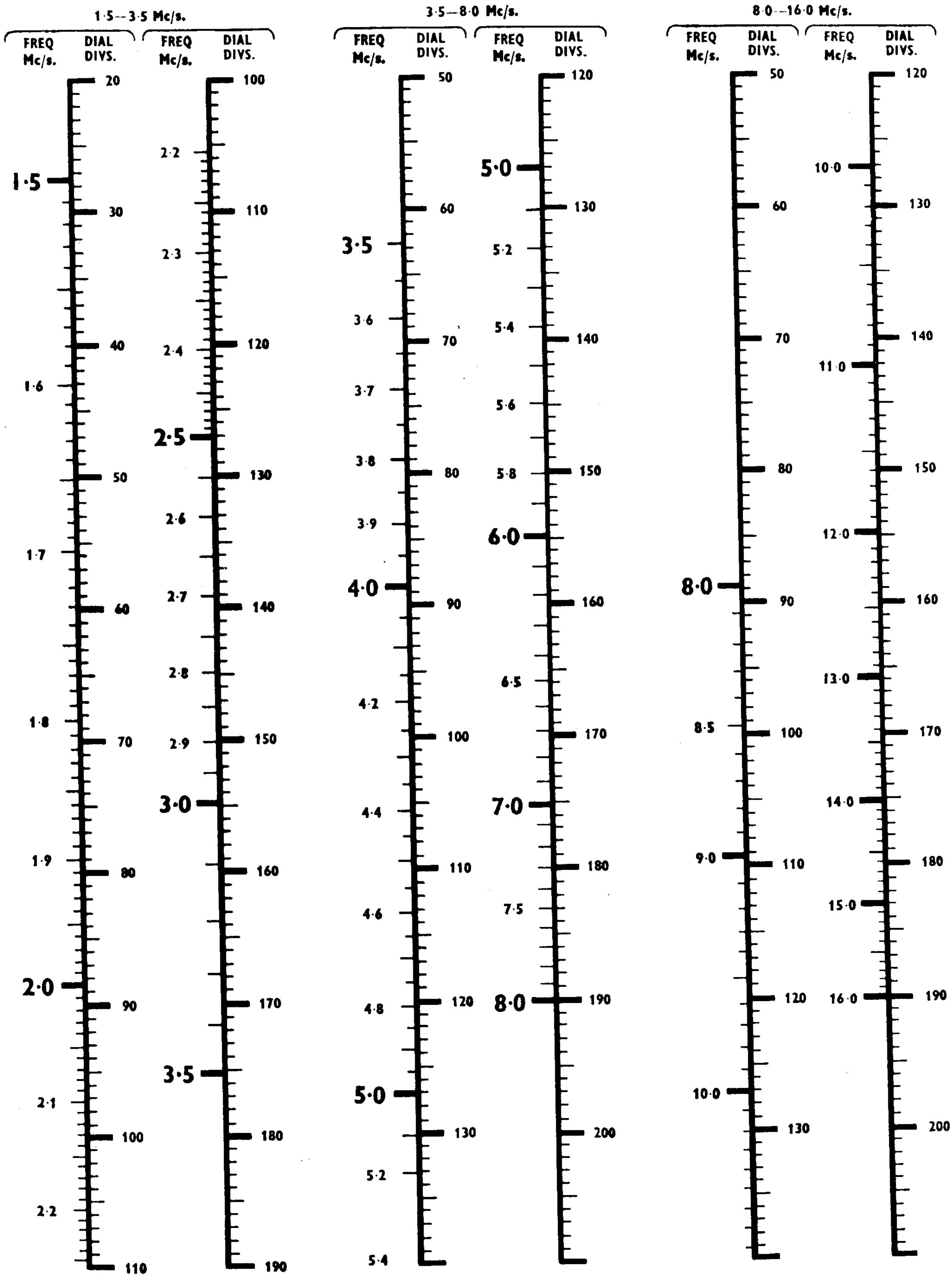
37. For the majority of the lining-up it is not necessary to have the power amplifier running, and it is advisable as a safety precaution to disconnect the H.T. to these valves so as to render the transmitter more convenient to work on. If the power unit is accessible the connections to the transformer TR1 should be removed, thus cutting off the A.C. supply to the H.T. rectifiers, leaving only the 350V H.T. supply. If the power unit cannot easily be reached the lead from pin C of PL9 on the transmitter should be detached. With modified power units, it will only be necessary to remove fuse F5.

Calibration of Master Oscillator.

38. (i) Loosen the six green painted screws at the top and bottom edges of the front panel, withdraw the transmitter from its case and turn it upside down.

H.F. TRANSMITTER AP100333

CALIBRATION CHART



38. (ii) Connect the multi-range meter across R84 and set to highest mA range to indicate P.A. grid current.

(iii) Set tuning slugs in coils L4 to L7 to about half travel.

(iv) Turn to Band 1 and set C1 dial to 190°.

(v) Set C2 so that the M.O. frequency with C1 at 190° is 4 Mc/s, using a wavemeter or the crystal calibrated receiver.

(vi) Turn C1 to a low dial reading and ensure that a frequency of 1.5 Mc/s can be obtained.

39 It is now convenient to calibrate the dial over the whole range of Band 1 and to draw a calibration curve for the set.

Alignment of Buffer Stage.

40. Band 1.

(i) Turn SWB to Band 1.

(ii) Set the M.O. to 1.5 Mc/s.

(iii) Adjust the core of L5 for maximum reading on the multi-range meter across R84.

(iv) Set the M.O. to 3.5 Mc/s.

(v) Adjust C23 for maximum reading on the meter.

(vi) Repeat (ii) to (v) until no further improvement can be obtained.

41. Band 2.

(i) Turn SWB to Band 2.

(ii) Set the M.O. dial to 1.75 Mc/s. (3.5 Mc/s final frequency).

(iii) Adjust the core of L6 for maximum reading on the meter.

(iv) Set the M.O. dial to 4 Mc/s (8 Mc/s final frequency).

(v) Adjust C18 for maximum reading on the meter.

(vi) Repeat (ii) to (v) until no further improvement can be obtained).

42. Band 3.

(i) Turn SWB to Band 3.

(ii) Set the M.O. dial to 2 Mc/s (8 Mc/s final frequency).

42. (iii) Adjust the cores of L4 and L7 for maximum reading on the meter.

(iv) Set the M.O. dial to 4 Mc/s (16 Mc/s final frequency).

(v) Adjust C10 and C17 for maximum reading.

(vi) Repeat (ii) to (v) until no further improvements can be obtained.

43. When the adjustment is completed meter readings of the following order should be obtained:

Band 1	17 - 30 mA
Badd 2	15 - 25 mA
Band 3	10 - 25 mA

Crystal Control

44. Switch the SWA to crystal control and plug in a crystal appropriate to each range. Tune C1 for maximum current on the meter for each range and see that the currents obtained lie within the limits stated for M.O. operation in paragraph 43 above.

Fault Tracing

45. Should no reading be obtained on the meter on any range, it will be necessary to use the valve voltmeter to trace the fault. The voltage across the following points should be checked and readings of the order indicated should be obtained. Absence of such readings will indicate the whereabouts of the fault.

Across L1	60 - 80V
V3 Anode to Earth	70 - 100V
V4 Grid to Earth	60 - 100V
V4 Anode to Earth	Over 50V

46. When the alignment of the R.F. section has been completed the multi-range meter should be removed and the transmitter turned upright.

Audio Stages.

47. Re-connect the P.A.H.T. Supply and connect an audio oscillator to the microphone input sockets SK6 Pins 3 and 7 in the power unit. It is necessary to provide a balanced source of 600 ohms impedance. This may be conveniently arranged by using an isolating transformer, with a filter circuit across the secondary consisting of two 280 ohms resistors in series in each line with a 68 ohms resistor between the line at the junction of the two resistors.

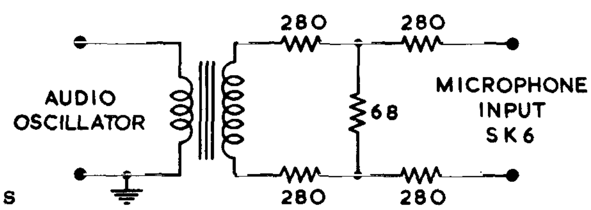


Fig. 4.1.

Any measurement of input voltage should then be made across the microphone input terminals of SK6, with point D on Plug 9 earthed.

Vogad Setting.

48. (i) Connect an oscilloscope scross the dummy load in the transmitter preferably by means of a coaxial cable directly to the C.R.T. plates.

(ii) Turn RV1 fully clockwise.

(iii) Adjust the input signal to -6dB relative to the standard input of 0.775V 1000 c/s (or any operational voltage which may be locally required).

(iv) Adjust RV2 to give 83% modulation as observed on the R.F. Output.

(v) Turn RV1 anti-clockwise until the VOGAD just begins to operate and the modulation falls to 80%.

49. The VOGAD should now maintain the modulation below 95% in spite of an increase of 12dB in input voltage.

Frequency Response

50. (i) Adjust the input signal level at 1000 c/s to 0.775V (standard input) and measure modulation depth as indicated on C.R.T. display.

(ii) Vary the frequency of the input signal from 250 c/s to 2500 c/s and check that variation in modulation depth does not exceed $\pm$ 3dB.

(iii) Check that the response is not down by less than 20dB at 3500 c/s.

(iv) Check that at 5000 c/s the response is not greater than -38dB.

M.C.W. Oscillator

51. (i) Turn SWE to M.C.W. operation and observe the M.C.W. waveform.

(ii) Check that the modulation depth is between 80% and 95% and that the modulating waveform is approximately sinusoidal.

Power Output.

52. The following measurements are performed with dummy loads as tabulated below:

Load A	5.6 ohms
Load B	10 ohms in series with 50pF
Load C	1000ohms in series with 20μH
Load D	250 ohms in series with 20μH
Load E	1000 ohms
Load F	1000 ohms in series with 50 pF

Procedure

53. (i) Connect Dummy Aerial load A (5.6Ω 40Watts) in series with thermal ammeter across Aerial and Earth terminals of transmitter.

(ii) Set Range switch to 1.5-3.5 Mc/s, M.O. dial to 1.5 Mc/s, Aerial coupling to Min and Aerial Current meter switch to maximum sensitivity.

53. (iii) Set H.T. Supply to Stand-by, P.A. H.T. connected, and switch on. After one minute switch to Trans. Ready and close key.

(iv) Adjust P.A. dial for minimum reading on P.A. Anode current meter . At the extreme frequencies in each band it is possible to tune the P.A. to the wrong harmonic. The correct harmonic is selected when the readings on the M.O. and P.A. dials are of the same order.

(v) Selecting suitable position for aerial capacitor switch, adjust Aerial Loading Coil for maximum reading on aerial current meter, adjusting meter sensitivity as required.

(vi) Increase Aerial Coupling for maximum reading on Aerial Current Meter or until P.A. anode current is 200mA whichever occurs first.

(vii) Repeat steps(iv) to (vi) for optimum reading on Aerial current meter provided that P.A.anode current of 200mA is not exceeded.

(viii) Repeat at frequencies of 2.0 and 3.5 Mc/s.

(ix) Set Range to 3.5-8 Mc/s and repeat steps(iv) to(vii) at frequencies of 3,5,6, and 8 Mc/s.

(x) Set Range to 8 - 16 Mc/s and repeat steps (iv) to (vii) at frequencies of 8,12,and at 16 Mc/s.

54. The R.F. Output is measured by the load current, which should not be less than the values given in the table below.

Mc/s.	A*	B	C	D	E*	F
	amp	amp	mA	mA	mA	mA
1.5	2.2	0.7	-	-	150	160
2	2.3	-	-	-	175	-
3.5	2.65	1.7	-	-	200	170
3.5	2.5	-	-	-	240	-
6	2.7	-	-	350	200	-
8	2.5	-	-	-	210	-
8	1.6	-	160	-	180	;
12	2.8	-	-	-	200	-
16	1.5	-	-	-	200	-

* Provisional Limits for Loads A & E.

Chapter 4.

M.F. TRANSMITTER AP100334.

Mechanical Description

55. The transmitter is housed in a steel cabinet, intended for tier mounting, from which it may be removed after loosening the six green painted screws at the top and bottom edges of the front panel.

56. The main chassis is a shallow box structure attached to the front panel at the bottom edge. Below this chassis are mounted the majority of the small components, together with the M.O. tuning capacitors, the coil L1, trimmer C31 and the audio oscillator inductance.

57. Above this chassis, mounted on a vertical panel at the rear of the transmitter are the valves and relays, arranged in two rows, In the top row from left to right, are RLC, V1, V2 V6, L4, RLA and L2, L3. In the bottom row are V9, V8, V7, V4 and V3.

58 Above the valve mounting panel is a heavy metal box, housing the coil L8 and the choke L6, together with the aerial capacitor, the aerial voltage meter and dummy load components. Access to this compartment may be gained by removing the 6 bA screws holding the "L" shaped rearpanel in place. It is, however, important to ensure that this panel is replaced and all its fixing screws tightened before any adjustment is made to the transmitter, as any lessening of the screening effect caused by faulty contact between the panel and the box will materially affect the characteristics of the transmitter.

Circuit Alignment.

59. Note: It will be assumed that power supplies to operate the set are available with facilities for keying. It will be convenient to use the power unit normally associated with the transmitter and in this case a plug should be inserted in the control circuit socket with the following connections:

Short together as separate group	H K V Y
	J M
	L T U

60. Since this transmitter operates on only one frequency band, no ganging of circuits is necessary, the damped tuning circuits of the buffer stage, being stagger-tuned so as to cover the whole working range as described earlier within this manual.

61. Should any major overhaul have been carried out, it will be advisable to check the calibration of the M.O. and it may then be necessary to re-adjust the trimmer C31.

In this case, proceed as follows:

(i) Disconnect H.T. supply to P.A. valves by unsoldering lead to PL14 Pin C. With modified power units it will only be necessary to remove fuse F5.

(ii) Connect the meter type (AVO 7) across R7 (10K) on the 400 V range.

(iii) Loosely couple the wavemeter to L5 and set to 330 kc/s. Switch SWC to C.W. operation and close key.

(iv) Set C31 to mid capacity.

(v) Set M.O. dial to 330 kc/s and lock.

(vi) Slightly loosen vane locking nut on the main shaft of tuning capacitor and adjust position of vanes until the M.O. frequency is exactly 330 kc/s. Tighten nut ensuring that M.O. frequency remains at 330 kc/s.

(vii) Set M.O. dial and wavemeter to 550 kc/s and adjust C31 until M.O. frequency is exactly 550 kc/s.

(viii) Repeat steps(v) to(vii) until no further adjustment is necessary.

(ix) Rotate M.O. dial from 330 kc/s to 550 kc/s and check that the reading of the P.A. grid circuit meter is within the limits 60 - 90 volts.

(x) Set M.O. dial successively to 330, 400, 440, 500 and 550 kc/s approaching setting first from one direction and then the other. Check calibration of M.O. dial using the wavemeter. Accuracy of calibration and re-set to be within $\pm$ 2 kc/s at these frequencies.

(xi) Remove P.A.grid current meter and resolder connections to PL14 Pin C.

Replacement of Bandspread Inductance or replace fuse F5.

62. The inductance in the M.O. Anode, Buffer Grid and Buffer Anode circuits are broadly tuned to 330, 555, and 440 kc/s respectively. The correct adjustment position of these coils is with the core flush with the end of the former, and any replacement coil should be so adjusted before insertion.

Chapter 4.

POWER UNIT AP100336.

Chassis Layout.

63. The Power Unit comprises a steel chassis divided into two decks, mounted in a steel case and provided with a mounting rack, upon which it is retained by two milled nuts engaging lugs at the base of the front panel. Two rollers are provided near the back of the bottom chassis deck to facilitate withdrawal from the rack.

64. To withdraw the unit, unscrew the two milled nuts and draw forward by the front carrying handle.

WARNING : The unit weighs 128lbs.

65. The cover is held in place by fourteen 6BA screws around its edges and by four 2BA screws holding the rear carrying handle, which is bolted to the upper deck of the chassis through the cover. After removal of the screws and the rear handle, the cover may be withdrawn upwards and to the rear.

66. The two decks are held together by means of stanchions at the corners of the lower deck, whichpass through locating tubes mounted on the lower side of the upper deck, and are secured by locking nuts.

67. If it is necessary to separate the decks, the front panel must first be detached by removing the front carrying handle, the switch knobs and the retaining lugs at the base of the panel. The lock nuts holding the two sections of the unit together may then be released and after detaching the two 18 way plugs and sockets the decks may be separated.

General Description

68. Electrically the unit consists entirely of conventional rectifying circuits and relay circuits, details of which are given earlier in this manual.

No adjustment or alignment is needed and normal servicing procedure, with the aid of the voltages indicated at various points in the diagrams and the following tables should enable any fault to be quickly located.

Output Checking.

69. Should it be necessary to make a complete check of the unit, the voltages and currents given below should be measured. The unit should first be connected to the appropriate mains supply, switched on and allowed to warm up, with SWB on REC. Switching SWB to the correct position should then give the following readings on load:

TABLE 1.

		SUPPLY VOLTAGE LIMITS			MAX PERMISSIBLE RIPPLE PEAK TO PEAK		
Power Unit Connection		Rec.	Stand By.	Trans Ready.	Rec.	Stand By	Trans Ready
SK. 2	GHJ	-	6.0-6.6V	6.0-6.6V	-	-	-
SK. 5	LM	6.0-6.6	6.0-6.6	6.0-6.6	-	-	-
SK. 3	C	-	-	395-455	-	-	3V
	R	-	-	285-335	-	-	2V
	S (Voice off)	-	-	285-335	-	-	2V
	S (Voice on)	-	-	0	-	-	-
SK. 5	C	145-155	145-155	145-155	50mV	-	-
	D	350-430	350-430	305-350	2V	-	-
	G (Muting off)	245-290	245-290	200-240	200mV	-	-
	G (Muting on)	245-290	245-290	0	-	-	-
	H	245-290	245-290	200-240	-	-	-
SK. 2	E (Voice off)	28 - 35	28 - 35	27 - 34	-	-	-
SK. 3	Q (Voice on)	56 - 70	56 - 70	54 - 68	-	-	10V
SK. 2	E	-	-	26-33.5	-	-	-
SK. 3	Q	-	-	53-65.5	-	-	-
SK. 3	K	47.5-58	47.5-58	37-45.5	-	-	-
SK. 2	F	-	-	37-45.5	-	-	-
SK. 2	F	-	-	37-45.5	-	-	-

Relay Operation.

70 (a) Switch SWB to TX Ready and SWC to Local. Check that Relay RLA is energised.

(b) Short circuit SK. 3 Pins D and J. Check that Relay RLC is energised.

(c) Switch SWC to Remote. Earth PL4 Pin N and check that Relays RLA and RLB are energised.

CHAPTER 5

MAINTENANCE

GENERAL
VALVE DATA.
H.F.M.F.RECEIVER AP100335
H.F. TRANSMITTER AP100333

CHAPTER 5.

MAINTENANCE

General

1. The equipment has been designed so as to keep routine maintenance at a minimum and the following checks will keep it in good working order.

2. Daily.

(i) Tune the receiver in to a signal on each waveband and check that there is no obvious falling off of sensitivity.

(ii) Turn the R.F. and A.F. gain controls and check that they operate correctly and quietly.

(iii) Check the power output of the M.F. Transmitter, AP100334, working into the dummy load or the usual aerial at representative frequencies throughout the band, and record the aerial current readings. Any falling off in performance will be immediately apparent from these figures: Typical readings are tabulated below:-

Dummy load comprises a 60W lamp in series with a 750pF capacitor.

Frequency	Aerial Current
330 kc/s	0.25 Amp.
550 kc/s	0.14 Amp.

(iv) Carry out tests on the H.F. Transmitter AP100333 as outlined in sub-para (iii) above.

Dummy load comprises 700Ω in parallel with 100pF.

Frequency Mc/s	AE meter range	AE current.
1.5	4	0.22 A
6	2	0.44 A
12	1	0.47 A

(v) Where practicable make test calls on all types of transmission on both M.O. and crystal working, and check that performance is satisfactory.

3. Weekly.

(i) Measure Noise Factor and Noise Gain with Noise Generator CT. 82*, as described in paragraph 6.

(ii) Examine all plugs and sockets to ensure that they are clean and free from corrosion.

(iii) Examine cables for signs of damage and replace if necessary.

(iv) Carry out daily check above.

4. Monthly.

(i) Remove the receiver and transmitter units from their cases by loosening the green painted screws at the edges of the front panels, and drawing forward. Inspect the interiors and ensure that they are free from dust and dirt.

(ii) Examine the contacts of relays for signs of burning and replace contacts and blades if necessary.

(iii) In the M. F. transmitter examine the aerial loading coil and follower for signs of burning. Clean or replace as necessary.

(iv) Examine the pigtail connections of the rotor portion of the aerial loading coils of both transmitters for signs of fraying and replace if necessary.

(v) Switch on and check the voltages.

(vi) Remove the case from the Power Unit as described in Chapter 4 and make a similar inspection.

(vii) Carry out weekly and daily checks mentioned above.

5. VALVE DATA.

C.V.No.	Prototype	PIN NUMBER 1	2	3	4	5	6	7	8	9	TC	BASE	DESCRIPTION
131	EF92	G1	C	H	H	A	G3 S	G2				B7G	Miniature H.F. Pentode. Variable-mu.
138	6F12	G1	C	H	H	A	G3 S	G2				B7G	Miniature H.F. Pentode.
140	6AL5	C'	A	H	H	C	S	A'				B7G	Miniature Double-diode.
378	R231	-	H	-	A	-	A	-	HC			10	High Vacuum Full-wave rectifier.
395	VX372	A	A	P	C	C	C	C	C			B8G	Voltage Stabiliser.
416	VX6055	G1	C	H	H	A	B	G2				B8G	H.F. Beam Tetrode.
422	VX371	A	A C	P	C C	C	C	C C	C			B8G	Voltage Stabiliser.
428	5B/251M	H	B C	G2	B	G1	G1 G2	B	H		A	B8G	Beam Power Amplifier.
453	6BE6	G1	G5	H	H	A	G4	G3				B7G	Pentagrid.
2129	5763	A	-	G3	H	H	G2	C	G1	G1		B9A	VHF Power Amplifier Pentode.
2136	VX7062	G1	G1	C	H	H	-	A	G2	B		B9A	Output Beam Tetrode.

A - Anode
G - Grid (numbered from C to A)
B - Beam Plates
H - Heater
S - Internal Screen
C - Cathode
P - Priming anode
TC - Top Cap

In double valves electrodes in the same sections are denoted by a tick.

H.F.M.F.RECEIVER A.P.100335

Routine Maintenance.

6. The Noise Generator CT.82* should be used for routine measurements of Noise Factor and Noise Gain. Information on its use in addition to the procedure given here can be found in B.R.1771(12). A connecting diagram is given in Fig.24.

Apparatus required:-

The receiver under test.

Noise Generator CT.82*, A.P.67166

Box of leads for Noise Generator CT.82*, A.P.60875/A

(1) Preliminary Preparations.

The receiver should be switched on at least two hours before measurements are taken. Variations in Mains voltage will cause variations in Noise Output(about 0.5dB for a 5% change in voltage;) for very accurate results the Mains Voltage should be measured.

(2) Setting of Receiver Controls.

(i) A.G.C. to OFF

(ii) RF GAIN, AF GAIN and Phones Volume to maximum

(iii) BANDWIDTH to 3 kc/s.

(iv) B.F.O. to Tune

(v) CRYSTAL to OFF.

(3) Setting of Noise Generator CT.82*, Controls.

(i) Mains Selector to the correct voltage.

(ii) "Audio In" switch to MEDIUM

(iii) "Noise Out" switch to 75 ohms.

(iv) Diode Current switch to "OFF" and Diode Current potentiometer to minimum.

(4) Test Rig.

Connect up as shown in Figure 24, and check that the receiver and instrument controls are set as shown in (2) and (3) above.

(5) To Measure Noise Output.

Tune the receiver to the mid frequency of Band 1 (i.e. 118 kc/s). Note the reading of the audio output meter of the CT. 82*. If this is less than 0 dB, switch the "Audio In" switch to HIGH and change over the audio lead A.P. 5438 from the Phone to the Loudspeaker socket of the receiver. If the reading is still less than 6 dB, set "Audio In " switch to LOW. Record this reading in the appropriate column in the table provided. It is important when recording the noise output reading to show clearly whether it was obtained on the High, Medium or Low position(e.g. 6L for 6 on LOW). In order to obtain Noise gain it will be necessary at a later stage to convert all the Noise output reading to LOW. This is dealt with under Noise Gain.

Having taken the Noise Output at this frequency it is convenient to take the Noise Factor also.

(6) To Measure the Receiver Noise Factor.

Continuing from (5) above the Noise Factor is obtained as follows:-

(i) Adjust Receiver "A.F. Gain" or "Phone Volume" so that the CT. 82* Audio output meter reads 10 dB. If 10 dB cannot be obtained, adjust receiver A.F. gain for the nearest convenient reading to 10 dB.

(ii) Switch "Diode current" switch to 10mA position.

(iii) Turn "Diode current" potentiometer in a clockwise direction until the Audio Output meter is increased by 3 dB.

If the noise factor is worse than 11 dB it will be necessary to set the "Diode current" switch to 100 mA position to obtain the necessary 3 dB increase. 10 dB must then be added to the reading obtained on the 75 ohm Noise Factor scale.

(iv) Record the reading of Noise Factor in the appropriate column.

(v) Restore receiver controls as in (2) and Noise Generator controls as (3)

(7) Repeat the procedure given in Para. (5) and (6) to obtain the Noise output and Noise Factor at all frequencies shown in the table.

(8) Noise Gain Figures.

Having completed the Noise Output and Noise Factor measurements for all frequencies shown in the table, it is now possible to obtain the Noise Gain Figure for each frequency.

For simplicity it is convenient to express all Noise Output figures in terms of the "Audio In" switch in the low position. In many cases readings will have been taken with the switch either in the Medium or High Position. On Receiver CAS the conversion is performed as in the examples below.

(i) To convert a reading from HIGH to LOW(both using the Loudspeaker socket) Add 8dB.

Example

Noise Output = 15 dB on HIGH on the Loudspeaker socket.

=15+8=23 dB on LOW

(ii) To convert a reading from MEDIUM (using the Phone socket) to LOW(when using the Loudspeaker socket). Add 25 dB.

Example

Noise Output = 12 dB MEDIUM(using the Phomesocket)

=12+25= 37 dB LOW(using the Loudspeaker socket)

NOTE. NEVER use HIGH or LOW when plugged into the Phone socket, nor MEDIUM when plugged into the Loudspeaker socket.

Having converted all Noise Output readings to dB referred to LOW, the Noise Gain at each frequency can be obtained as below.

Noise Gain(dB) = Noise Output (dB LOW) - Noise Factor.

Example.

Noise Output = 15 dB HIGH(using Loudspeaker socket)
Noise Factor = 6 dB.
Noise Output(LOW) = 15 + 8 = 23 dB LOW
and Noise Gain =23- 6 = 17 dB

This figure should be recorded in the appropriate column for each frequency.

7. RESULTS TO BE EXPECTED.

The following Tables 1,2 and 3 are given for guidance,but it must be remembered that most information can be obtained by carefully recording the Noise Factor and Noise Gain and watching the trend of the results.

(i) Table No. 1.

This table gives the Noise Factor,Noise Output and Noise Gain to be expected of a new receiver on installation.

(ii) Table No. 2.

This table gives the results to be expected of a receiver which just passes its specifation.

(iii) Table No. 3.

This table gives results below which it is not considered desirable to let the performance fall. A receiver giving results worse than these should be removed from service as soon as possible and fault finding tables in paragraph 6 should be consulted.

NOTE 1.

The readings given in tables 1,2 and 3 are only applicable when Noise Factor and Noise Output are measured using the CT.82* A.P.67166 Noise Generator.

NOTE 2.

The Noise Generator cannot measure bandwidth,but provided it was known on installation that the receiver bandwidth was correct,the careful recording of subsequent Noise Gain results will indicate any sudden change of bandwidth.

NOTE 3.

It may be found the Noise Output becomes so low even with the CT.82* on LOW,that Noise Factor cannot be measured. In this case,the Receiver should be considered to have a low Noise Gain.

NOTE 4.

CT410 NSN 6625-99-580-1668 may also be used. Set INPUT IMPEDANCE to 600 ohms, connect AUDIO INPUT to receiver L.S. socket for all tests and read Noise Factor on 75 ohm scale. See BR 1771(43).

TABLE NO. 1.

TYPICAL FIGURES TO BE EXPECTED FROM NEW RECEIVERS.

Range No.	Frequency kc/s	Noise Output		Noise Factor dB CT82 and CT410	Noise Gain dB CT82	Noise Gain dB CT410
		CT82 Referred to dB Low	CT410 Referred to Direct dB			
1	62	22	-2	10	12	-12
	118	25	0	4	21	-4
	170	28	+3	4	24	-1
2	195	28	+3	6	22	-3
	344	34	+8	4	30	+4
	520	31	+5	4	27	+1
3	1530	30	+4	4	26	0
	2900	30	+4	4	26	0
	4500	32	+6	4	28	+2
4	4800	24	-1	8	16	-9
	8900	27	+2	7	20	-5
	14000	37	+10	5	32	+5
5	14800	21	-3	18	3	-21
	21000	29	+3	9	20	-6
	29000	29	+3	10	19	-7

TABLE NO. 2.

RESULTS FROM A RECEIVER JUST PASSING SPECIFICATION

Range No.	Frequency kc/s	Noise Output Referred to LOW dB	Noise Factor dB	Noise Gain dB
1	118	-	9	-
2	344	-	9	-
3	2900	-	9	-
4	8900	-	13	-
5	21000	-	15	-

Equivalent Noise Gain figures relating to specification sensitivity are not possible.

TABLE NO. 3.

RESULTS FROM A RECEIVER ON THE LOWER LIMIT OF ACCEPTABLE PERFORMANCE

Range	Noise Factor Worst Permissible Value dB CT82 and CT410	Noise Gain Worst Permissible Value dB	
		CT82	CT410
1	21.5	-21	-34
2	21.5	-21	-34
3	21.5	-21	-34
4	21.5	-21	-34
5	21.5	-21	-34

8. FAULT FINDING TABLES.

The following table is given as a guide only and is not exhaustive. In general, the Noise Generator tests described above can give considerable information not only on the receiver performance, but also on the location of the fault; then more accurate test equipment may be required to remedy the fault.

NOTE 1.

This table is not exhaustive, and is intended only as a guide to localise the fault. In the column marked " Remedy" suggestions only are given. The receiver should be removed to the E.M.R., and other test equipment used to establish the exact cause of failure. The normal maintenance checks given in the handbook should be used for this purpose.

The simple checks, e.g. voltage measurements and overall gain measurements should always be performed first.

NOTE 2.

Wherever alignment is given as a possible cause, it is essential to perform every other test first and to establish beyond doubt that misalignment is indeed the fault. Then and only then should alignment be undertaken. This particularly applies to the I.F. alignment; if emergency alignment is necessary, the receiver should be made a Dockyard Defect item as soon as possible.

TABLE 4.

Symptom	Possible Fault	Location of Fault	Remedy
High Poor Noise Factor on all Bands.	A. Bad contact in RF valves	A. RF valve and mixer valves	Move Valves about in socket to give cleaning action on pins. Inspect holders.

TABLE 4 cont......

Symptom	Possible Fault	Location of Fault	Remedy
	B. RF valve Failing	B. RF valve and mixer valve	Check valves on CT160 Valve tester for emission etc. Replace faulty valves.
	C. Low RF gain	C. H. T. voltages or mains voltage low	Check using Avometer Model 7X
		Unswitched components in RF stages i.e. any component common to all bands of the receiver.	Check by pass capacitors electrode voltages etc. in RF and mixer stages. Replace faulty component
High(Poor) Noise Factor on whole of one band	RF gain low in that band only.	D. Switched components for that band, in RF and mixer circuits.	Check appropriate components, coils etc.
		E. alignment of RF stages on that band only	Re-align stages and oscillator stage on that band only. See Note 2*

TABLE 4. cont....

Symptom	Possible Fault	Location of Fault	Remedy
High(Poor) Noise Factor at one end of a band.	RF gain low at that point.	F. AS in E above	See Note 2*
Noise Factor measurement not obtainable due to no increase in Receiver noise output.	No noise entering Receiver Aerial terminal	G. Noise Generator not operating	Check mains on, Diode current meter reading etc. See B.R.1771(12) for fault finding.
		H. Connecting lead from noise generator to Receiver Aerial terminals open or short circuited	Check for continuity and insulation.
		J. Receiver noise factor greater than 20dB	Check overall gain etc.as indicated in Receiver handbook. Pay particular attention to first RF and mixer stages.
Noise Factor suddenly changes on one band only	RF gain Low on that band	K. See D,E, F above	See Note 2*

TABLE 4 cont....

Symptom	Possible Fault	Location of Fault	Remedy
Noise Factor suddenly changes in all bands	RF gain changed	L. RF stages of Receiver	Check H.T. mains voltage and electrode voltages.
		M. Noise Generator fault.	See B.R.1771(12)
Noise Gain Low on all bands, Noise Factor normal	Receiver gain low.	N. H.T. voltage low. Mains voltage low.	
		P. Faulty components in non switched sections e.g. by-pass capacitors.	Check electrode voltages: use handbook maintenance methods.
		Q. Valve or Valves low in gain or emission.	Check AF overall gain, IF overall gain to locate fault. Check suspect valves on CT160 valve tester.
		R. B.F.O. not working properly.	Check according to handbook.
		S. IF alignment incorrect	Re-align IF as an emergency measure only. (*See Note 2 at head of table before attempting alignment).

TABLE 4 cont....

Symptom	Possible Fault	Location of Fault	Remedy
Noise Gain Low on one band only. Noise Factor being normal	RF gain low in mixer stage	T. Switched components in RF stages and oscillator, particularly in the mixer stage.	Check these components.
		U. Alignment of RF stages and oscillator stage	Try all other fault finding before attempting an RF re-alignment See Note 2*
Noise Gain Low on one end of one band only and Noise Factor Normal.	RF gain low at bad point	V. As in T, & U above.	
Noise Gain Higher than usual	High Receiver gain.	W. Main voltage high. H.T. high.	Check using Avometer.

Dismantling the Receiver.

9. All the units of the receiver are easily accessible for servicing, as follows:

(1) Remove the six green painted screws from the sides of the front panel and withdraw the receiver from its case.

(2) To Remove the R.F. Unit.

(i) Remove the knob from the wave-change switch and the tuning control, and unscrew the knob from the dial lock lever.

(ii) Remove the two chromium screws from the centre of the dial face, detach the chromium strip and centre panel of the dial. Spring off the logging scale.

(iii) Remove the two chromium screws from the right hand side of the panel and the two counter sunk screws from the right hand side of the dial aperture.

(iv) Slacken the screw in the paxolin block at the top of the scale and drive assembly, and pull out the lead at the front of the block.

(v) Detach PL102 behind the dial and lift out the R.F. Unit.

(vi) Replace by reversing the above procedure, ensuring that logging scale is pressed home with its zero position vertical when the tuning knob is fully clockwise.

(3) The R.F. coils and associated components are easily accessible at the rear of the unit when the appropriate cover is removed but to reach the valve bases, wave change switch and gang capacitor it is necessary to remove the cover at the right hand front of the R.F. Unit.

(i) Remove the five 6BA cheese head screws from the front and the two countersunk screws from the bottom of this panel.

NOTE : To avoid damage to coil tuning slugs do not rest unit on its back.

(ii) Ease up the right hand side of the panel and slip out the grommet at the top right hand corner, passing the cable form round to the top of the panel.

(iii) It is now possible to lift the panel over the pillars at the right and to slide it clear, taking care that the coaxial cable on the left is not strained.

(4) To Remove the A.F. Unit.

(i) Remove the two milled head coin slotted screws at the bottom rear of the unit.

(ii) Detach the plugs PL201 and PL301.

(iii) Slide the unit out to the rear.

6. (5) To Remove the I.F. Unit.

Having removed the A.F. Unit as detailed in paragraph (4)

(i) Remove all the remaining knobs on the front panel, with the exception of the local oscillator crystal switch knob.

(ii) Withdraw the I.F. Unit to the rear.

7. No further dismantling of the set should be necessary for ordinary servicing purposes but in an emergency certain other parts may be detached, as detailed below:

8. To Separate the Scale and Drive Assembly.

Note: This operation will upset the relationship between the tuning scale and the capacitor, and should not be attempted unless essential.

(i) Remove the rear lead to the paxolin block at the top of the assembly.

(ii) Slacken the 2BA Allen head screws at the top and the bottom.

(iii) Slacken the two 2BA nyloc nuts clamping the bearing plate to the capacitor gang.

(iv) Slide the scale and the drive assembly clear of the R.F. Unit.

9. The assembly may be replaced by reversing this procedure but the scale and capacitor must be realigned as follows:

(i) Turn the capacitor to maximum capacity and set the scale, with the cursor at mid-position to 14.5 Mc/s exactly. Lock the scale. Ensure that the wave-change switch is fully anti-clockwise.

(ii) Load the split gear wheel on the capacitor shaft 2 teeth and slide the scale and drive assembly on to its mounting so that the gears mesh in this position.

(iii) Tighten the fixing screws and nyloc nuts.

(iv) Loosen the set screws in the gear wheel on the capacitor shaft and set the capacitor so that the vanes on the rotor are flush with those on the stator.

(v) Re-tighten the set-screws and assemble the receiver, checking that the scale frequency alignment is correct. If not, re-align receiver electrically in its new mechanical relationship.

10. Dismantling the Scale and Drive Assembly.

Note: This assembly is built up during manufacture with the aid of jigs and tools which may not be obtainable in Service. No attempt should therefore be made to disturb the assembly except in great emergency.

The parts of the assembly are illustrated in Figs. 1 and 2 at the rear of this manual.

The following adjustments are provided, apart from the alignment of the scale and capacitor mentioned above.

(1) Wave-band escutcheon.

The position of this escutcheon may be altered with respect to the dial window by rotating the screw at the top of the click arm, after loosening the two set-screws.

(2) Scale stop.

The roller on the assembly of arm and bush may be adjusted to ensure that, with the cursor central and capacitor gangat maximum, the scale end stop is at 14.5 Mc/s exactly.

(3) Dial Lock.

The dial lock arm may be adjusted to ensure that sufficient pressure is available to lock the mechanism within the space provided by the slot in the front panel by slackening the 4BA screw in the arm.

11. Should it be necessary to dismantle the drive assembly proceed as follows:

(1) Remove the assembly from the R.F. unit as detailed above.

(2) Carefully remove the taper pins through the following, ensuring that they are driven back towards their wider ends.

(i) Escutcheon boss and shaft.

(ii) Star wheel and shaft.

(iii) Dial stop collar and shaft (working through the cut-out in the left side-flange of the casting).

(iv) Drive pinion and worm shaft.

(3) Slacken the set screws in the dog free and slide it along the shaft. Then remove the screw at the end of the shaft together with the spring and other parts.

(4) Slacken the nyloc nut at the end of the worm shaft and remove the front

flywheel together with the clutch spring and washer.

11. (5) Slacken the set screws in the logging scale carrier and slide off the shaft. Similarly remove the rear flywheel and escutcheon.

(6) Removing the two screws holding the cursor guide will now enable the cursor assembly to be removed, giving access to the screws holding the scale.

(7) After removing the scale, the click arm and spring should be detached from the rear of the assembly, when the wave band switch bevel drive pinion and star wheel may be removed, allowing the drive shaft and gears to be withdrawn.

(8) The two gear assemblies between the worm shaft and the wave change switch shaft are identical, and are held in place by circlips at the ends of the shafts. Note that the upper shaft is longer than the lower.

(9) The remaining shafts are held in place by collars fastened with set screws and may be removed by slackening the screws in the collars and gears.

12. Re-assembly of the scale and drive should be carried out in the reverse order noting the following points:

(1) All split gears should be loaded 2 teeth before meshing.

(2) The spindle for capacitor drive should be set so that it only just protrudes through the bearing plate. The wormwheel is then loaded and set on this spindle over the centre of the worm on the spindle.

(3) The stop collar on the worm spindle must be placed so that its concave face is towards the clockwise direction of rotation.

(4) When re-pinning the escutcheon care should be taken that 14.5-30.5 Mc/s band is uppermost when the star wheel and the wave change switch are fully anti clockwise.

(5) When mounted the outer face of the logging scale should be 1.3/8 ins. from the front face of the lower right hand fixing boss.

NOTE: Output Transformers A.P.622521

The internal wiring of certain Transformers A.P.622521, which have been provisioned as spares for Receivers H.F. M.F. A.P.100335, differs from the wiring of the transformers supplied in the original receivers.

These transformers have their Low Impedance secondary winding connected to the terminals used for the High Impedance secondary winding on the original transformers, and vice versa.

Care must be taken when replacing A.P.62252 or A.P.622521 Transformers to ensure that the secondary windings are correctly connected to PL301. The high and low impedance secondary windings may be identified by resistance measurement. The centre terminal is a common connection to both windings and is connected to Pin 3 of PL301 via a black lead. The outer end of the high impedance winding is connected to Pin 5 of PL301 via a white lead, and the outer end of the low impedance winding is connected to Pin 1 of PL301 via a green lead.

Where terminals are numbered the following guide may be used:-

Original	Primary	- 10 - 12	
	Low Impedance Secondary	- 2 - 3)	2 Common
	High Impedance Secondary	- 1 - 2)	
Replacement	Primary	- 10 - 16	
	Low Impedance Secondary	- 21 - 11)	21 Common
	High Impedance Secondary	- 5 - 21)	

H. F. TRANSMITTER AP100333.

Removal of P. A. Anode Coil L9.

13. Should the pigtails of the coil L9 become broken, they may be replaced by removing the coil as follows:

(i) Unsolder the lead to the aerial tuning coil L10 at the aerial coil end.

(ii) Unsolder the lead to the tuning capacitor C20 at the capacitor end.

(iii) Unsolder the lead to C21 at the P.A. coil end.

(iv) Unsolder the lead from wafers E & F of SWB to capacitor C20 at the capacitor and.

(v) Remove the two 4BA screws holding the switch bracket to its mounting bar.

(vi) Remove the two screws holding the coil former to the chassis.

(vii) Remove the switch drive lever attachment from the end of the spindle and lift lever to one side.

(viii) Remove the P.A. coil tuning knob from the spindle through the front panel and withdraw the coil assembly to the rear.

14. The coil may be replaced by reversing the above procedure, care being taken to ensure that wafers E & F of the switch SWB are in step with the remainder of the wafers beneath the chassis. This alignment may be adjusted by loosening the slotted coupling in the lever controlling the wafers E & F.

COMPONENTS LISTS

H.F.M.F.RECEIVER	AP100335
H.F. TRANSMITTER	AP100333
M.F. TRANSMITTER	AP100334
POWER UNIT	AP100336
DUMMY LOAD, ELECTRICAL	AP 103099

Circuit Ref.	Name	Joint Service Ref. or Admy Patt. No.	Value	Tol%	Rating
		5905-99-			
R101	Res. Fixed Carbon GR11, Insltd.	022-3122	470 kohms	±10%	½W
R102	" " " " "	022-1153	220 kohms	"	¾W
R103	" " " " "	022-2184	27 kohms	"	½W
R104	" " " " "	022-2006	1 kohm	"	¾W
R105	" " " " "	022-2089	4.7 kohm	"	½W
R106	" " " " "	022-3113	390 kohms	"	½W
R107	" " " " "	022-3122	470 kohms	"	½W
R108	" " " " "	022-1194	470 ohms	"	½W
R109	" " " " "	022-2215	47 kohms	"	½W
R110	" " " " "	022-2131	10 kohms	"	½W
R111	" " " " "	022-2005	1 kohm	"	½W
R112	" " " " "	022-3017	68 kohms	"	½W
R113	" " " " "	022-2059	2.7 kohms	"	½W
R114	" " " " "	022-2215	47 kohms	"	½W
R115	" " " " "	022-1143	180 ohms	"	½W
R116	" " " " "	022-2152	15 kohms	"	½W
R117	" " " " "	022-2152	15 kohms	"	½W
R118	" " " " "	022-2089	4.7 kohms	"	½W
R119	" " " " "	022-1185	390 ohms	"	½W
R120	" " " " "	022-2017	1.2 kohms	"	½W
R121	" " " " "	022-2215	47 kohms	"	½W
R122	" " " " "	022-1215	680 ohms	"	½W
R123	" " " " "	022-2089	4.7 kohms	"	½W
R124	" " " " "	022-2080	3.9 kohms	"	½W
R125	" " " " "	022-2027	1.5 kohms	"	½W
R126	" " " " "	022-2005	1 kohm	"	½W
R127	" " " " "	022-1131	150 ohms	"	½W
R128	" " " " "	022-1026	22 ohms	"	½W
R129	" " " " "	AP 102924	7 ohms	±5%	¾W
R130	" " " " "	AP 102924	7 ohms	"	¾W
R131	" " " " "	022-2038	100 kohms	±10%	½W
R132	" " " " "	022-1152	220 ohms	"	½W
RV101	Res. Var WW Anti-Semi-Log	AP 102810	5 kohms	±10%	
C102	Cap. Var.	AP 68954	2-20 pF		
C103	Cap. Fixed Mica Metalsd Wax Cvd	AP 102927	470 pF	±1%	350VW
C105	Cap. Fixed Cer Tub. Insltd.	012-7113	100 pF	±10%	500VW
* C106	Cap. Var.	Z160010	3-33pF		

* See Page 86.

	Circuit Ref.	Name	Joint Service Ref. or Admy Patt No.	Value	Tol %	Rating
			5905-99-			
	C107	Cap Fixed Metlsd Wax Covd.	012-3938	270 pF	±2%	350VW
	C108	Cap Var.	AP 102822	14-532 pF		
	C109	Cap Fixed Paper Foil, Tub	011-5552	0.01 µF	±20%	350VW
	C110	" " " " "	Z115594	0.01 µF	"	350VW
	C111	" " " " "	011-5552	0.01 µF	"	350VW
	C112	Cap Fixed Mica Metlsd Wax Covd.	AP 102811	710 pF	±5%	350VW
	C113	Cap Fixed Cer Tub Insltd	012-6770	4.7 pF	± ½pf	500VW
	C114	Cap Fixed Paper Foil Tub Insltd	011-5625	0.01 µF	±25%	350VW
*	C115	Cap. Var.	Z160010	3-33 pF		
	C116	Cap Fixed Cer Tub Insltd.	012-6767	2.7 pF	±½pF	500VW
	C117	Cap Fixed Mica Metlsd Wax Covd.	012-3938	270 pF	±2%	350VW
	C118	Cap Fixed Cer Tub Insltd.	012-7113	100 pF	±10%	500VW
	C119	Cap Var	AP 102822	14-532 pF		
	C120	Cap Fixed Paper Foil Tub Insltd.	011-5625	0.01 µF	±25%	350VW
	C121	Cap Fixed Paper Foil Tub	011-5552	0.01 µF	"	350VW
	C122	" " " " "	011-5552	0.01 µF	"	350VW
	C123	" " " " "	011-5552	0.01 µF	"	350VW
	C124	Cap Fixed Mica Metallised	012-3938	270 pF	±2%	350VW
*	C125	Cap. Var	Z160010	3-33 pF		
	C126	" "	AP 102822	14-532 pF		
	C127	Cap Fixed Paper Foil Tub	011-5552	0.01 µF	±20%	350VW
	C128	Cap Fixed Paper Foil Tib Insltd.	011-5625	0.01 µF	±25%	350VW
	C129	Cap Fixed Cer Tub Insltd.	012-7113	100 pF	±10%	500VW
	C130	Cap Fixed Mica Metlsd Wax Covd.	Z125630	470 pF	±5%	350VW
	C131	Cap Fixed Paper Foil Tub Insltd.	011-5625	0.01 µF	±25%	350VW
	C132	Cap Fixed Mica Metalsd. Wax Covd.	Z125630	470 pF	±5%	350VW
	C133	Cap. Var.	AP 102822	14-532 pF		
*	C134	Cap Var	Z160010	3-33 pF		
X	C135	Cap Fixed Cer Tub Insltd.	Z132292	56 pF	±5%	500VW
	C136	Cap Fixed Mica Metalsd. Wax Covd	972-1840	39 pF	±2%	350VW
	C137	Cap Fixed Cer Tub Insltd.	012-7113	100 pF	±10%	500VW
	C138	" " " " "	012-7105	47 pF	±10%	500VW
	C139	" " " " "	Z132300	100 pF	±10%	500VW
	C140	Cap Fixed Mica Foil Moulded	940-9270	0.005 µF	±20%	350VW
	C141	" " " " "	972-2188	0.005 µF	"	350VW

* See Page 86.

X In later receivers C135 is 5910-99-012-7297, 47 pF ± 2%, 500 VW

	Circuit Ref.	Name	Joint Service Ref. or Admy Patt No.	Value	Tol%	Rating
*	C142	Cap Var	5905-99-Z160010	3-33pF		
*	C143	" "	"	"		
*	C144	" "	"	"		
*	C145	" "	"	"		
	C146	Cap Fixed Mica Metalsd. Wax Covd	Z126313	1000pF	5%	350VW
*	C147	Cap Var.	Z160010	3-33pF		
*	C148	" "	"	"		
*	C149	" "	"	"		
*	C150	" "	"	"		
*	C151	" "	"	"		
*	C152	" "	"	"		
*	C153	" "	"	"		
*	C154	" "	"	"		
	C155	Cap Fixed Cer Tub Insltd.	012-7103	39pF	±10%	500VW
	C156	" " " " "	012-7093	15pF	±10%	500VW
	C157	" " " " "	012-7091	12pF	"	500VW
	C158	" " " " "	012-7093	15pF	±5%	500VW
*	C159	Cap. Var.	Z160010	3-33pF		
*	C160	" "	"	"		
*	C161	" "	"	"		
*	C162	" "	"	"		
	C163	Cap Fixed Mica Metalsd Wax Covd.	AP102814	105pF	±2%	350VW
	C164	" " " " " "	972-2982	960pF	±5%	350VW
	C165	Cap Fixed Mica Metalsd Wax Covd.	972-4294	3080pF	±5%	350VW
	C166	" " " " " "	972-2140	245pF	±2%	350VW
	C167	" " " " " "	911-4958	10pF	±½pF	350VW
	C168	" " " " " "	972-2189	22pF	"	350VW
	C169	" " Cer Tub Insltd.	012-7105	47pF	±10%	500VW
	SW101 a-k	Band Selector Switch	AP102823			
	SW102 a-k	Crystal Switch	AP102827			
	TR101	Transformer, AE Band 1	AP102839			
	TR102	" " " 2	AP102840			
	TR103	" " " 3	AP102841			
	TR104	" " " 4	AP102842			

* When fitting Capacitor, Variable, 5910-99-016-0047 a slot $\frac{1}{4}$ inch wide and $\frac{3}{8}$ inch long should be cut in the cover assembly to allow full rotation of the capacitor vanes without fouling.

H.F.M.F.RECEIVER AP100335

Circuit Ref.	Name	Joint Service Ref. or Admy Patt No.	Value	Tol%	Rating
TR105	Transformer, AE Band 5.	AP102843			
TR106	I.F. Transformer No.1	AP102844			
TR111	I.F. 2nd R.F. Grid Band 1	AP102834			
TR112	" " " " 2	AP102835			
TR113	" " " " 3	AP102836			
TR114	"" " " " 4	AP102837			
TR115	" " " " 5	AP102838			
TR121	" Mixer Grid Band 1	AP102829			
TR122	" " " " 2	AP102830			
TR123	" " " " 3	AP102831			
TR124	" " " " 4	AP102832			
TR125	" " " " 5	AP102833			
L101	L.O. Coil Band 1	AP102849			
L102	" " " 2	AP102850			
L103	" " " 3	AP102851			
L104	" " " 4	AP102852			
L105	" " " 5	AP102853			
L106	" I.F. Rejector	AP102854			
L107	Cathode Coil V104	AP102855			
V101	CV138 CV4014	CV138	EF91 6AM6		
V102	CV131 CV4015	CV131	EF92		
V103	CV453 CV 4012	CV453	EK90 6BE6		
V104	CV138 CV4014	CV138	EF91 6AM6		
PL101	Plug 4-way fixed	999-3526			
PL102	Plug 12-way free	972-8185)			
		972-8100)			
R201	Res. Fixed Carbon GR11 Insltd.	022-2038	100KΩ	±10%	½W
R202	" " " " "	022-2005	1KΩ	"	½W
R203	" " " " "	022-2131	10KΩ	"	½W
R204	" " " " "	022-2047	2.2KΩ	"	½W
R205	" " " " "	022-2038	100KΩ	"	½W
R206	" " " " "	022-1143	180Ω	"	½W
R207	" " " " "	022-1185	390Ω	"	½W
R208	" " " " "	022-1110	100Ω	"	½W
R209	" " " " "	022-2131	10KΩ	"	½W
R210	" " " " "	022-2047	2.2KΩ	"	½W

Circuit Ref.	Name	Joint Service Ref. or Admy Patt No	Value	Tol%	Rating
R211	Res. Fixed Carbon GR11 Insltd.	5905-99-022-1143	180 ohms	±10%	½W
R212	" " " " "	022-1185	390 ohms	"	½W
R213	" " " " "	022-1110	100 ohms	"	½W
R214	" " " " "	022-3113	390 kohms	"	½W
R215	" " " " "	022-2149	15 kohms	"	½W
R216	" " " " "	022-2131	10 kohms	"	½W
R217	" " " " "	022-3077	220 kohms	"	½W
R218	" " " " "	022-2047	2.2 k	"	½W
R219	" " " " "	022-2152	15 kohms	"	½W
R220	" " " " "	022-2215	47 kohms	"	½W
R221	" " " " "	022-3017	68 kohms	"	½W
R222	" " " " "	022-3164	1 Mohm	"	½W
R223	" " " " "	022-3071	180 kohms	"	½W
R224	" " " " "	022-3164	1 Mohm	"	½W
R225	" " " " "	022-3155	820 kohms	"	½W
R226	" " " " "	022-3134	560 kohms	"	½W
R227	" " " " "	022-2038	100 kohms	"	½W
R228	" " " " "	022-1143	10 kohms	"	½W
R229	" " " " "	022-3164	1 Mohm	"	½W
R230	" " " " "	022-2131	10 kohms	"	½W
R231	" " " " "	022-2038	100 kohms	"	½W
R232	" " " " "	022-1143	180 ohms	"	½W
R233	" " " " "	022-2132	10 kohms	"	¾W
R234	" " " " "	022-3008	56 kohms	"	½W
R235	" " " " "	022-2173	22 kohms	"	½W
R236	" " " " "	022-2005	1 kohm	"	½W
R237	" " " " "	022-3206	2.2 Mohms	"	½W
RV201	Res. Var. Comp. Log.	AP 102916	2 Mohms	±20%	
RV202	Res. Var. WWLin	AP 102915	100 ohms	±10%	
C201	Cap Fixed Mica Metalsd. Wax Covd	Z125630	470 pF	±5%	350VW
C202	Cap Fixed Paper Foil Tub Insltd.	011-5629	0.02 μF	±20%	350VW
C203	Cap Fixed Paper Foil Tub.	011-5552	0.01 μF	"	350VW
C204	" " " " "	011-5095	0.1 μF	"	350VW
C205	Cap Fixed Mica Metalsd Wax Covd.	Z125630	470 pF	±5%	350VW

Circuit Ref.	Name	Joint Service Ref. or Admy Patt No.	Value	Tol%	Rating
		5905-99-			
C206	Cap Fixed Paper Foil Tub	011-5095	0.1μF	±20%	350VW
C207	" " " " "	011-5095	0.1μF	"	350VW
C208	Cap Fixed Mica Metalsd Wax Covd	Z125630	470pF	±5%	350VW
C209	" " " " " "	Z125630	470pF	"	350VW
C210	Cap Fixed Paper Foil Tub Insltd.	011-5629	.02μF	±20%	350VW
C211	Cap. Var.	AP67887	1.25-10pF		
C212	Cap Fixed Paper Foil Tub	011-5095	0.1μF	"	350VW
C213	" " " " "	011-5095	0.1μF	"	350VW
C214	" " " " "	011-5095	0.1μF	"	350VW
C215	" " Paper Mtld. Tub Insltd.	011-9830	0.25μF	±25%	150VW
C217	Cap Fixed Cer Tub Insltd.	999-4105	270pF	±20%	350VW
C218	Cap Fixed Mica Metalsd Wax Covd.	Z125630	470pF	±5%	350VW
C219	" " " " " "	Z125630	470pF	"	350VW
C220	Cap Fixed Paper Foil Tub.	011-5095	0.1μF	±20%	350VW
C221	Cap Fixed Paper Foil Tub	011-5095	0.1μF	±20%	350VW
C222	Cap Fixed Paper Metalsd Tub Instd.	011-9827	0.1μF	±25%	150VW
C223	Cap Fixed Cer Tub Insltd.	012-7113	100pF	±10%	500VW
C224	Cap Fixed Mica Metalsd Wax Covd.	Z125630	470pF	±5%	350VW
C225	Cap Fixed Paper Foil Tub	011-5095	0.1μF	±20%	350VW
C226	Cap Fixed Mica Metalsd Wax Covd.	Z125630	470pF	±5%	350VW
C227	Cap Fixed Min HiK Cer Tub Std-off	AP 102925	270pF	±20%	
C228	" " " " " " " "	AP102925	270pF	"	
C229	Cap Fixed Paper Foil Tub Insltd.	011-5629	.02μF	"	350VW
C230	Cap Fixed Paper Metalsd Tub Insltd.	011-9827	0.1μF	±25%	150VW
C231	Cap Fixed Paper Foil Tub Insltd.	011-5524	.005μF	±20%	350VW
C232	Cap Fixed Min Hik Cer Tub Insltd.	999-4105	270pF	"	350VW
C233	Cap Fixed Paper Metalsd Tub Insltd.	011-9827	0.1μF	±25%	150VW
C234	Cap Fixed Min HiK Cer Tub Insltd.	999-4105	270pF	±20%	350VW
C235	" " " " " " "	972-7246	470pF	"	350VW
C236	Cap Fixed Paper Foil Tub Instd.	011-5629	.02μF	"	350VW
C237	Cap Fixed Mica Metalsd Wax Covd.	Z125630	470pF	±5%	350VW
C238	Cap Fixed Cer Tub Insltd.	519-1715	47pF	$\pm\frac{1}{2}$ pF	500VW
C239	Cap Var.	AP67887	1.25-10pF		
C240	" "	AP67887	1.25-10pF		

Circuit Ref.	Name	Joint Service Ref. or Admy Patt No.	Value	Tol%	Rating
C241	Cap Fixed Cer Tub Insltd.	5905-99-012-7113	100pF	±10%	500VW
C242	Cap Fixed Paper Metalsd Tub Insltd.	011-9827	0.1μF	±25%	150VW
C243	Cap Fixed Paper Foil Tub Insltd.	011-5629	.02μF	±20%	350VW
C244	Cap Var. Diff.		1.5-8pF		
C245	Cap Var.	Z180010	3-30pF		
C246	Cap Fixed		75pF	±2%	350VW
SW201	Selectivity Switch	AP102824			
SW202	A.G.C. Switch	AP102825			
SW203	B.F.O. Switch	AP102826			
TR201	I.F. Transformer No. 2	AP102845			
TR202	I.F. Transformer No. 3	AP102846			
TR203	I.F. Transformer No. 4	AP102847			
TR204	I.F. Transformer No. 5	AP102848			
XF201	Crystal Filter complete in can	AP102828			
L201	Crystal Assembly only				
L202	B.F.O. Coil	AP102857			
MR201	Rectifier	6130-99-924-6977			
V201	CV131 CV4015	CV131 EF92			
V202	CV131 CV4015	CV131 EF92			
V203	CV131 CV4015	CV131 EF92			
V204	CV140 CV4007 CV4025	CV140 EB91	6AL5		
V205	CV140 CV4007 CV4025	CV140 EB91	6AL5		
V206	CV131 CV4015	CV131 EF92			
PL201	Plug 12 way Fixed	5935-99-972-9109			
PL202	Plug 8 way Free	911-6428)			
		972-8208)			
SK201	Socket 12 way fixed	972-8233			
SK202	Socket 8 way Free	AP62238			
SK203	Jack Socket	972-9652			
SK204	Jack Socket	972-9652			
SK205	Jack Socket	972-9652			
R301	Res. Fixed Carbon GR11 Insltd.	022-2216	47KΩ	±10%	$\frac{3}{4}$W
R302	" " " " "	022-2006	1KΩ	"	$\frac{3}{4}$W
R303	" " " " "	022-3030	82KΩ	"	$\frac{3}{4}$W
R304	" " " " "	022-3122	470KΩ	"	$\frac{1}{2}$W
R305	" " " " "	022-1228	820Ω	"	$\frac{3}{4}$W
R306	" " " " "	022-3018	68KΩ	"	$\frac{3}{4}$W
R307	" " " " "	022-3102	330KΩ	"	$\frac{3}{4}$W

Circuit Ref.	Name	Joint Service Ref. or Admy Patt. No.	Value	Tol%	Rating.
		5905-99-			
R308	Res. Fixed WW non-insulated.	011-8242	22 k	±5%	4.5W
R309	Res. Fixed Carbon GR11 Insltd.	022-3122	470KΩ	±10	½W
R310	Res. Fixed WW, non insulated.	011-3479	470Ω	±5	4.5W
R311	Res. Fixed Carbon GR11 Insltd.	022-2111	6.8KΩ	±10	¾W
C301	Cap Fixed Paper Foil Tub.	AP 102818	.02μF	"	350VW
C302	" " " " "	AP102818	.02μF	"	350VW
C303	Cap Fixed Paper Foil Tub. Insltd.	011-7818	0.1μF	±20	350VW
C304	Cap Fixed MICA	012-3949	470pF	±10	750VW
C305	Cap Fixed Paper Foil Tub Non insltd.	011-7818	0.1μF	±20	350VW
C306	Cap Fixed Paper Foil Tub non-insltd.	011-7823	0.1μF	"	500VW
C307 ≠	Capacitor Fixed	5910-99-011-1377	0.5μF	"	650VW
C308	Cap Fixed Paper Foil Tub Insltd.	011-7818	0.1μF	"	350VW
TR301	Output Transformer	AP 62252/622521			
L301	Filter Choke	AP 106152			
L302	" "	AP 106152			
V301	CV131 CV 4015	CV131 EF92			
V302	CV131 CV 4015	CV131 EF92			
V303	CV2136	CV2136 6BW6			
PL301	Plug 8 way fixed	972-8226			
SK301	Socket 8 way fixed	972-8232			
LP1	Pilot Lamp	5935-99-995-1211	6.2V	MES	0.3A
LP2	Pilot Lamp	5935-99-995-1211	6.2V	MES	0.3A
	Trimming Tool	AP 102928			
	Trimming Tool	AP 102929			

≠ Capacitor C307 is mounted on 2 No. 5910-99-011-0001 Clamps, Fixing.

Circuit Ref.	Name		Joint Service Ref. or Admy Patt. No.	Value	Tol%	Rating
C1a-d	Capacitor	Variable	AP102867	14-532pF		
C2	"	"	AP102868	3-19pF		
C3	"	Fixed	Z132277	22pF	+10	500VW
C4	"	"	Z132300	100pF	"	500VW
C5	"	"	Z132283	33pF	"	500VW
C6	"	"	Z132300	100pF	+10	500VW
C7	"	"	Z115625	.01μF	+25	350VW
C8	"	"	Z115625	.01μF	"	350VW
C9	"	"	911-5660	1000 pF	10%	750VW
C10	"	Variable	AP102869	3-33pF	"	350VW
C12	"	Fixed	Z124479	.001μF	+10	350VW
C13	"	"	Z115625	.01μF	+20	350VW
C15	"	"	Z115625	.01μF	"	350VW
C16	"	"	Z124407	.01μF	"	350VW
C17	"	Variable	AP102869	3-33pF		350VW
C18	"	"	AP102869	3-33pF		350VW
C19	"	Fixed	011-5525	.01μF	+20	500W
C20	"	Variable	AP102870	500pF		
C21	"	Fixed (2 in No.)	012-4153	2000 pF	"	2000V
C22	"	"	AP102864	100pF	+10	
C23	"	Variable	AP102869	3-33pF		350VW
C24	"	Fixed	AP102865	50pF	"	
C25	"	"	Z132630	1000pF	+20	350VW
C26	"	"	Z115095	.1μF	"	350VW
C27	"	"	Z132298	82pF	+10	500VW
C28	"	"	Z132298	82pF	"	500VW
C29	"	"	Z132298	82pF	"	500VW
C30	"	"	Z145159	25μF	-20 / +100	25VW
C31	"	"	Z115095	.1μF	+20	350VW
C32	"	"	Z115572	2μF	+25	150VW
C33	"	"	Z115598	.05μF	+20	200VW
C34	"	"	Z115598	.05μF	"	200VW
C35	"	"	Z115625	.01μF	"	350VW
C36	"	"	Z115598	.05μF	"	200VW
C37	"	"	Z115572	2μF	+25	150VW
C38	"	"	Z115625	.01μF	+20	350VW

Circuit Ref.	Name		Joint Service Ref. or Admy Patt. No.	Value	Tol%	Rating
C39	Capacitor Fixed		Z145168	25µF	+100 -20	50VW
C40	"	"	Z115570	1µF	±25	250VW
C41	"	"	Z115573	2µF		250VW
C42	"	"	Z115524	.005µF	+20	350VW
C43	"	"	Z145159	25µF	+100% - 20%	25VW
C44	"	"	Z115570	1µF	±25	250VW
C45	"	"	Z115573	2µF	"	150VW
C46	"	"	Z115625	.01µF	±20	350VW
C48	"	"	Z115594	.01µF	"	350VW
C50	"	"	Z115544	.002µF	±20	500VW
C51	"	"	Z115544	.002µF	"	500VW
C52	"	"	Z115544	.002µF	"	500VW
C53	"	"	Z115594	.01µF	"	350VW
C54	"	"	Z115594	.01µF	"	350VW
C55	"	"	Z115544	.002µF	"	500VW
C56	"	"	Z115544	.002µF	"	500VW
C57	"	"	Z115544	.002µF	"	500VW
C58	"	"	Z115544	.002µF	"	500VW
C59	"	"	Z115594	.01µF	"	350VW
C60	"	"	011-5525	.01µF	"	500W
C61	"	"	Z115286	.1µF	"	500VW
C62	"	"	Z115544	.002µF	"	500VW
C63	"	"	Z145159	25µF	+100 -20	25VW
C64	"	"	AP102866	40pF	±20	
C65	"	"	AP102866	40pF		
C66	"	"	AP102866	40pF		
C67	"	"	AP102866	40pF		
C68	"	"	AP102866	40pF		
C70	"	"	Z115627	.01µF	±20	200VW
C71	"	"	Z124479	.001µF	"	350VW
C72	"	"	W2007	.004µF	"	750VW
C73	"		5910-99-972-5488	500pF	"	350VW
C74	"	"	Z123251	200pF	±10	350VW
R1	Resistor		Z223122	470KΩ	"	½W
R2	"		Z223029	82KΩ	"	½W
R3	"		Z244038	2.5KΩ	±5	6W
R4	"		Z222222	47KΩ	±10	1W

Circuit Ref.	Name	Joint Service Ref. or Admy Patt No.	Value	Tol%	Rating
R5	Resistor	Z221153	220Ω	±10%	¾W
R6	"	Z223038	100KΩ	"	½W
R7	"	Z223009	56KΩ	"	¾W
R8	"	Z221059	39Ω	"	½W
R9	"	Z221153	220Ω	±10	¾W
R10	"	Z221110	100Ω	"	½W
R11	"	Z222090	4.7KΩ	"	¾W
R12	"	Z222006	1KΩ	"	¾W
R13	"	Z244105	12KΩ	±5%	3W
R14	"	Z244114	15KΩ	"	5W
R15	"	Z221068	47Ω	±10%	½W
R16	"	Z221026	22Ω	"	½W
R17	"	Z221068	47Ω	"	½W
R18	"	Z221068	47Ω	"	½W
R19	"	Z221026	22Ω	"	½W
R20	"	Z221068	47Ω	"	½W
R21	"	Z221068	47Ω	"	½W
R22	"	Z221026	22Ω	"	½W
R23	"	Z221068	47Ω	"	½W
R24	"	Z244058	3.9KΩ	±5%	5W
* R25	"	AP102913	0.2 Ω	±0.5%	
R26	"	Z222131	10KΩ	±10%	½W
R27	"	Z223039	100KΩ	"	¾W
R28	"	Z244122	18KΩ	±5%	5W
R29	"	Z222005	1KΩ	±10%	½W
R30	"	Z222215	47KΩ	"	½W
R31	"	Z223143	680KΩ	"	½W
R32	"	Z223143	680KΩ	±20%	½W
R33	"	Z223143	680KΩ	"	½W
R34	"	Z221152	220Ω	"	½W
R35	"	Z222194	33KΩ	"	½W
R36	"	Z221215	680Ω	"	½W
R37	"	Z223038	100KΩ	"	½W
R38	"	Z223122	470KΩ	"	½W
R39	"	Z223122	470KΩ	"	½W
R40	"	Z223164	1MΩ	"	½W
R41	"	Z222080	3.9KΩ	"	½W
R42	"	Z223038	100KΩ	"	½W
R43	"	Z223008	56KΩ	"	½W

* External Shunt R25 is to be removed when M2 is AP 63456.

Circuit Ref.	Name	Joint Service Ref. or Admy Patt. No.	Value	Tol%	Rating
R45	Resistor	Z223038	100K	±10	$\frac{1}{2}$W
R46	"	Z223050	120K	"	$\frac{1}{2}$W
R47	"	Z221215	680	"	$\frac{1}{2}$W
R48	"	Z222060	2.7K	"	$\frac{3}{4}$W
R49	"	Z222194	33K	"	$\frac{1}{2}$W
R50	"	Z223080	220K	"	$\frac{1}{2}$W
R51	"	Z223017	68K	"	$\frac{1}{2}$W
R53	"	Z222131	10K	"	$\frac{1}{2}$W
R54	"	Z222047	2.2K	"	$\frac{1}{2}$W
R55	"	Z222060	2.7K	"	$\frac{3}{4}$W
R56	"	Z222215	47K	"	$\frac{1}{2}$W
R57	"	Z223080	220K	"	$\frac{1}{2}$W
R58	"	Z223122	470K	"	$\frac{1}{2}$W
R59	"	Z221195	470	"	$\frac{3}{4}$W
R60	"	Z221110	100	"	$\frac{1}{2}$W
R61	"	Z221068	47	"	$\frac{1}{2}$W
R62	"	Z222131	10K	"	$\frac{1}{2}$W
R63	"	Z222131	10K	"	$\frac{1}{2}$W
R64	"	Z221026	22	"	$\frac{1}{2}$W
R65	"	Z221068	47	"	$\frac{1}{2}$W
R66	"	Z221068	47	"	$\frac{1}{2}$W
R67A/B	"	Z113418	7.5K	±5	6W
R68	"	Z222017	1.2K	±10	$\frac{1}{2}$W
R70	"	Z244082	6.8K	±5	10W
R71	"	Z244082	6.8K	"	10W
R72	"	Z243097	100	±5	5W
R73	"	Z221185	390	±10	$\frac{1}{2}$W
R74	"	Z223081	220K	"	$\frac{3}{4}$W
R75	"	W9948	700	±20	35W
R76	"	Z222152	15K	±10	$\frac{1}{2}$W
R77	"	Z221026	22	"	$\frac{1}{2}$W
R78	"	Z221026	22	"	$\frac{1}{2}$W
R79	"	Z222207	39K	"	$\frac{3}{4}$W
R80	"	Z222216	47K	"	$\frac{3}{4}$W
R81	"	Z221068	47	"	$\frac{1}{2}$W

H.F. TRANSMITTER AP100333

Circuit Ref.	Name	Joint Service Ref. or Admy Patt. No.	Value	Tol%	Rating
R82	Resistor	Z221195	470	10	$\frac{3}{4}$W
R83	"	Z222047	2.2K	"	$\frac{1}{2}$W
R84	"	Z222047	2.2K	"	$\frac{1}{2}$W
R85	"	Z223102	330K	"	$\frac{3}{4}$W
R86	"	Z222089	4.7K	"	$\frac{1}{2}$W
RV1	Resistor Variable	AP102917	50K	$\pm$20	$\frac{1}{4}$W
RV2	" "	AP102917	50K	"	$\frac{1}{4}$W
RV3	" "	Z261885	20K	"	$\frac{1}{4}$W
V1	CV395	CV395	QS150/45		
V2	CV422	CV422	QS108/45		
V3	CV2136	CV2136	6BW6		
V4	CV2129	CV2129	5763, QV03-12		
V5	CV428	CV428	5B/251M		
V6	CV428	CV428	5B/251M		
V7	CV428	CV428	5B/251M		
V8	CV131 CV4015	CV131	EF92		
V9	CV138 CV4014	CV138	EF91		
V10	CV131 CV4015	CV131	EF92		
V11	CV131 CV4015	CV131	EF92		
V12	CV2136	CV2136	6BW6		
V13	CV428	CV428	5B/251M		
V14	CV428	CV428	5B/251M		
TR1	Microphone Transformer	AP102912			
TR2	Driver Transformer	AP62249 A/972-0334			
TR3	Modulation Transformer	AP62250			
TR4	Ae Current Transformer	AP102877			
L1	Osc. Grid Coil	AP102878			
L2	Osc. Anode Choke	AP102879			
L3	sc. Cathode Choke	AP102879			
L4	Osc. Anode Coil	AP102880			
L5	Buffer Anode Coil RG.1.	AP102881			
L6	Buffer Anode Coil RG.2.	AP102882			
L7	Buffer Anode Coil RG. 3.	AP102883			
L8	P.A. Grid Choke	AP102879			
L9	Variometer Coil	AP102885			
L10	Var. Inductance Coil	AP102886			

H.F. TRANSMITTER AP100333

Circuit Ref.	Name	Joint Service Ref. or Admy Patt. No.	Value	Tol%	Rating
L11	Audio Filter Coil	AP102887			
L12	Audio Filter Coil	AP102888			
L13	Audio Filter Coil	AP102887			
L14	P.A. Anode Choke	AP102884			
RLB	Keying Relay	AP530039			
RLC	AE Changeover Relay	AP 102876			
PL9	18 Pin Plug Fixed Plessey Mk. 4	Z560190			
PL10	Plug	Z560153			
SK11	Socket Coaxial	~~AP66092~~ 5935-99-913-8550			(AMDT 12)
J1	Phone Jack Socket	AP676A			
SWA	Switch Channel Selector	AP102871			
SWB	Switch Range See NOTE A	AP102872			
SWC	Switch AE Tuning	AP102873			
SWD	Switch AE Current Meter	AP102874			
SWE	Switch Service Selector	AP102875			
	Coupling Flexible	3010-99-999-4562			
MR1	Germanium Crystal	CV448			
MR2	Germanium Crystal	CV448			
MR3	Germanium Crystal	CV448			
MR4	Germanium Crystal	CV448			
MR5	Germanium Crystal	CV448			
M1	Meter Ae Current	AP63455			
* M2	Meter P.A. Anode	AP63456			

* When AP 63456 is fitted as M2 the external shunt (R25) is to be removed.

NOTE A - Wafer G is part of AP 102885 Variometer Coil (L9) and is separately patternised as 5930-AP 104981 Switch rotary, 1 Wafer.

M. F. TRANSMITTER AP100334

Circuit Ref.	Name	Joint Service Ref. or Admy Patt. No.	Value	Tol%	Rating
R1	Resistor	Z223029	82KΩ	±10	½W
R2	"	Z223122	470KΩ	"	½W
R3	"	Z222216	47KΩ	"	¾W
R4(A)	"				
R4(B)	"	5905-99-014-0235	5.1K	±5	–
R5	"	Z222131	10Kohms	±10	½W
R6	"	Z222216	47KΩ	"	¾W
R7	"	Z222132	10KΩ	"	¾W
R8	"	Z222131	10KΩ	"	½W
R9	"	Z222153	15KΩ	"	¾W
R10	"	5905-99-014-0347	2K	±5	¾W
R11	"	Z222132	10KΩ	±10	¾W
R12	"	Z221195	470Ω	"	¾W
R13	"	Z221038	27Ω	"	½W
R14	"	AP102906	7KΩ	±5	5W
R15	"	Z221038	27Ω	±10	½W
R16	"	Z221038	27Ω	"	½W
R17	"	Z221038	27Ω	"	½W
* R18	"	AP102923	0.2Ω	±5	
R19	"	Z221038	27Ω	±10	½W
R20	"	Z222173	22KΩ	"	½W
R21	"	5905-99-014-0232	3.9K	±5	½W
R22	"	Z221038	27Ω	±10	½W
R23	"	Z222186	27KΩ	"	¾W
R24	"	Z222216	47KΩ	"	¾W
R25	"	Z222186	27KΩ	"	¾W
R26	"	Z222216	47KΩ	"	¾W
R27	"	Z221038	27Ω	"	½W
R28	"	Z222017	1.2KΩ	"	½W
R30	"	Z221185	390Ω	"	½W
R31	"	Z221038	27Ω	"	½W
R32	"	Z221038	27Ω	"	½W
R33	"	Z221038	27Ω	"	½W
R35	"	Z243090	82Ω	±5	5W
R36	"	Z221038	27Ω	±10	½W

* External shunt R18 is to be removed when M1 is AP 63456.

Circuit Ref.	Name		Joint Service Ref. or Admy Patt. No.	Value	Tol%	Rating
R37	Resistor		Z221038	27Ω	±10	½W
R38	"		Z221038	27Ω	"	½W
R39	"		Z221068	47Ω	"	½W
R40	"		Z221110	100Ω	"	½W
R41	"		5905-99-014-0364	10K	±5	½W
R42	"		Z222132	10KΩ	±10	¾W
R43	"		Z223018	68KΩ	"	¾W
R44	"		Z221038	27Ω	"	½W
R45	"		Z221038	27Ω	"	½W
R46	"		Z221038	27Ω	"	½W
RV1	"	Variable	Z261885	20KΩ	±20	½W
R47(LP1)	Lamp SBC, 12V 60W		6240-99-995-2514			
C1	Capacitor	Variable	AP102870	500pF	Max	
C2	Capacitor	Fixed	Z125303	150pF	±5	350VW
C3	"	"	Z123310	270pF	±10	350VW
C4	"	"	Z115095	0.1μF	±25	350VW
C5	"	"	Z115095	0.1μF	"	350VW
C6	"	"	Z132300	100pF	±10	500VW
C7	"	"	Z132300	100pF	"	500VW
C8	"	"	Z115095	0.1μF	±25	350VW
C9	"	"	Z115095	0.1μF	"	350VW
C10	"	"	Z115095	0.1μF	"	350VW
C11	"	"	Z115543	0.001μF	±20	500VW
C12	"	"	Z124325	0.005μF	"	750VW
C13	"	"	Z123411	470pF	±10	350VW
C14	"	"	Z115506	0.1μF	±20	350VW
C15	"	"	AP102891	0.04μF		
C16	"	"	AP102892	0.002μF		
C17	"	"	AP102892	0.002μF		
C18	"	"	AP51370	0.0005μF		
C19	"	"	AP102892	0.002μF		
C20	"	"	AP102893	0.001μF		
C21	"	"	AP102892	0.002μF		
C22	"	"	Z115506	0.1μF	±20	350VW
C23	"	"	AP61758	0.05μF	"	

M.F. TRANSMITTER AP100334

Circuit Ref.	Name		Joint Service Ref. or Admy Patt. No.	Value	Tol%	Rating
C24	Capacitor	Fixed	AP102896	0.04μF	±20	
C25	"	"	AP61758	0.05μF	"	
C26	"	"	Z115573	2μF	"	250VW
C27	"	"	Z123310	270pF	±10	350VW
C28	"	"	Z132300	100pF	"	500VW
C29	"	"	AP61758	0.05μF	±20	
C30	"	"	AP61758	0.05μF	"	
C31	"	Variable	AP102869	3-33pF		
C32	"	Fixed	Z132273	18pF	±5	500VW
C33	"	"	Z145159	25μF	+100 -20	25VW
C34	"	"	AP102894	750pF	±20	10KV
C35	"	"	Z132630	1000pF	"	350VW
C36	"	Aerial Voltage Indicator				
C37	"	Fixed	Z115506	0.1μF	±20	350VW
L1	Inductance		AP102897			
L2	"		AP102900			
L3	"		AP102900			
L4	"		AP102901			
L5	"		AP102902			
L6	"		AP102903			
L7	"		AP102879			
L8	"		AP102921			
TR1	Transformer		AP102922			
SWA	Switch		AP102908			
SWB	"		AP102926			
SWC	"		AP102907			
JK1	Jack Socket		AP676A			
* M1	Meter P.A. Anode Current		AP63456			
M2	" Ae Voltage		AP63455			
RLA	Ae Change-over Relay		AP 102876			
RLC	Relay C.W. M.C.W.		Z530096			

* When AP 63456 is fitted as M1, external shunt (R18) is to be removed.

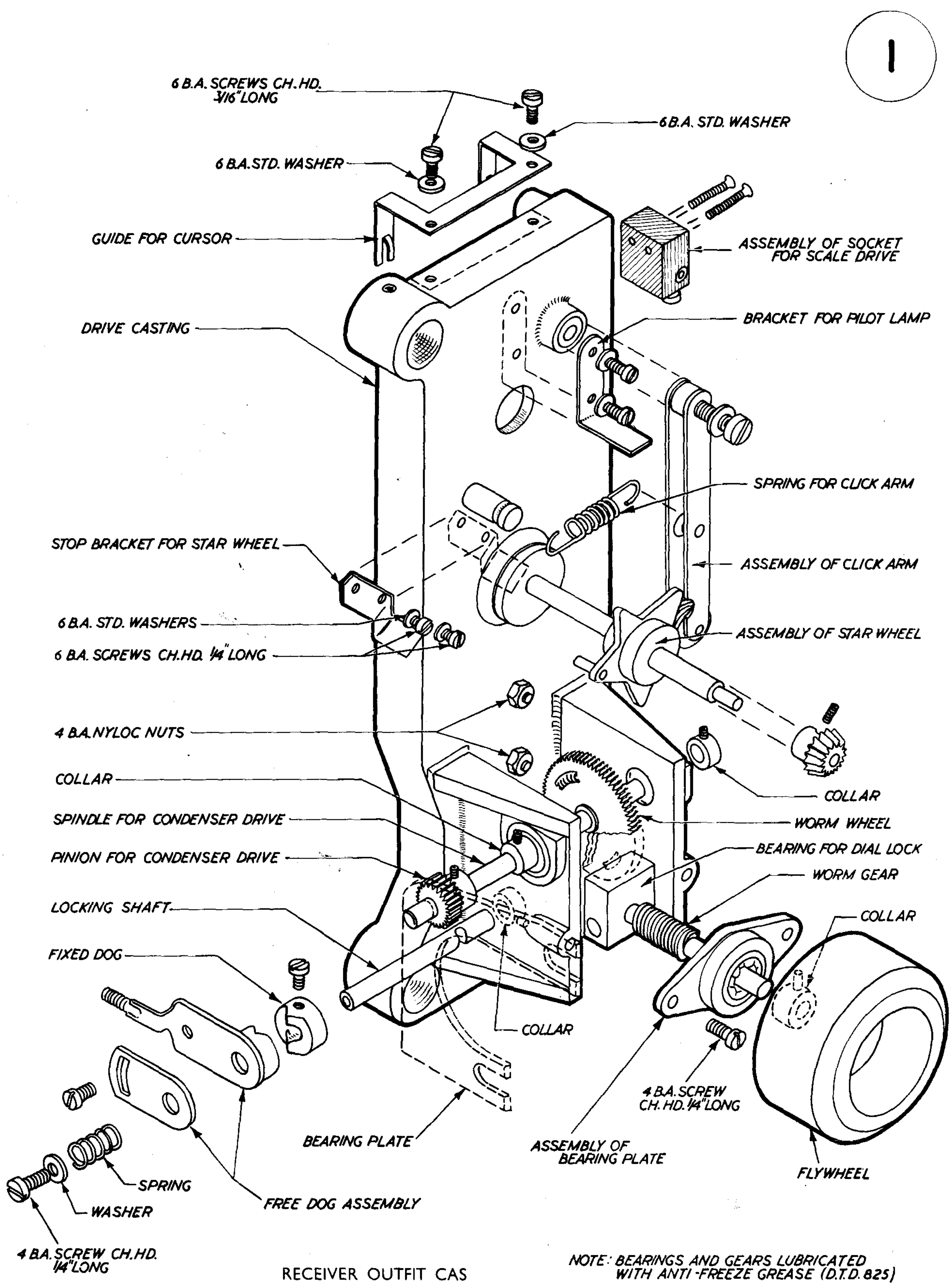
M.F. TRANSMITTER AP100334

Circuit Ref.	Name	Joint Service Ref. or Admy Patt. No.	Value	Tol%	Rating
MR1	Rectifier CV448	CV448			
PL13	Plug	Z560153			
PL14	"	Z560190			
SK15	Socket	W7084			
V1	Valve	CV422	QS 108/45		
V2	Valve	CV395	QS 150/45		
V3	"	CV416	6F 17		
V4	"	CV428	5B/251M		
V5	"	CV428	5B/251M		
V6	"	CV428	5B/251M		
V7	"	CV428	5B/251M		
V8	"	CV428	5B/251M		
V9	"	CV428	5B/251M		

POWER UNIT AP100336

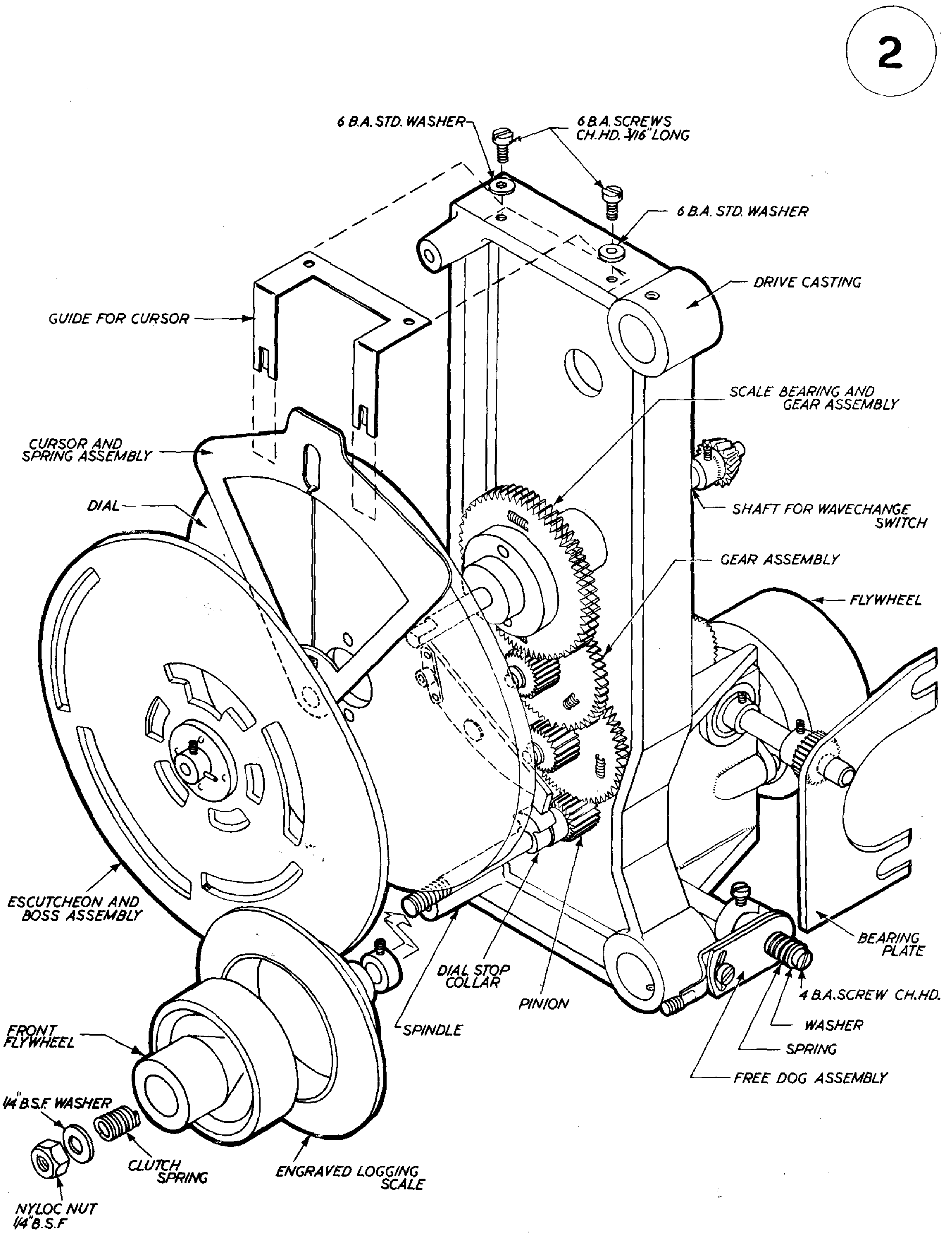
Circuit Ref.	Name	Joint Service Ref. or Admy Patt. No.	Value	Tol%	Rating.
R1	Resistor	011-3431	27 kohms	±5	6W
R2	"	022-3081	220 kohms	±10	$\frac{3}{4}$W
R3	"	022-3081	220 kohms	"	$\frac{3}{4}$W
R4	"	022-3029	82 kohms	"	$\frac{1}{2}$W
R5	"	011-3417	6.8 kohms	±5	10W
R6	"	011-3406	2.5 kohms	"	6W
R7	"	011-3370	75 ohms	"	5W
R8	"	011-3370	75 ohms	"	5W
R9	"	022-2069	3.3 kohms	±10	$\frac{3}{4}$W
R10	"	022-1185	390 ohms	"	$\frac{3}{4}$W
R11	"	011-3382	250 ohms	±5	6W
R12	"	011-3388	430 ohms	"	6W
R13	"	011-3387	390 ohms	"	6W
R14	"	011-3397	1000 ohms	"	6W
R15	"	011-3397	1000 ohms	"	6W
R16	"	022-1185	390 ohms	±10	$\frac{1}{2}$W
R17	"	022-3093	270 kohms	"	$\frac{3}{4}$W
R18	"	022-2081	3.9 kohms	"	$\frac{3}{4}$W
R19	"	022-2081	3.9 kohms	"	$\frac{3}{4}$W
C1	Capacitor	011-2825	8 μF	±20	600VW
C2	"	011-2825	8 μF	"	600VW
C3	"	011-2825	8 μF	"	600VW
C4	"	011-2825	8 μF	"	600VW
C5	"	011-2825	8 μF	"	600VW
C6	"	011-2825	8 μF	"	600VW
C7	"	011-2884	8 μF	"	200VW
C8	"	011-2884	8 μF	"	200VW
C9	"	011-2884	8 μF	"	200VW
C10	"	012-4409	0.01 μF	"	750VW
C11	"	012-4409	0.01 μF	"	750VW
C12	"	012-4402	25 μF	+100 -20	50VW
C13	"	011-2825	8 μF	±20	600VW
TR1	Transformer H.T.	5950-99-520-2684			
TR2	Transformer Heater and Bias	972-0330			
L1	Choke Swinging 450mA	972-0331			
L2	Choke Smoothing 450mA	972-0332			

Circuit Ref.	Name	Joint Service Ref. or Admy Patt. No.	Value	Tol%	Rating
L3	Choke Mounting Design 8.	580-1785			
L4	" " 200mA	972-0333			
L5	" C-Core 8H, 50mA	972-8409			
SWA	Switch	W1367			
SWB	"	AP102910			
SWC	"	AP102909			
PL1	Plug	999-3528			
PL4	"	999-3527			
PL7	"	999-0202			
PL8	"	920-8788			
SK2	Socket	920-8755			
SK3	"	920-8776			
SK5	"	5935-99-972-9114			
SK6	"	469881			
SK7	"	5935-99-920-8688			
SK8	Socket	920-8776			
RLA	Relay	AP 102919			
RLB	"	053-0371			
RLC	"	053-0389			
LP1	Lamp, Neon, Indicator	6240-99-996-1110			
JK1	Phone Jack	972-9652			
F1	Fuses 3 Amp for 220/245V)	5920-99-972-6150 OR			
F2	" OR 5 Amp for 110/120V)	5920-99-972-7865			
F3	" 5 Amp for 220/245V)	5920-99-972-6912 OR			
F4	" OR 3 Amp for 110/120V)	5920-99-972-6150			
F5	" 1 Amp	Z590109			
F6	" 500 mA	Z590108			
V1	Valve CV378	CV378 GZ33, 53KU			
V2	Valve CV378	CV378 GZ33, 53KU			
V3	Valve CV378	CV378 GZ33, 53KU			
V4	Valve CV395	CV395 QS150/45			
MR1	Rectifier	AP 63690			
<u>Dummy Load, Electrical, AP 103099</u>					
PL1	Plug, 12 way	5935-99-972-9109			
R1	Resistor, 6.8 k, 30 W W.W.	5905-99-024-2133			
R2	Resistor, 10 k, 30 W W.W.	5905-99-024-2144			

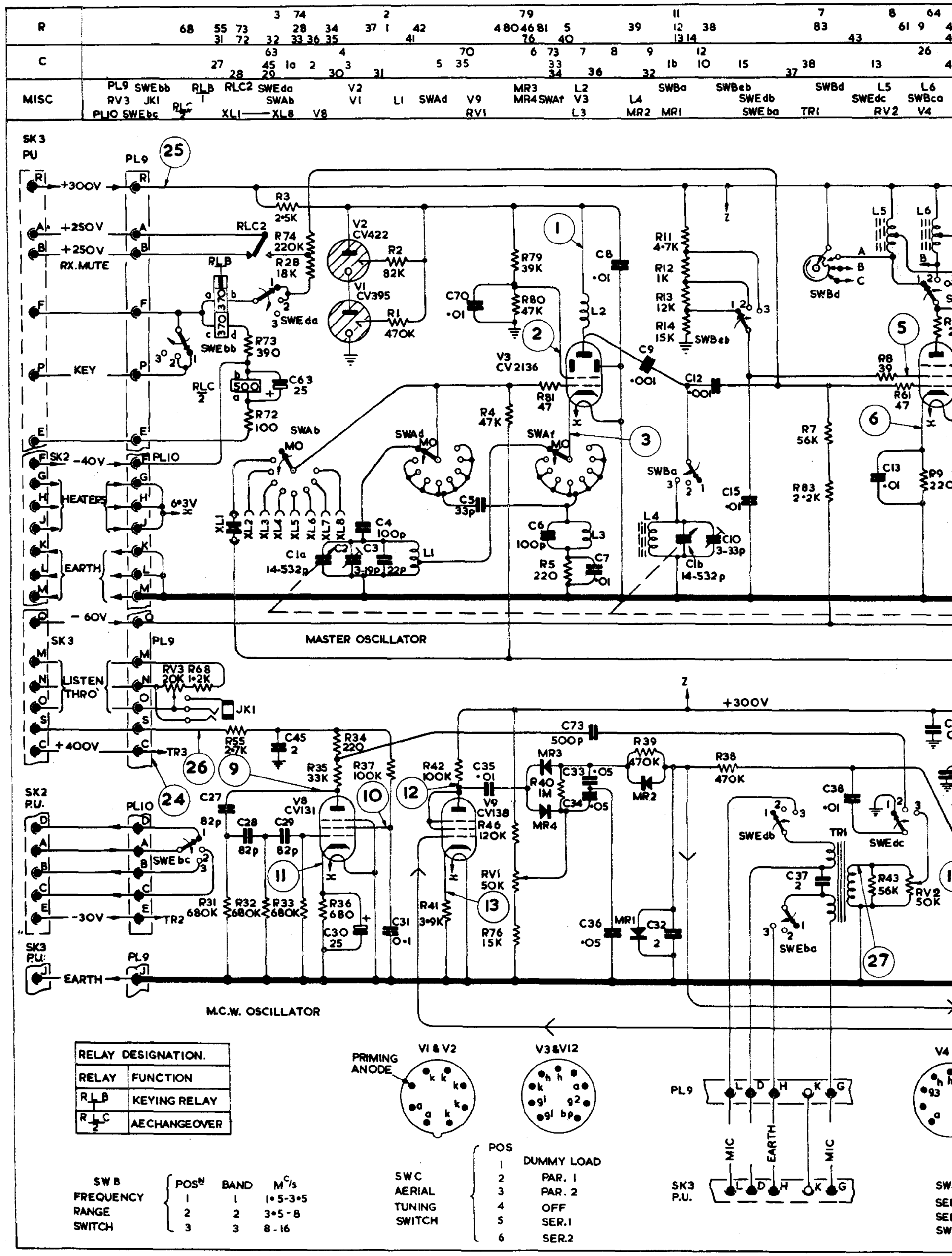


NOTE: BEARINGS AND GEARS LUBRICATED WITH ANTI-FREEZE GREASE (D.T.D. 825)

RECEIVER OUTFIT CAS
SCALE AND DRIVE ASSEMBLY
REAR VIEW



RECEIVER OUTFIT CAS
SCALE AND DRIVE ASSEMBLY
FRONT VIEW



RELAY DESIGNATION.	
RELAY	FUNCTION
RLB	KEYING RELAY
RLC/2	AE CHANGEOVER

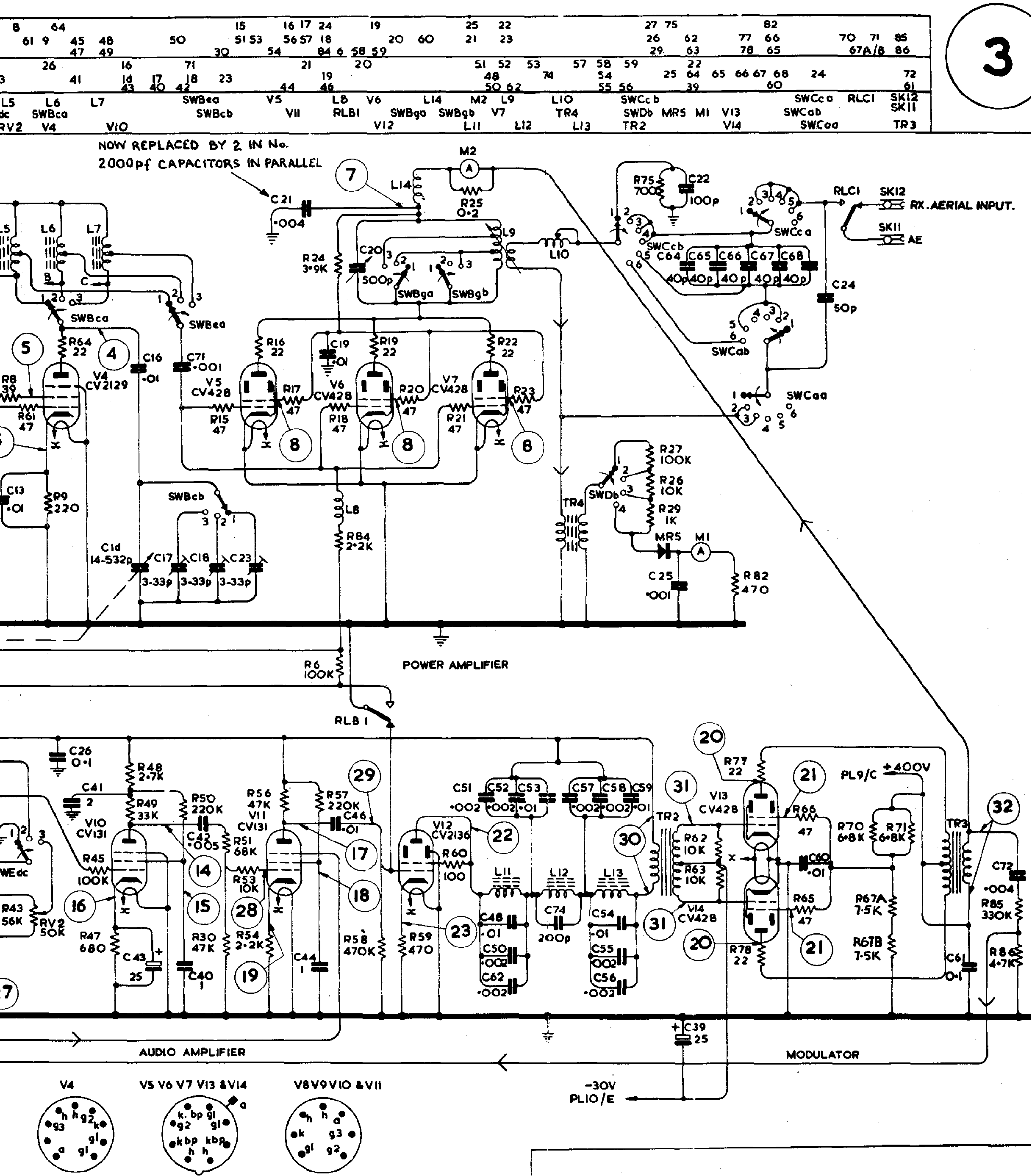
SW B FREQUENCY RANGE SWITCH

POS^N	BAND	M^C/s
1	1	1·5-3·5
2	2	3·5-8
3	3	8-16

SWC AERIAL TUNING SWITCH

POS	
1	DUMMY LOAD
2	PAR. 1
3	PAR. 2
4	OFF
5	SER.1
6	SER.2

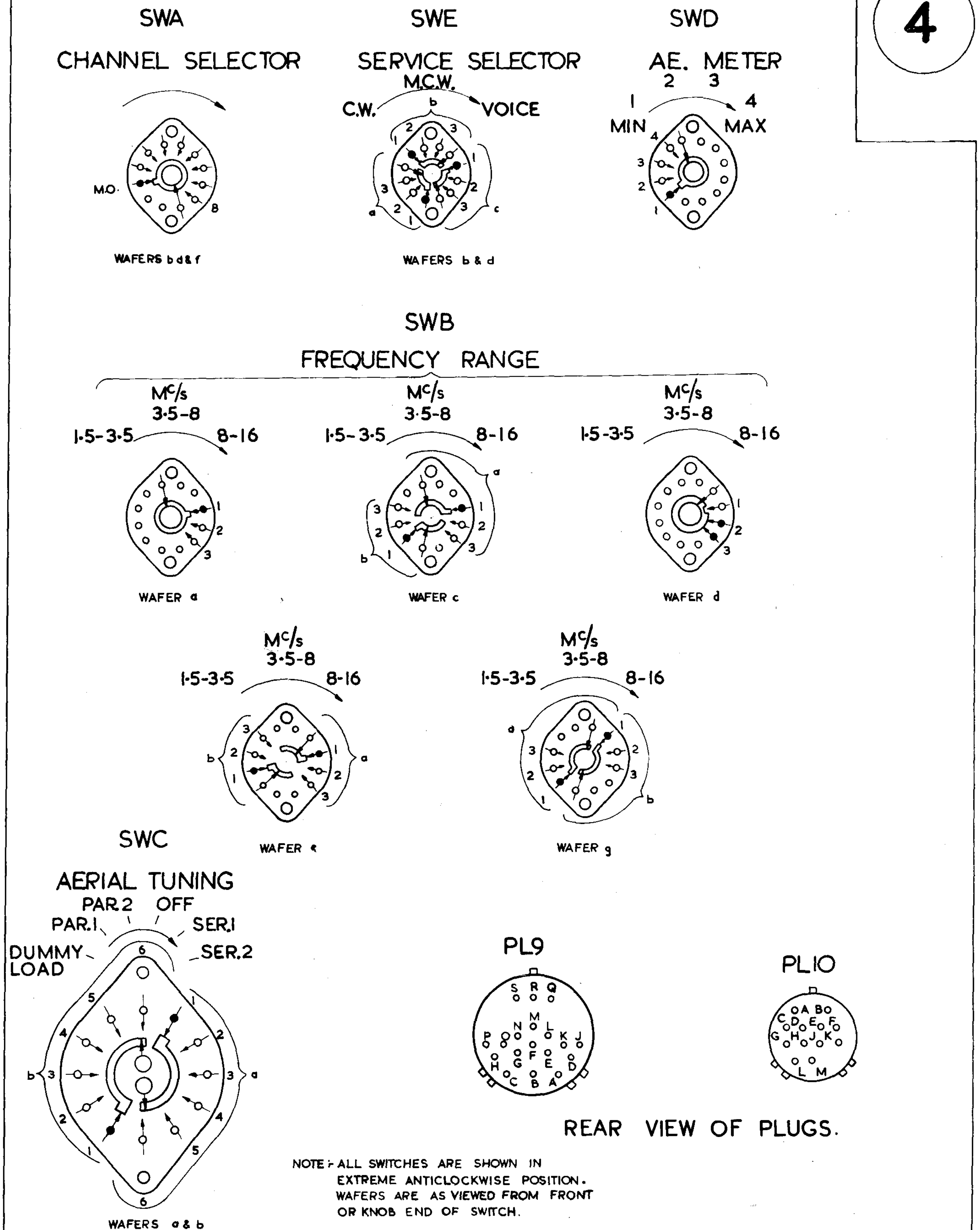
3



AP100333 TRANSMITTER H. F.

CIRCUIT DIAGRAM (SHEET 1.)

SWE SERVICE SELECTOR SWITCH	POS^N	
	1	C.W.
	2	M.C.W.
	3	VOICE



AP 100333 TRANSMITTER H.F.

CIRCUIT DIAGRAM (SHEET 2.)

5

EQUIPMENT USED

AVO METER MODEL 7.

CONDITIONS (UNLESS OTHERWISE STATED.)

1. TRANSMITTER SET UP ON DUMMY LOAD AT MID POINT OF BAND 1.
2. READINGS ARE FOR DRIVEN & UNDRIVEN CONDITIONS. THE FORMER IS THAT OF NORMAL WORKING.
   UNDRIVEN MEASUREMENTS ARE OBTAINED WHEN THE PREVIOUS STAGE IS NOT PRODUCING ANY DRIVE.
   I.E. ON R.F. STAGES ASSUMPTION IS MADE THAT M.O. IS FAULTY IN UNDRIVEN CONDITION.
   ON A.F. STAGES DRIVEN CONDITION IS WITH SW.E. IN M.C.W. POSITION AND UNDRIVEN CONDITION IS WITH SW.E. IN C.W. POSITION.
3. READINGS UNDER KEY UP ARE WITH SW.E. IN C.W. POSITION.

CIRCUIT POINT No.	KEY UP.	KEY DOWN.		METER RANGE VOLTS.	REMARKS.
		DRIVEN.	UNDRIVEN.		
1	260	255+	255+	400	UNDRIVEN CON. WITH SW.A.
2	132	119	110	400	TO CRYSTAL WITH
3	0	0	0	—	NO CRYSTAL INSERTED.
	0	4·4	5·0	10	SW.A. TO CRYSTAL AT 3 M c/s
4	303	303	298	400	SW.B. TO BAND 1.
	306	295	297	400	SW.B. TO BAND 2.
	305	299	296	400	SW.B. TO BAND 3.
5	138	122	136	400	SW.B. TO BAND 1.
	248	214	237	400	SW.B. TO BAND 2.
	254	220	244	400	SW.B. TO BAND 3.
6	0	2·6	0·95	10	SW.B. TO BAND 1.
	0	5·5	3·9	10	SW.B. TO BAND 2.
	0	6·9	4·1	10	SW.B. TO BAND 3
7	420	410	420	1000	
8	410	168	410	1000	
9	155	151	151	400	GRID SHORT CIRCUITED
10	151	149	153	400	TO CHASSIS IN UN-
11	2·9	2·8	2·7	10	DRIVEN CONDITION.
12	162	154	160	400	
13	2·9	2·9	2·8	10	
14	172	224	178	400	
15	100	130	100	400	
16	2·3	0·95	2·3	10	
17	185	188	184	400	
18	121	119	120	400	
19	4·5	4·0	4·15	10	
20	426	420	410	1000	
21	330	300	325	400	
22	288	283	283	400	
23	19	19	19	100	
24	421	414	421	1000	
25	308	303	308	400	
26	308	304	304	400	

AUDIO RESPONSE FIGURES FOR MODULATOR.

EQUIPMENT USED

A.F. VALVE VOLTMETER.
AUDIO OSCILLATOR.

CONDITIONS

TRANSMITTER SET UP FOR 80% MOD. AT 1000 C.P.S. WITH VOGAD OPERATING.

CIRCUIT POINT No.	A. F. VOLTAGE READINGS.					REMARKS.
	250 c/s	1000 c/s	2500 c/s	3500 c/s	5000 c/s	
27	7·0	4·7	4·8	4·75	4·55	
14	6·5	6·0	4·05	4·1	3·95	
28	1·5	1·9	1·6	1·6	1·55	
17	13·0	16·0	12·75	13·0	12·5	
29	12·5	16·0	12·0	13·0	12·5	
22	100	75	100	125	97	
30	85	148	100	7·6	0·55	
3	20	29	22·5	1·85	< 0·5	
32	107	107	197	20	< 0·5	THRO' 0·25 µF CAPACITOR

AERIAL CURRENT READINGS ON DUMMY LOAD.

FREQ. BAND	FREQ.	METER RANGE	READING (mA)
1·5 – 3·5 M c/s	1·5 M c/s	4	0·22
3·5 – 8·0 M c/s	6·0 M c/s	2	0·44
8·0 – 16·0 M c/s	12·0 M c/s	1	0·47

DRIVE VOLTS ACROSS R84, 2·2K.

AVO METER MODEL 7. 400V RANGE.

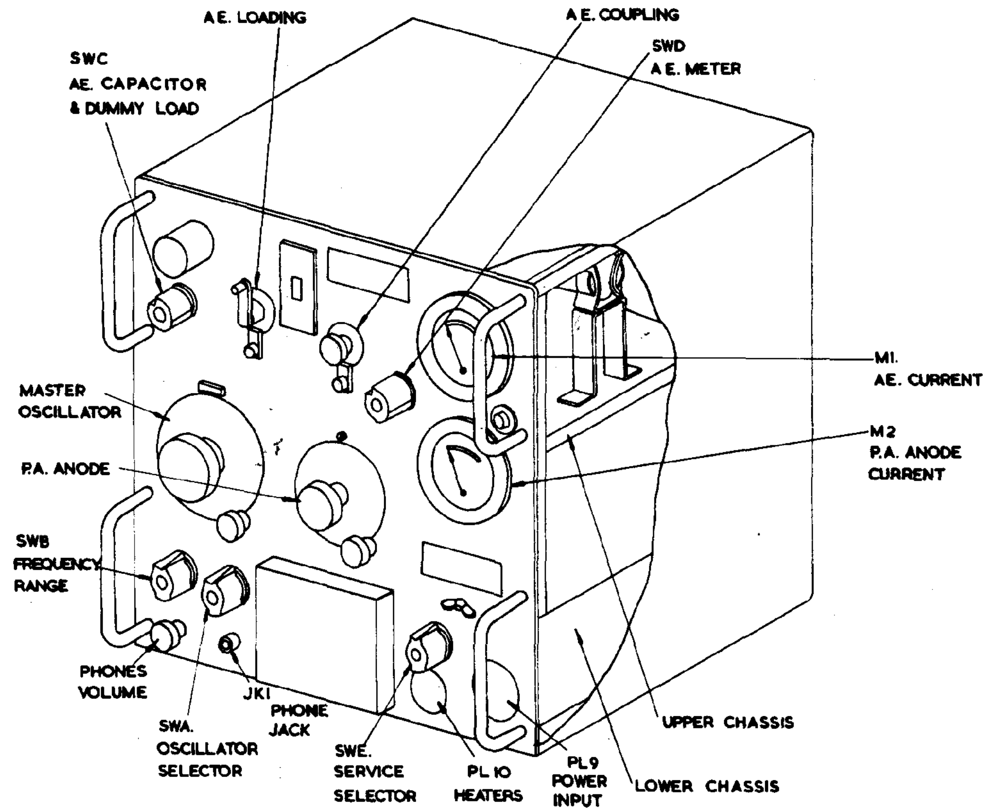
FREQ. BAND	FREQ.	READING.
1·5 – 3·5 M c/s	1·5 M c/s	30
3·5 – 8·0 M c/s	6·0 M c/s	28
8·0 – 16·0 M c/s	12·0 M c/s	26

A.P. 100333 TRANSMITTER H.F.

CIRCUIT DIAGRAM. (SHEET 3.)

TYPICAL VOLTAGE, AUDIO RESPONSE & CURRENT READINGS.

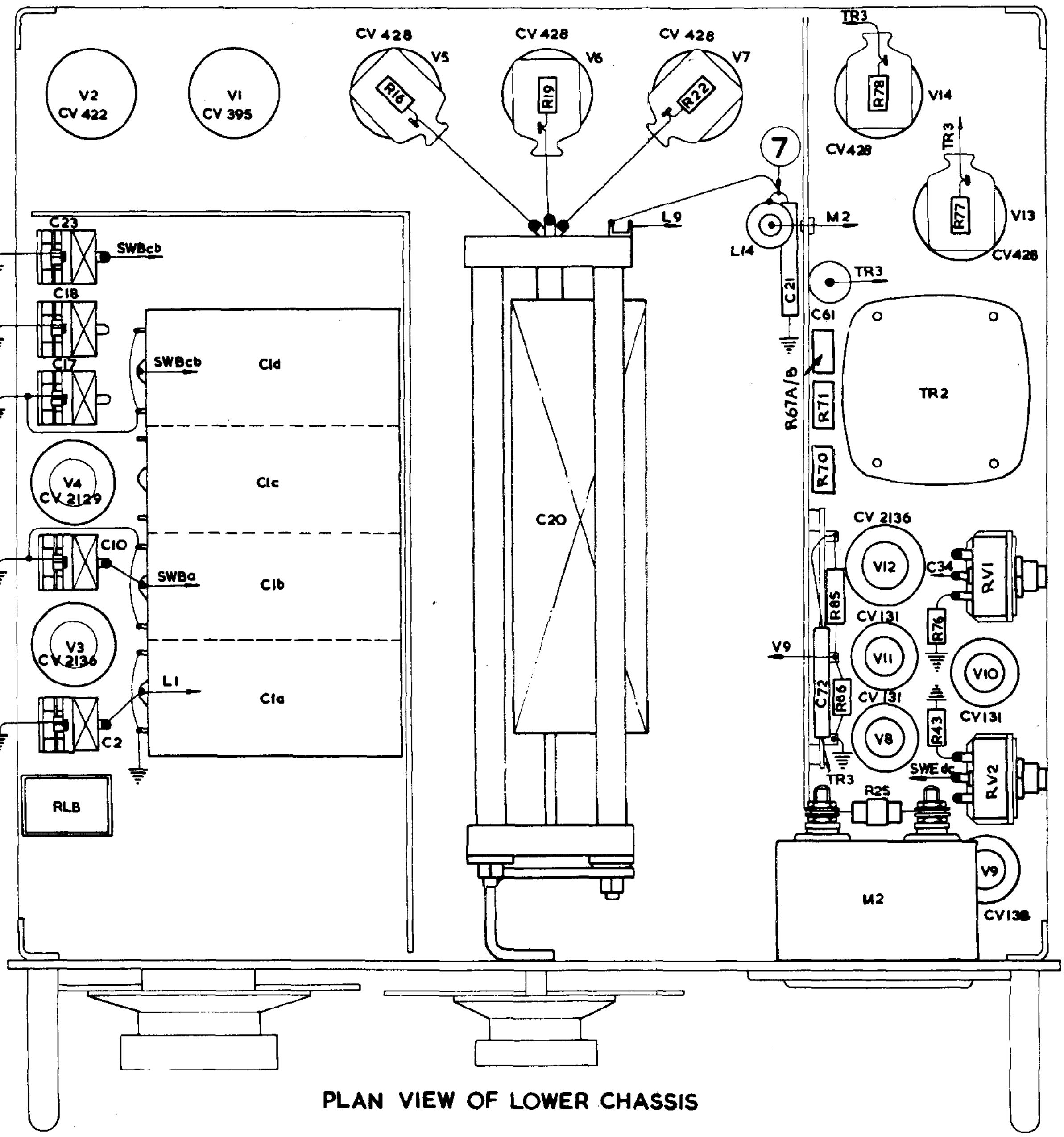
R	
C	
MISC	



A.E. LOADING
A.E. COUPLING
SWC
AE. CAPACITOR
& DUMMY LOAD
SWD
A.E. METER
M1.
AE. CURRENT
MASTER
OSCILLATOR
M2
P.A. ANODE
CURRENT
P.A. ANODE
SWB
FREQUENCY
RANGE
PHONES
VOLUME
JK1
PHONE
JACK
SWA.
OSCILLATOR
SELECTOR
SWE.
SERVICE
SELECTOR
PL 10
HEATERS
PL9
POWER
INPUT
UPPER CHASSIS
LOWER CHASSIS

		16	19	22	67A/B 71 85 70 86	78 77 76 25 43	R
23 18 10 2 17	Ia - Id		20		21 61 72		C
V2 V4 RLB V3	VI	V5	V6	V7	L14	VI4 VI3 VI2 TR2 RV2 VII VIO RVI V8 M2 V9	MISC

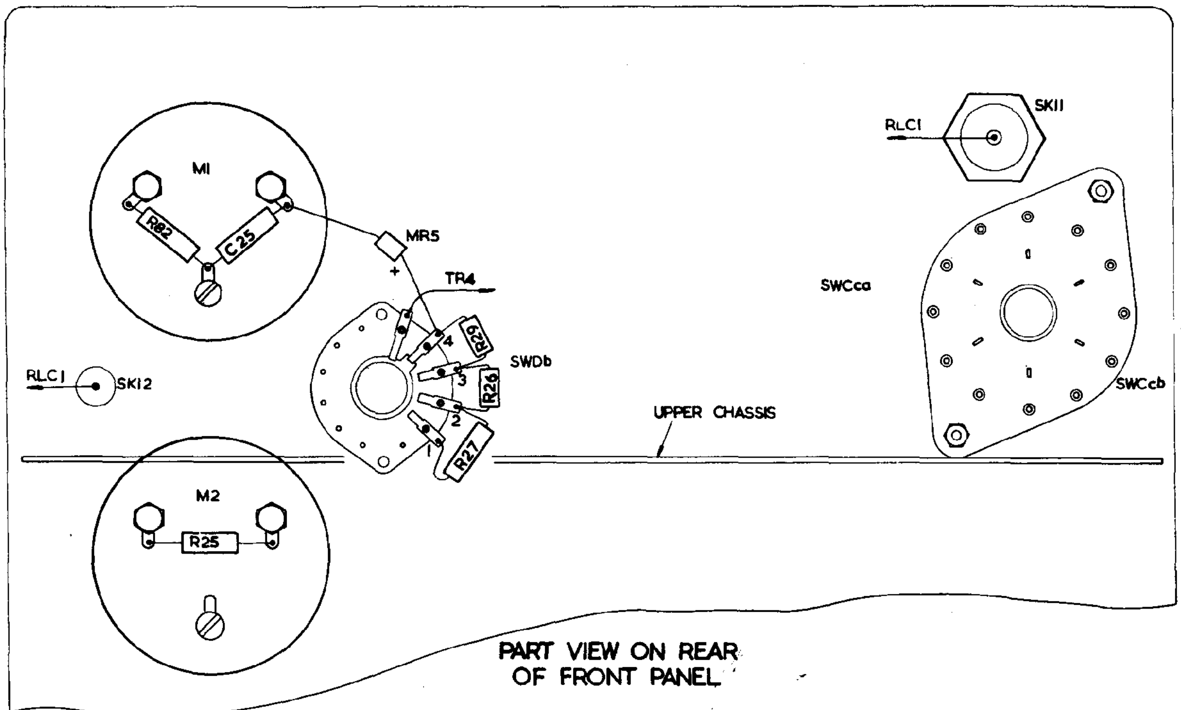
6



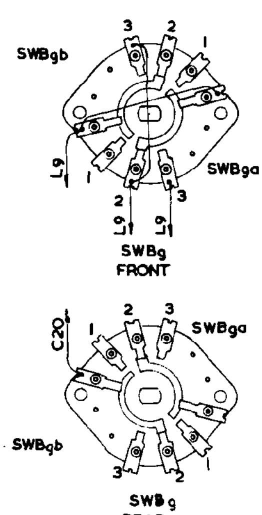
PLAN VIEW OF LOWER CHASSIS

TRANSMITTER H.F. AP.100333
LAYOUT & SWITCH WIRING DIAGRAM.
(SHEET 1)

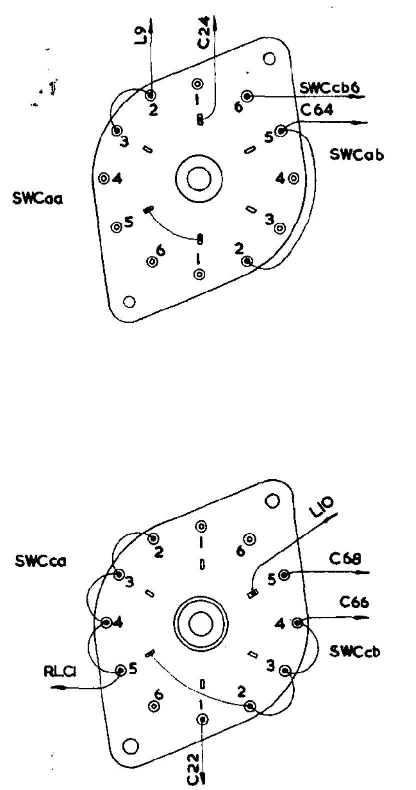
R		82	25			29 26 27					
C				25					68 67	65 66	64
MISC	SK12		M1 M2		MR5	SWDb			SK11 SWC		



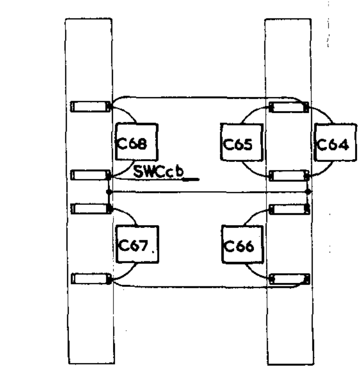
PART VIEW ON REAR
OF FRONT PANEL



PART OF SWB.
FREQUENCY RANGE



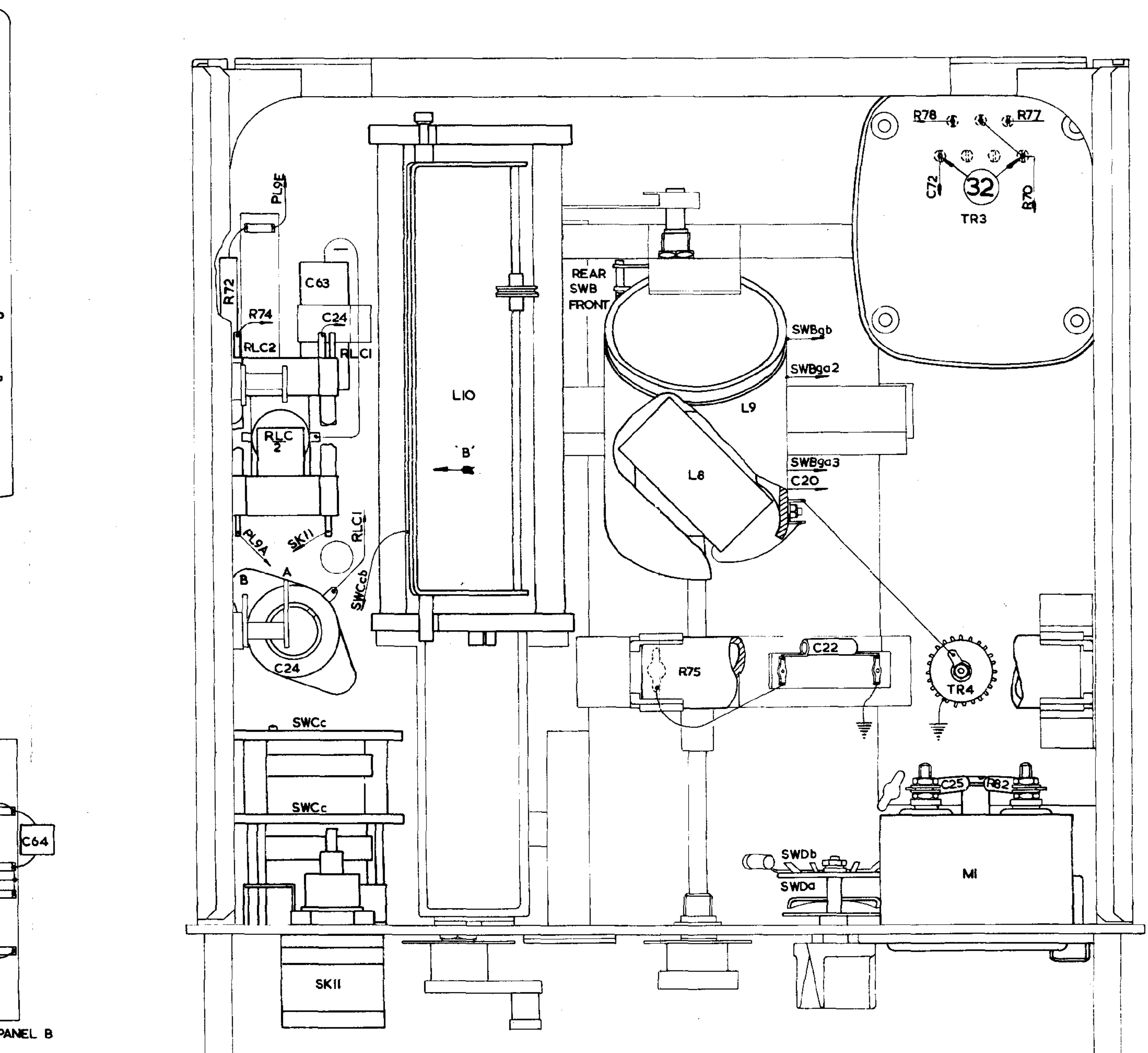
SWC
AE CAPACITOR & DUMMY LOAD



SCRAP VIEW IN DIRECTION OF ARROW

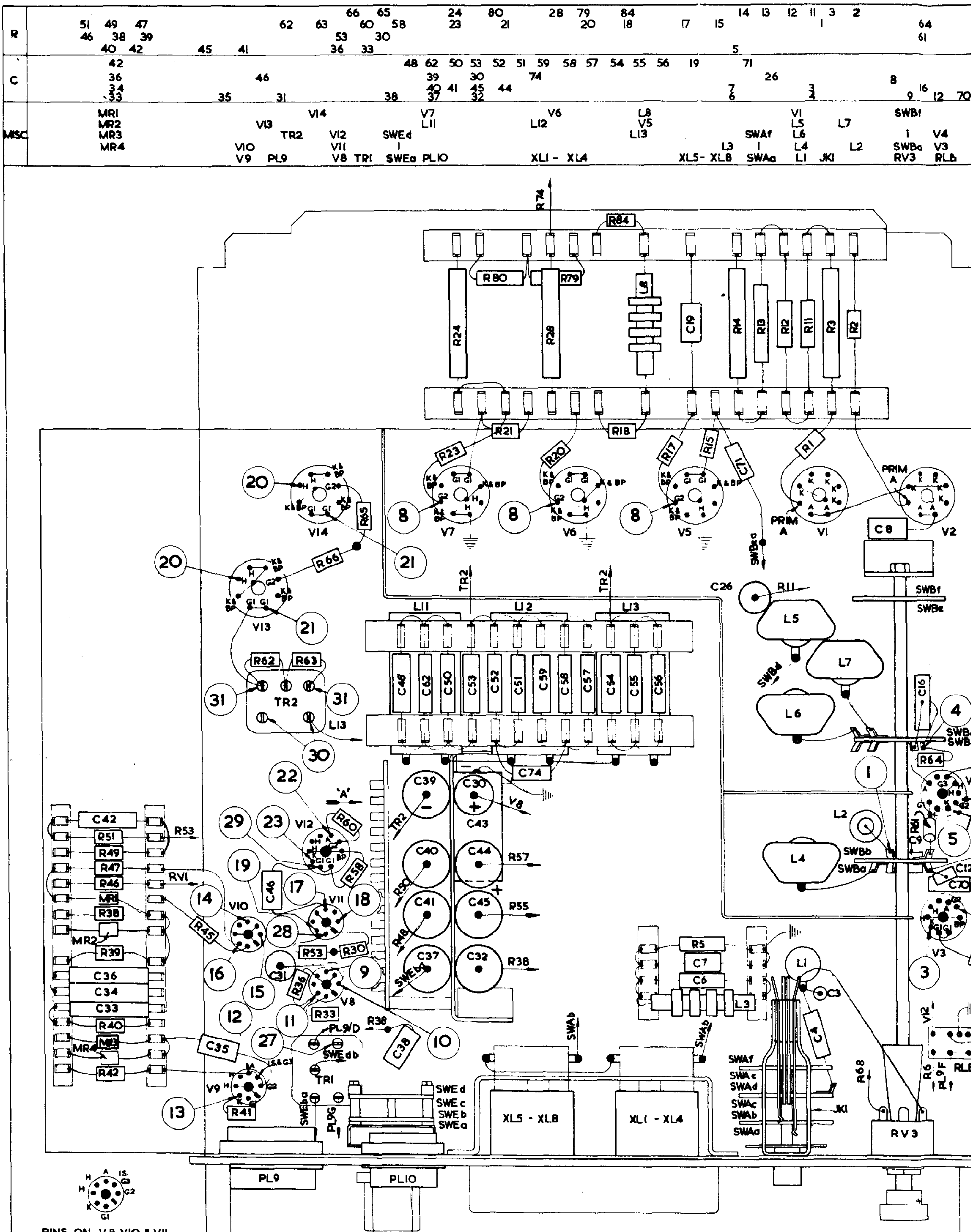
	72			75				82	R
64	24					22	25		C
	RLC2 RLC1 RLC/2 SWCc SWCa SK11	L10	SWBg SWBh	L9 L8		SWDb SWDa	TR3 TR 4 M1		MISC

7

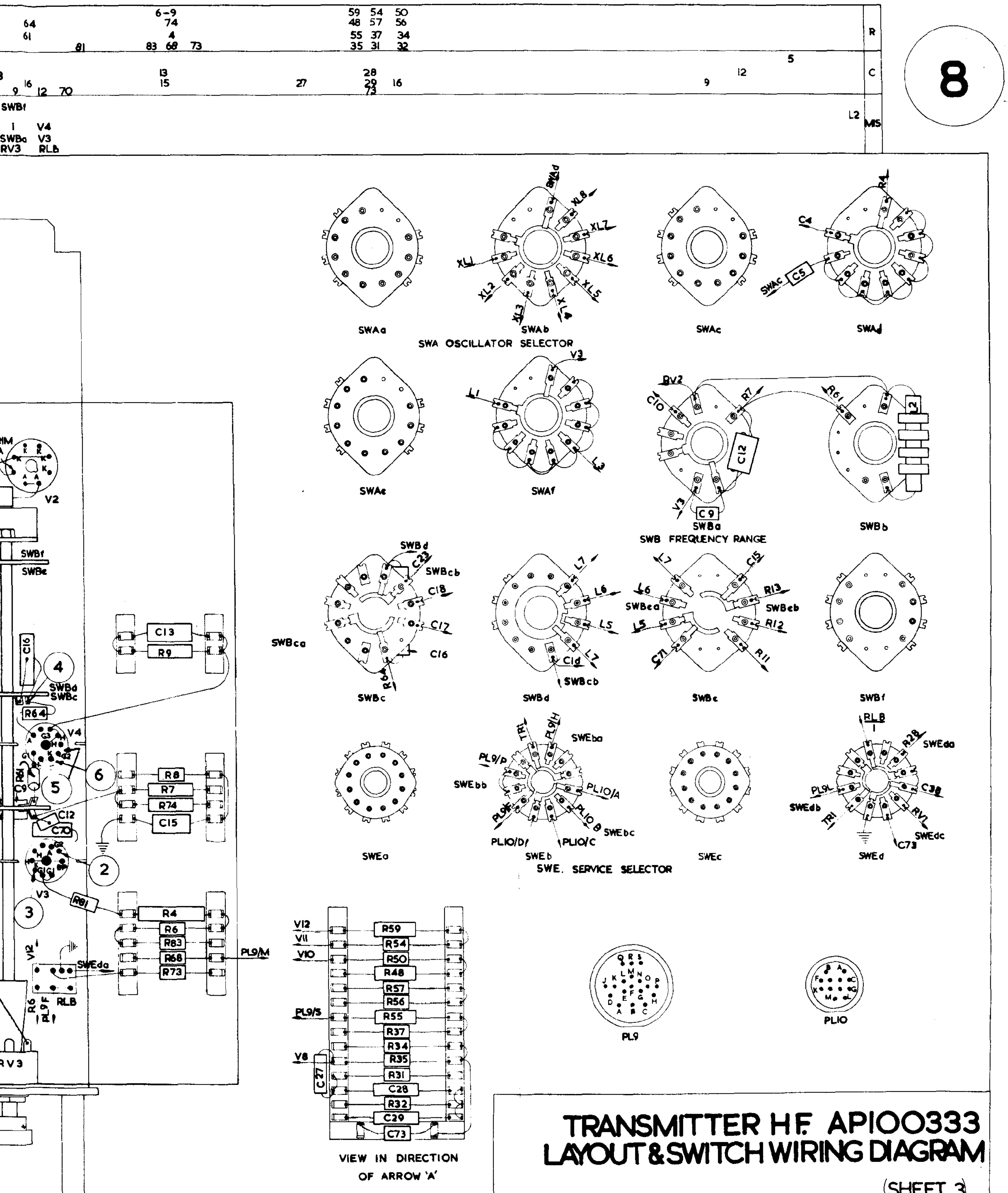


PLAN VIEW OF UPPER CHASSIS

TRANSMITTER H.F. A.P. 100333
LAYOUT & SWITCH WIRING DIAGRAM
(SHEET 2)

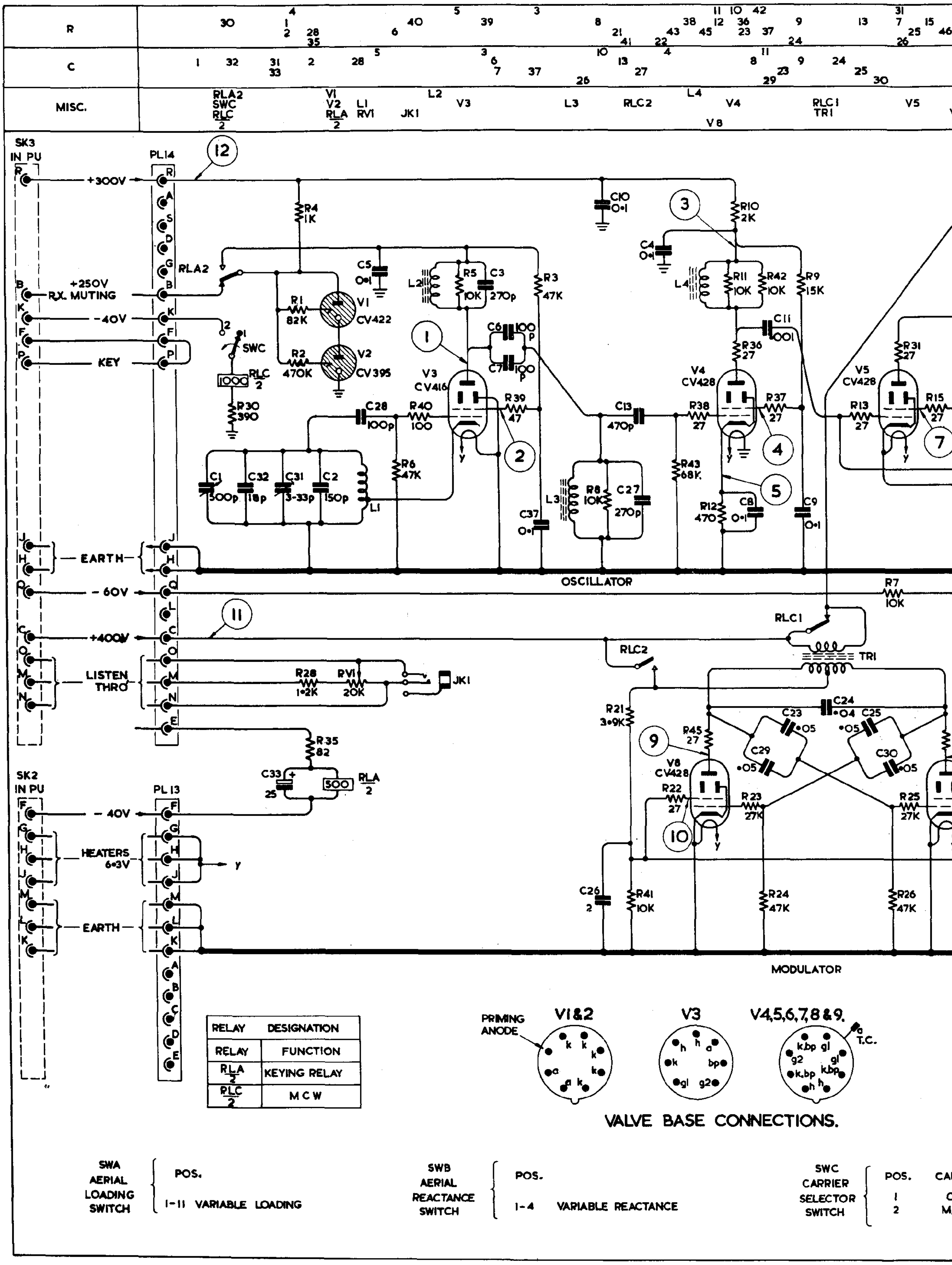


INVERSE PLAN OF LOWER CHASSIS
SIDES DEVELOPED.

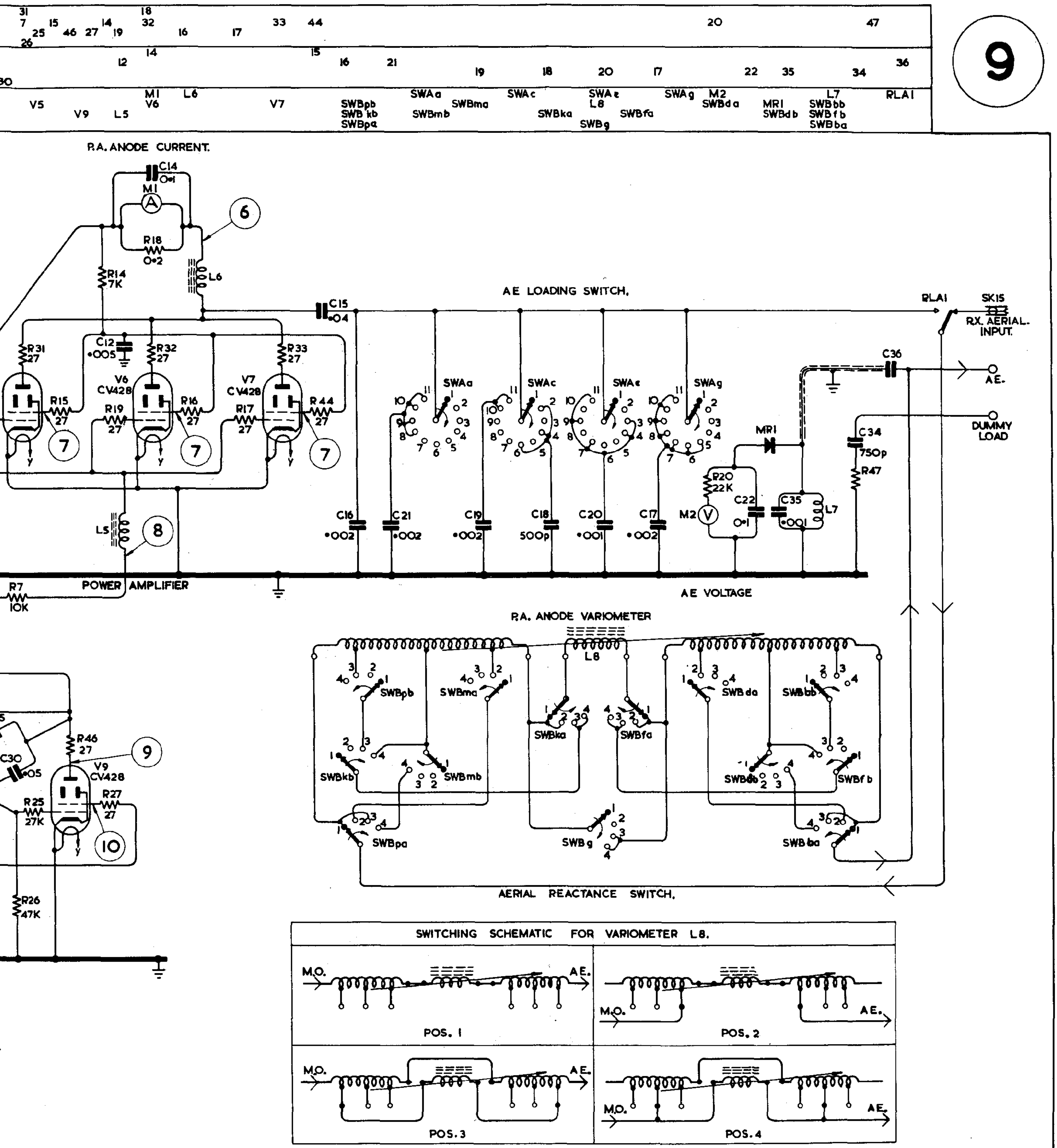


TRANSMITTER H.F. AP100333
LAYOUT & SWITCH WIRING DIAGRAM

(SHEET 3)


R
C
MISC.
RLA2 SWC RLC 2
V1 V2 RLA 2
L1 RV1
JK1
L2
V3
L3
RLC2
L4
V4
V8
RLC1 TR1
V5
SK3 IN PU
PL14
+300V
+250V RX. MUTING
-40V
KEY
EARTH
- 60V
+400V
LISTEN THRO
OSCILLATOR
MODULATOR
SK2 IN PU
PL13
- 40V
HEATERS 6•3V
EARTH
V1 CV422
V2 CV395
V3 CV416
V4 CV428
V5 CV428
V8 CV428
RELAY DESIGNATION
RELAY
FUNCTION
RLA 2
KEYING RELAY
RLC 2
M C W
PRIMING ANODE
V1&2
V3
V4,5,6,7,8 & 9.
T.C.
VALVE BASE CONNECTIONS.
SWA AERIAL LOADING SWITCH
POS.
1-11 VARIABLE LOADING
SWB AERIAL REACTANCE SWITCH
POS.
1-4 VARIABLE REACTANCE
SWC CARRIER SELECTOR SWITCH
POS.
1
2

9

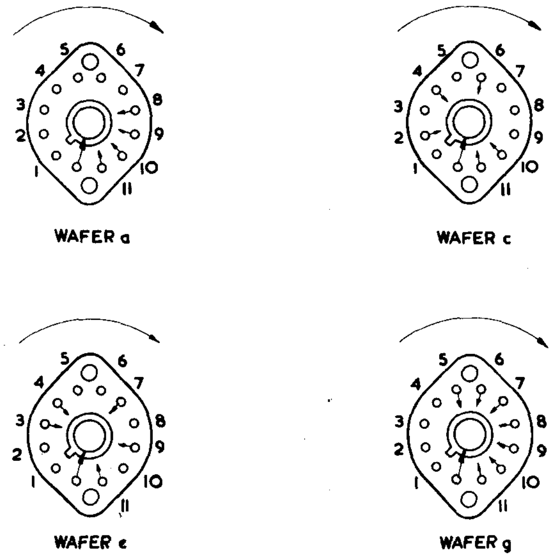


POS.	CARRIER
1	C.W.
2	M.C.W.

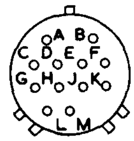
AP 100334 TRANSMITTER M.F

CIRCUIT DIAGRAM. (SHEET 1)

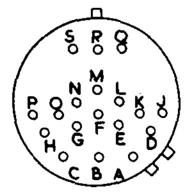
SWA
AERIAL LOADING



PL13

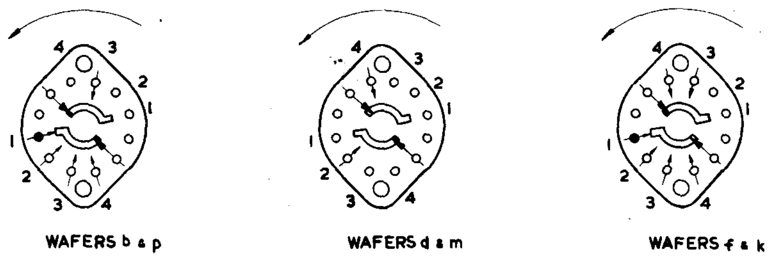


PL14



REAR VIEW OF PLUGS.

SWB
AERIAL REACTANCE



NOTE:- ALL SWITCHES ARE SHOWN WITH CONTROL KNOB IN EXTREME ANTI-CLOCKWISE POSITION. WAFERS ARE AS VIEWED FROM FRONT OF KNOB END OF SWITCH.

AP 100334 TRANSMITTER M.F.

CIRCUIT DIAGRAM (SHEET 2)

EQUIPMENT USED.

AVO METER MODEL 7.

CONDITIONS (UNLESS OTHERWISE STATED).

1. TRANSMITTER SET UP ON DUMMY LOAD AT 330K C/S.
2. UNDRIVEN CONDITION IS WHEN M.O. IS INOPERATIVE.

CIRCUIT POINT NO.	KEY UP.	KEY DOWN.		METER RANGE VOLTS.	REMARKS.
		DRIVEN.	UNDRIVEN.		
1	0	260	260	400	UNDRIVEN CONDITION WITH V3 GRID EARTHED.
2	0	110	84	400	
3	253	253	253	400	
4	211	185	211	400	
5	16·5	13·7	16·5	100	
6	480	376	480	1000	SW. C. TO M.C.W.
7	465	241	465	1000	
8	−60	−133	−60	400	
6	480	428	480	1000	SW. C. TO C.W.
7	465	280	465	1000	
8	−60	−133	−60	400	
9	0	0	0	—	SW. C. TO C.W.
10	0	0	0	—	
9	425	380	—	1000	SW. C. TO M.C.W.
10	270	241	—	1000	
11	480	428	—	1000	
12	376	330	—	400	

AERIAL CURRENT READINGS ON DUMMY LOAD.

FREQUENCY.	READING.
330 K C/S	0·25 mA.
550 K C/S	0·14 mA.

DRIVE VOLTS ACROSS R7, 10K.

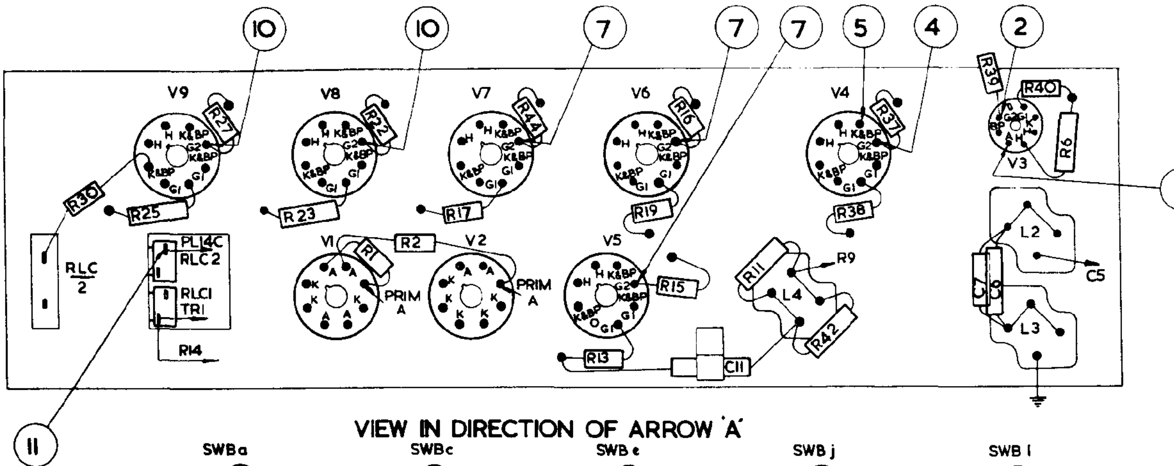
AVO METER MODEL 7, 400V RANGE.

FREQUENCY.	READING.
330 K C/S	76
550 K C/S	83

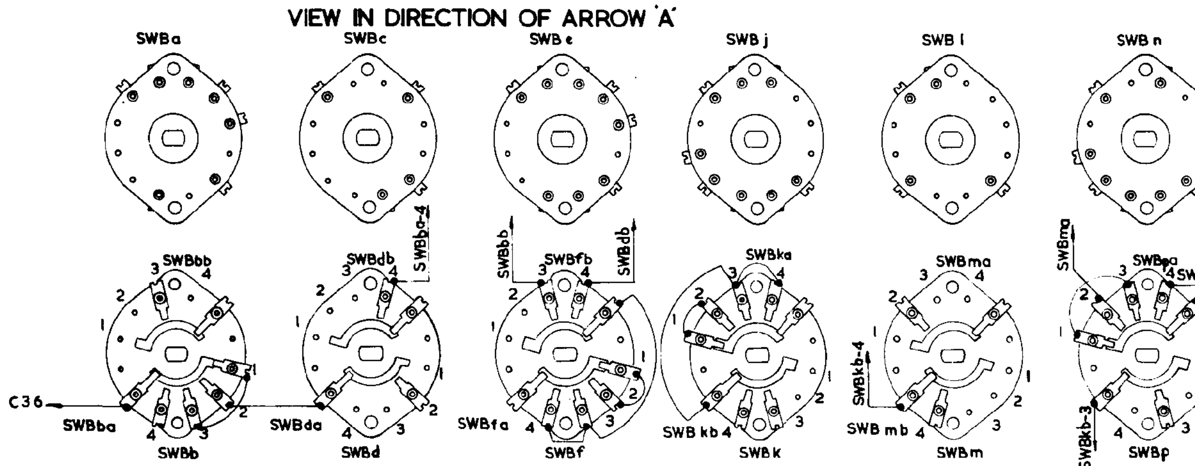
A.P. 100334 TRANSMITTER M.F.

CIRCUIT DIAGRAM (SHEET 3).
TYPICAL VOLTAGE & CURRENT READINGS.

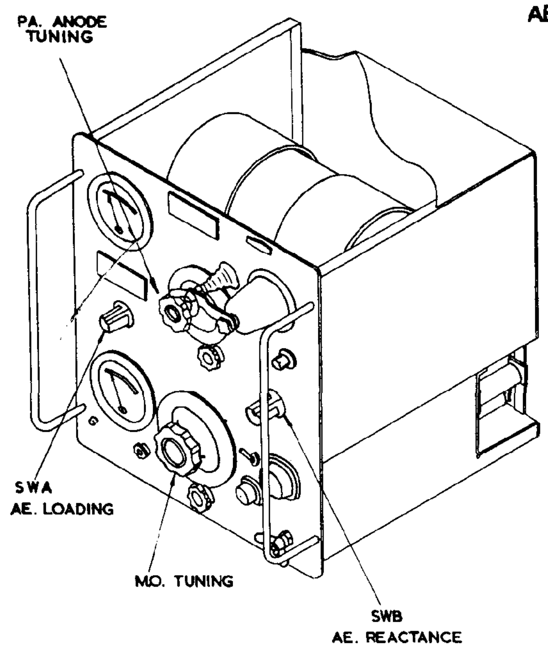
R	30 25 27 23 22 1 2 17 44 19 13 16 15 11 42 38 37 39 40 6
C	11 7 6
MISC	RLC/2 V9 RLC2 RLC1 V8 V1 V7 V2 V6 V5 L4 V4 L8 SWB V3 L2 L3

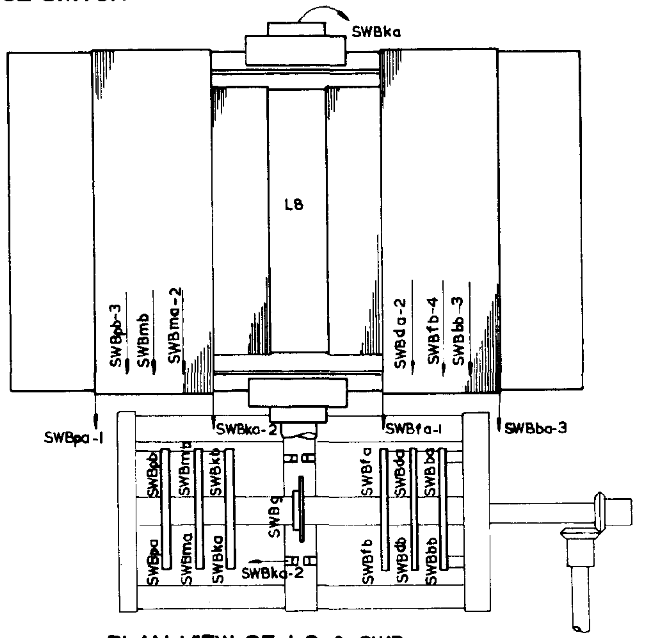


VIEW IN DIRECTION OF ARROW 'A'

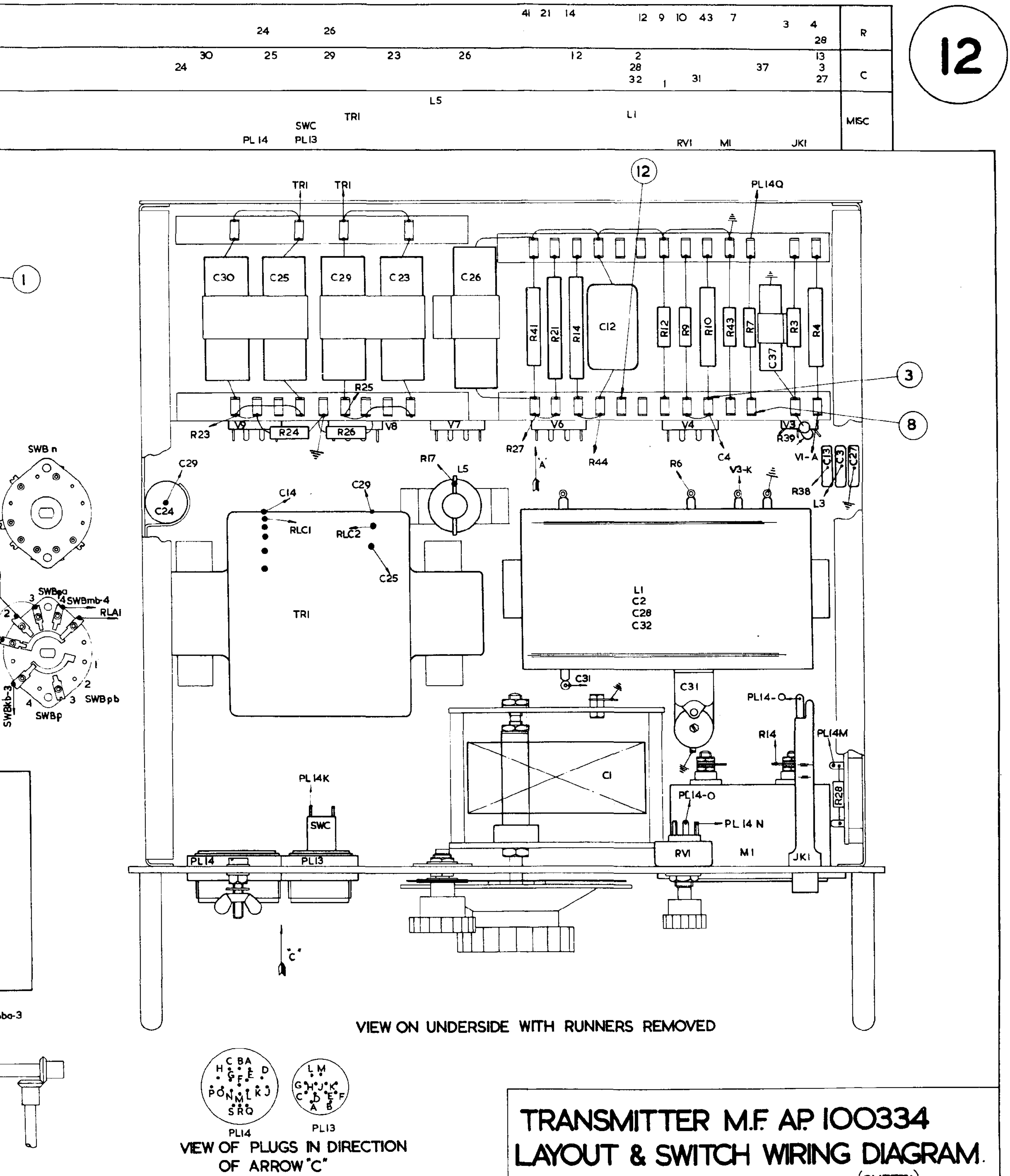


AERIAL REACTANCE SWITCH



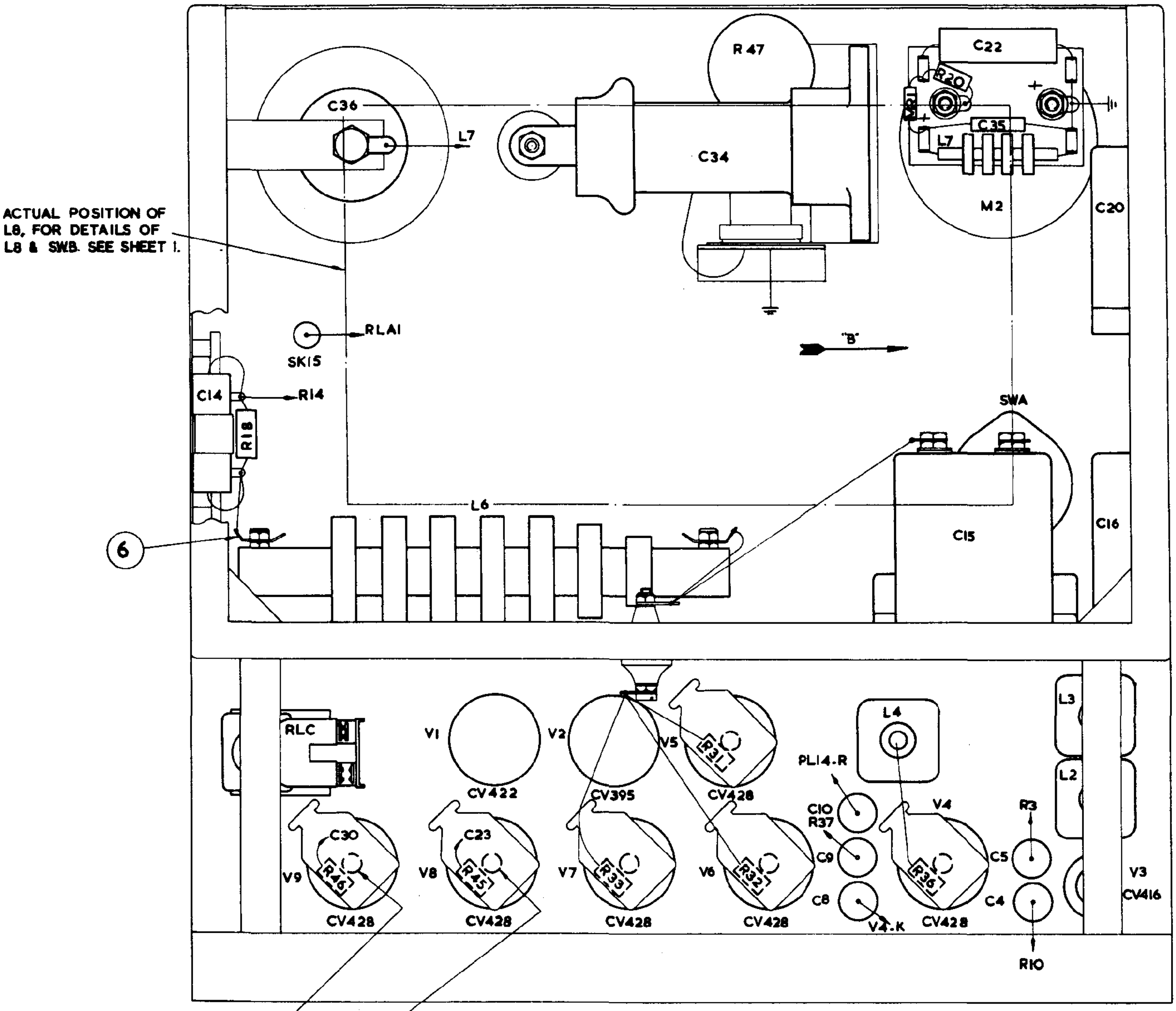


PLAN VIEW OF L8 & SWB
(FOR ACTUAL POSITION SEE SHEET 2)



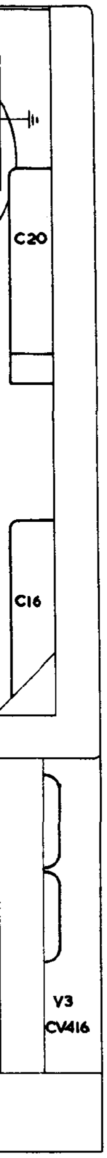
TRANSMITTER M.F. AP. 100334
LAYOUT & SWITCH WIRING DIAGRAM.
(SHEET.1.)

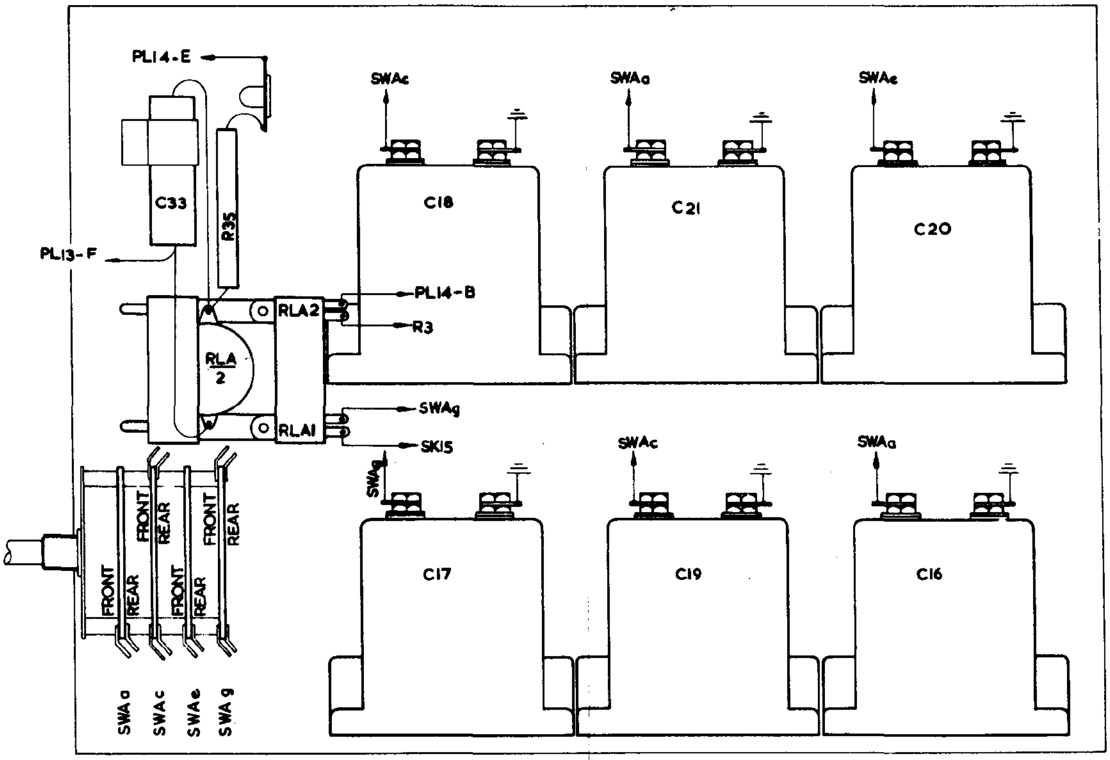
R	18, 46, 45, 33, 47, 31, 32, 36, 20
C	14, 36, 34, 10, 9, 8, 15, 22, 35, 5, 4
MISC.	SK15, RLC, V9, L6, V1, V8, V2, V7, V5, V6, MRI, L4, V4, L7, M2, SWA, L3, L2, V3



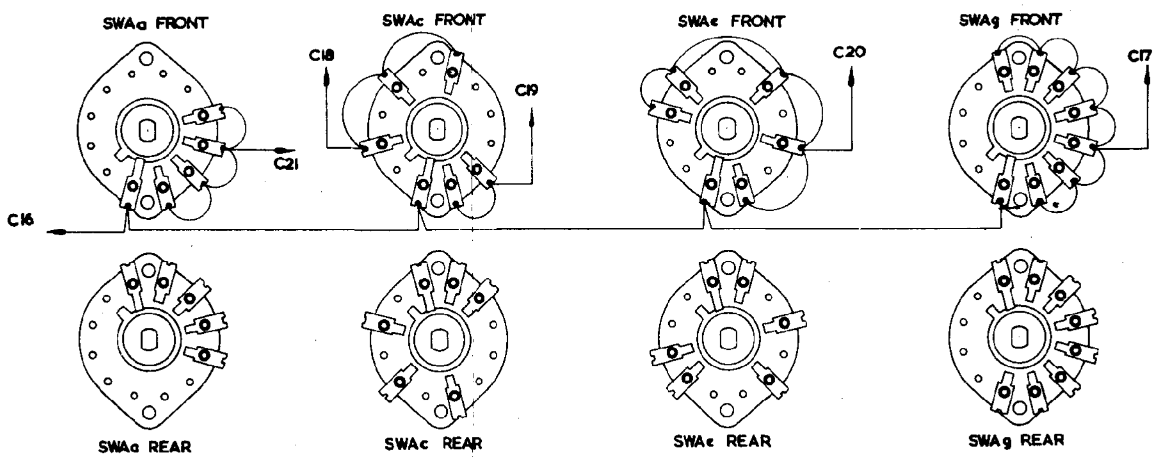
VIEW ON REAR OF UNIT WITH COVER REMOVED.

	35				R
	33	18 17	21 19	20 16	C
V3	RLA/2 RLA2 RLA1 SWA				MISC.





VIEW IN DIRECTION OF ARROW "B"

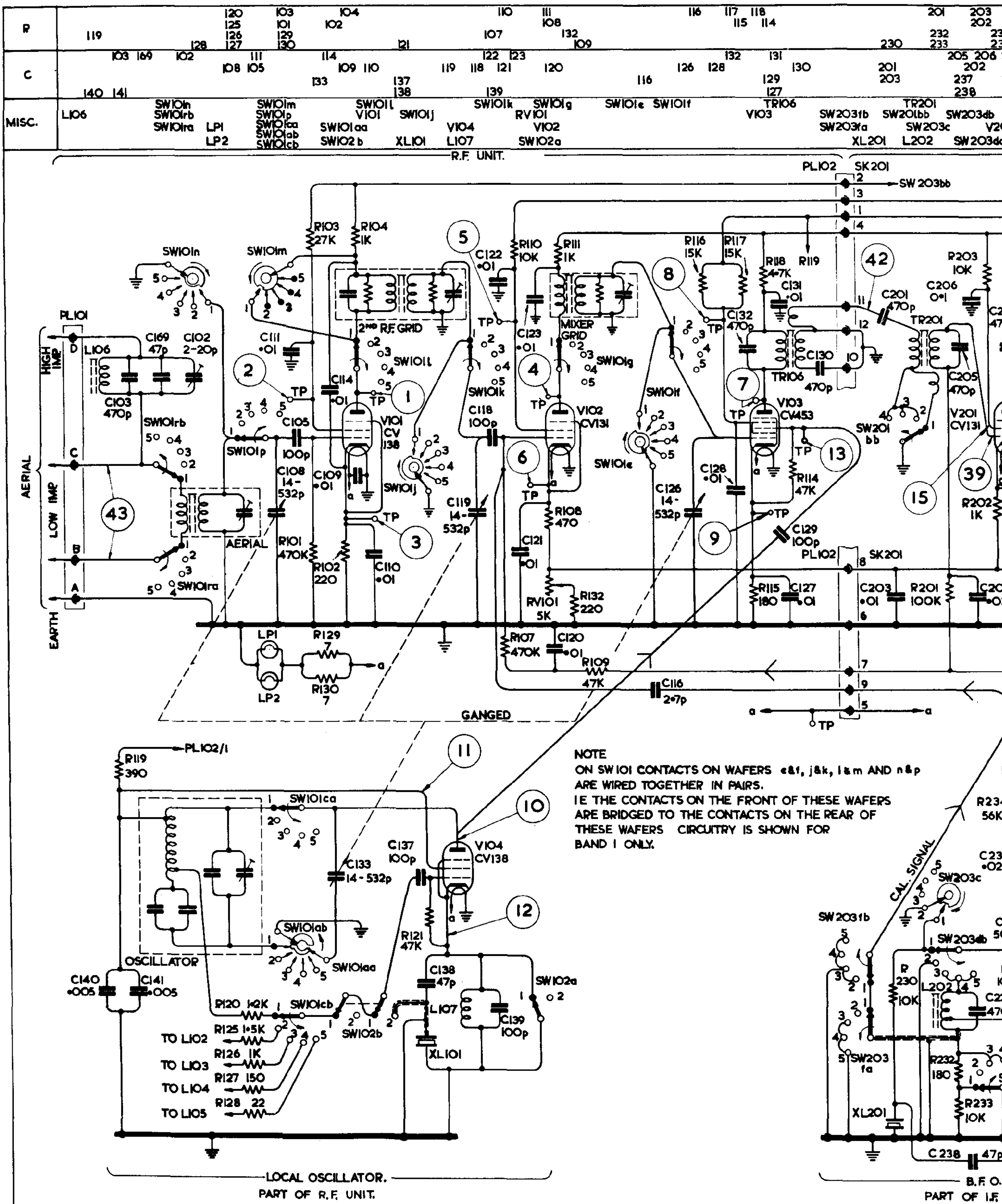


AERIAL LOADING SWITCH SWA.

NOTE.
ON SWA. CONTACTS ON FRONT OF WAFERS ARE WIRED TO ADJACENT CONTACTS ON REAR OF WAFERS.

TRANSMITTER M.F. A.P. 100334 LAYOUT & SWITCH WIRING DIAGRAM.

(SHEET 2)



SW101 FREQUENCY RANGE SWITCH.

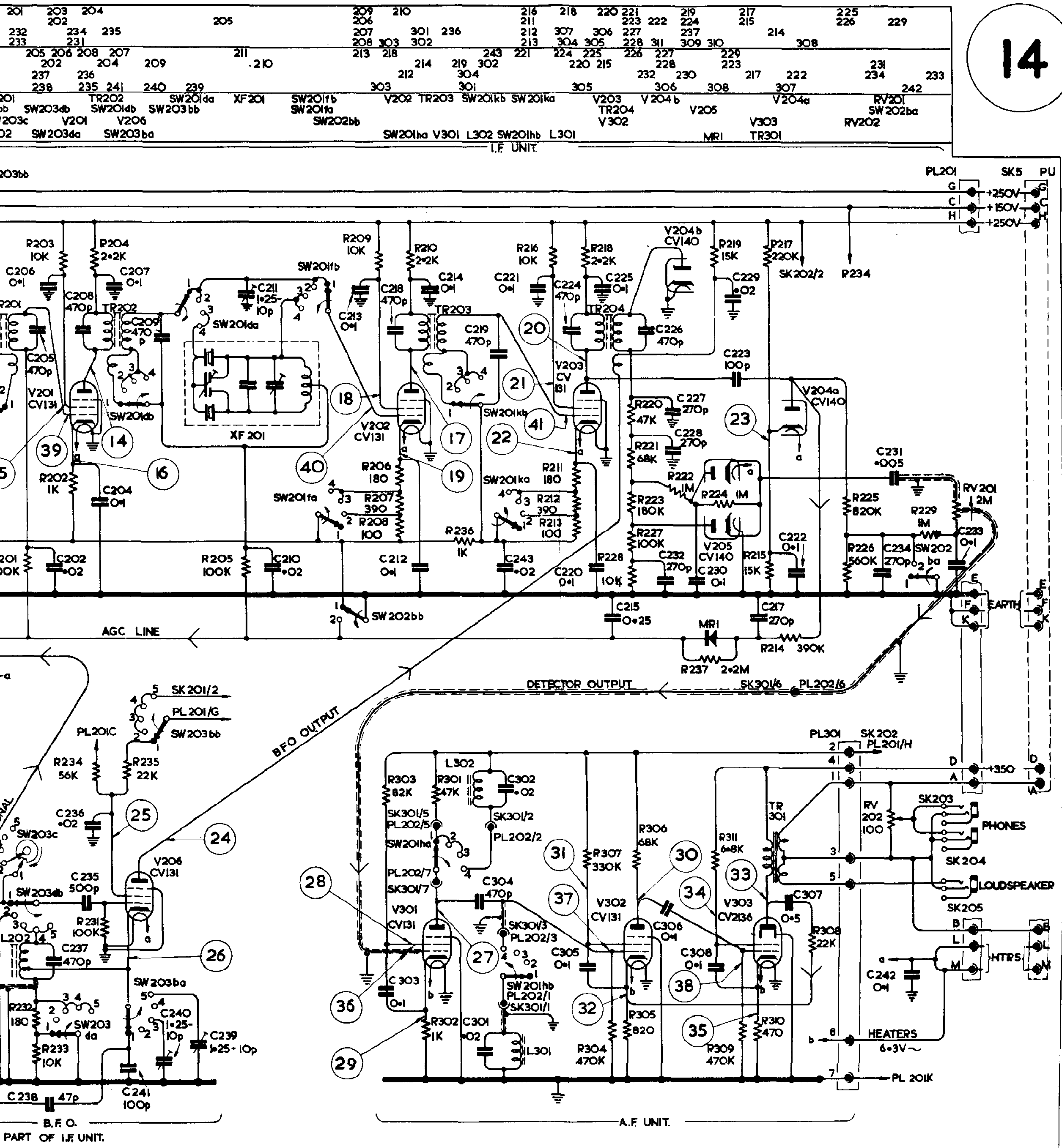
POSITION	BAND	FREQ. RANGE
1	1	60 - 180 Kc/s
2	2	180 - 550Kc/s
3	3	1·5 - 4·7Mc/s
4	4	4·7 - 14·7Mc/s
5	5	14·7 - 30Mc/s

SW102 CRYSTAL SWITCH.

POSITION	
1	OUT
2	IN

SW201 BANDWIDTH SWITCH.

POSITION	
1	8Kc/s
2	3Kc/s
3	1Kc/s
4	200c/s



8Kc/s
3Kc/s
1Kc/s
200c/s

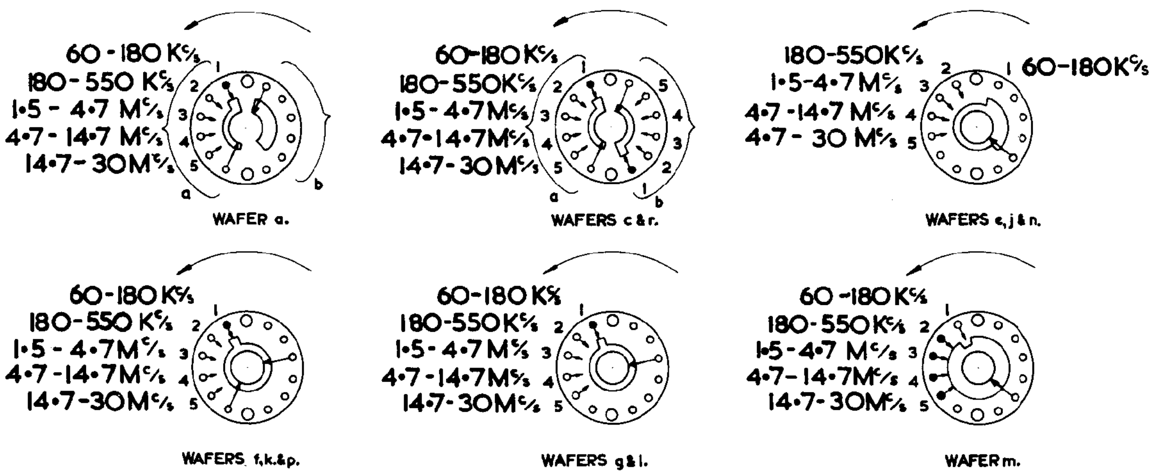
		POSITION	
SW 202 AGC ON-OFF SWITCH.		1	ON
		2	OFF

		POSITION	
SW203 BFO SWITCH.		1	CAL
		2	OFF
		3	TUNE
		4	HIGH
		5	LOW

AP100335 RECEIVER H.F M.F

CIRCUIT DIAGRAM (SHEET 1)

SW 101
FREQUENCY RANGE.



BAND 2
180-550

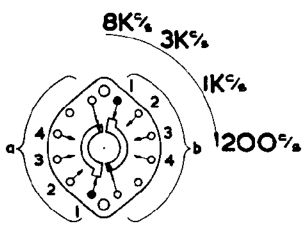
BAND 1
60 - 180K

BAND 5
14·7 -30M

BAND 4
4·7 - 14·7M

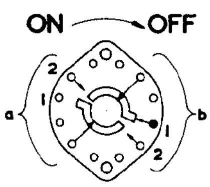
BAND 3
1·5 - 4·7 M

SW201
BANDWIDTH



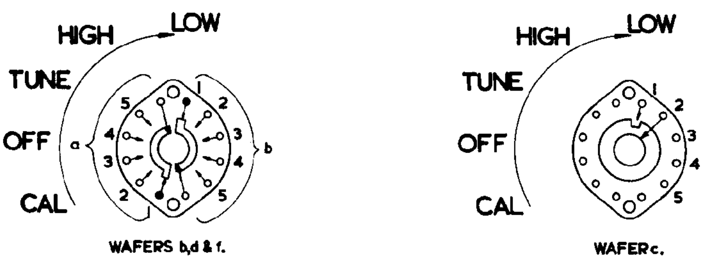
WAFERS b, d, f, h & k.

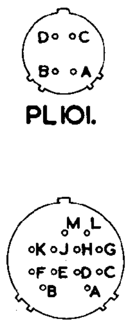
SW202
AGC



WAFER b.

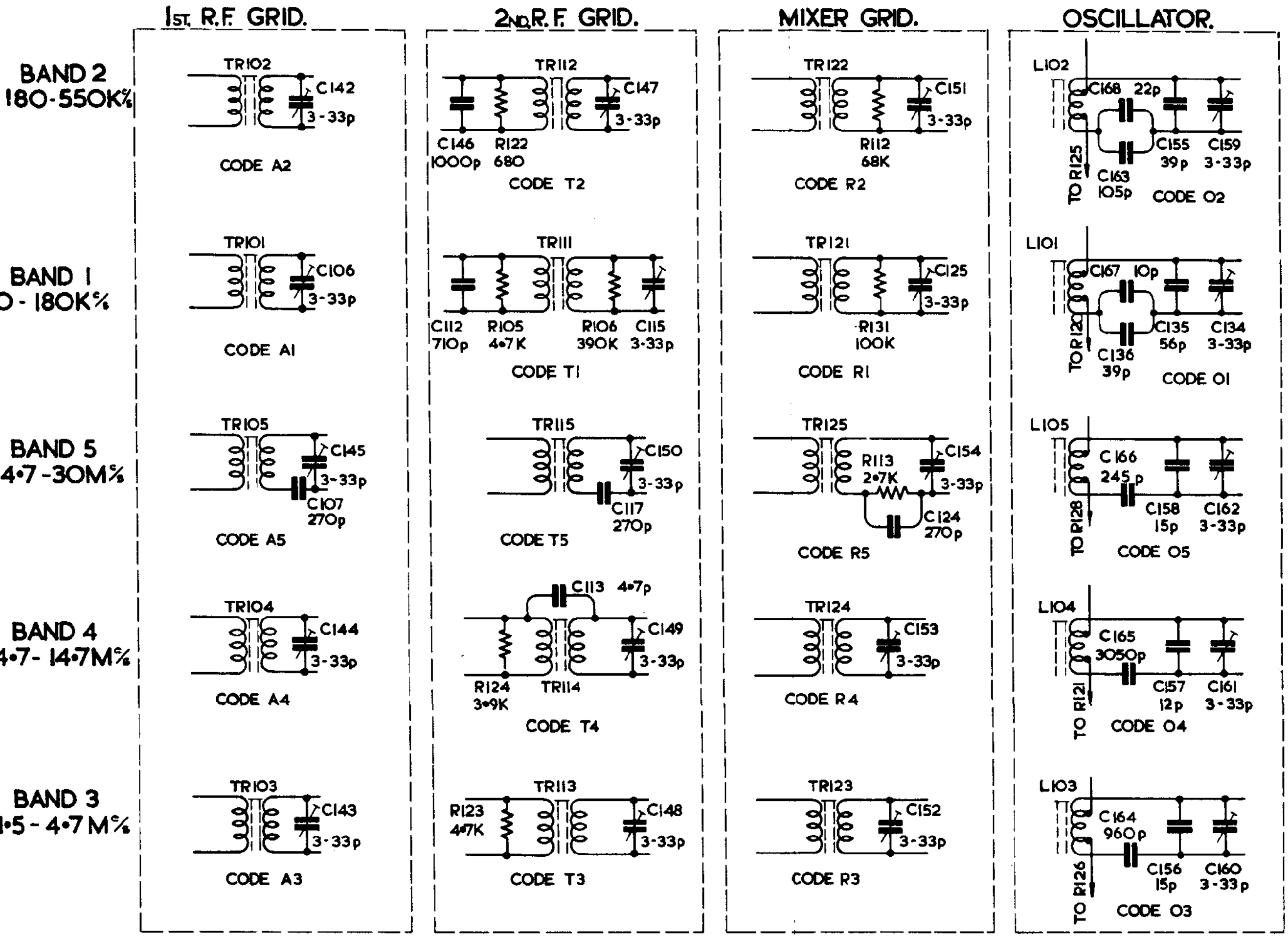
SW 203
BFO

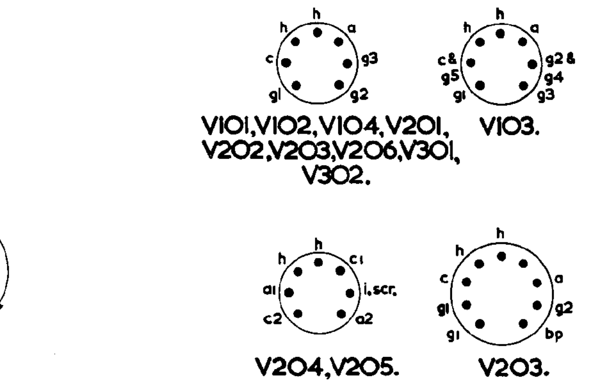




REAR VIEW OF PLUGS.

NOTE. ALL SWITCHES ARE SHOWN WITH CONTROL KNOB IN EXTREME ANTI-CLOCKWISE POSITION.
WAFERS ARE AS VIEWED FROM FRONT OR KNOB END OF SWITCH.





PLUGS.

VALVE BASE CONNECTIONS.

AP100335 RECEIVER H.F M.F

CIRCUIT DIAGRAM (SHEET 2)

R. F UNIT.

EQUIPMENT USED.

AVO METER MODEL 7.
VALVE VOLTMETER.

CONDITIONS (UNLESS OTHERWISE STATED)

1. A.F. & R.F. GAIN CONTROLS MAX.
2. INPUT SIGNAL ZERO.
3. A.G.C. OFF.
4. BANDWIDTH 3 KC/S.
5. D.C. INPUT VOLTS. PL.201/G. 250 V.
   PL.201/C. 150 V.

CIRCUIT POINT No.	METER RANGE VOLTS	METER READING VOLTS	REMARKS
1	400	236	
2	400	178	
3	10	1·7	
4	400	240	
5	400	224	
6	10	3·6	
	100	24·0	R. F. GAIN MINIMUM
7	400	228	
8	400	97	
9	10	1·5	
10	400	146	
11	400	146	
12	10	0·5	CRYSTAL SWITCH IN
13	MEASURED WITH VALVE VOLT-METER	11	FREQUENCY 0·118 MC/S
		8·2	FREQUENCY 0·344 MC/S
		7·2	FREQUENCY 2·91 MC/S
		8·5	FREQUENCY 8·8 MC/S
		5·5	FREQUENCY 21·0 MC/S

I. F UNIT.

EQUIPMENT USED.

AVO METER MODEL 7.

CONDITIONS (UNLESS OTHERWISE STATED).

1. A.F. & R.F. GAIN CONTROLS MAX.
2. SIGNAL INPUT ZERO.
3. A.G.C. OFF.
4. BANDWIDTH 3 KC/S.
5. D.C. INPUT VOLTS. PL201/H. 250V.

CIRCUIT POINT No.	METER RANGE VOLTS	METER READING VOLTS	REMARKS
14	400	233	
15	400	223	
16	10	5·7	
17	400	233	
18	400	223	
19	10	4·8	
	10	5·2	BAND WIDTH S.W. 8 KC/S
	10	4·6	BANDWIDTH S.W. 1 KC/S
20	400	230	
21	400	220	
22	10	10·0	
	10	11·5	BANDWIDTH S.W. 8 KC/S
	10	14·0	BANDWIDTH S.W. 1 KC/S
23	100	14·0	
24	400	157	S.W. 203 TO CAL.
25	400	177	
26	10	1·2	
24	400	218	S.W. 203 TO OFF.
25	400	111	
26	10	4·5	
24	400	211	S.W. 203 TO HIGH.
	400	99	

NOTE:–
AVERAGE B.F.O. OUTPUT
10μA. THROUGH R228 (WITH GRID 1 V203 EARTHED) VIA. ·01μF. CAPACITOR.

AP100335 RECEIVER H.F M.F

CIRCUIT DIAGRAM (SHEET 3).
TYPICAL VOLTAGE READINGS.

A.F. UNIT.

EQUIPMENT USED.
AVO METER MODEL 7.

CONDITIONS (UNLESS OTHERWISE STATED)
1. A.F. & R.F. GAIN CONTROLS MAX.
2. SIGNAL INPUT ZERO.
3. BANDWIDTH 3K c/s
4. D.C. INPUT VOLTS. PL. 301/2. 250V.
   PL. 301/4. 350V.

CIRCUIT POINT NO.	METER RANGE VOLTS	METER READING VOLTS	REMARKS.
27	400	91	
	400	240	BANDWIDTH SW. 200 c/s.
28	400	133	
29	10	3·38	
	10	3·57	BANDWIDTH SW. 200 c/s.
30	400	93	
31	400	61	
32	10	1·72	
33	400	337	
34	400	307	
35	100	19·3	

EQUIPMENT USED.
AUDIO OSCILLATOR
SIGNAL GENERATOR (MARCONI TF144G)
OUTPUT POWER METER (MARCONI TF340)

CONDITIONS.
1. D.C. INPUT VOLTS. PL. 201/C. 150V.
   PL. 201/D. 350V.
   PL. 201/H. 250V.
2. R.F. & A.F. GAIN CONTROLS MAXIMUM A.G.C. OFF. BANDWIDTH 3K c/s.
3. SIGNAL GENERATOR 30% MODULATED AT 400 c/s.
4. R.F. & I.F. INPUT FED VIA A 0·1μF. CAPACITOR.
5. INPUT TO AE. CIRCUIT VIA. 80Ω MATCHED PAD (20dB)
6. OUTPUT MEASURED AT 600Ω LOUDSPEAKER JACK.

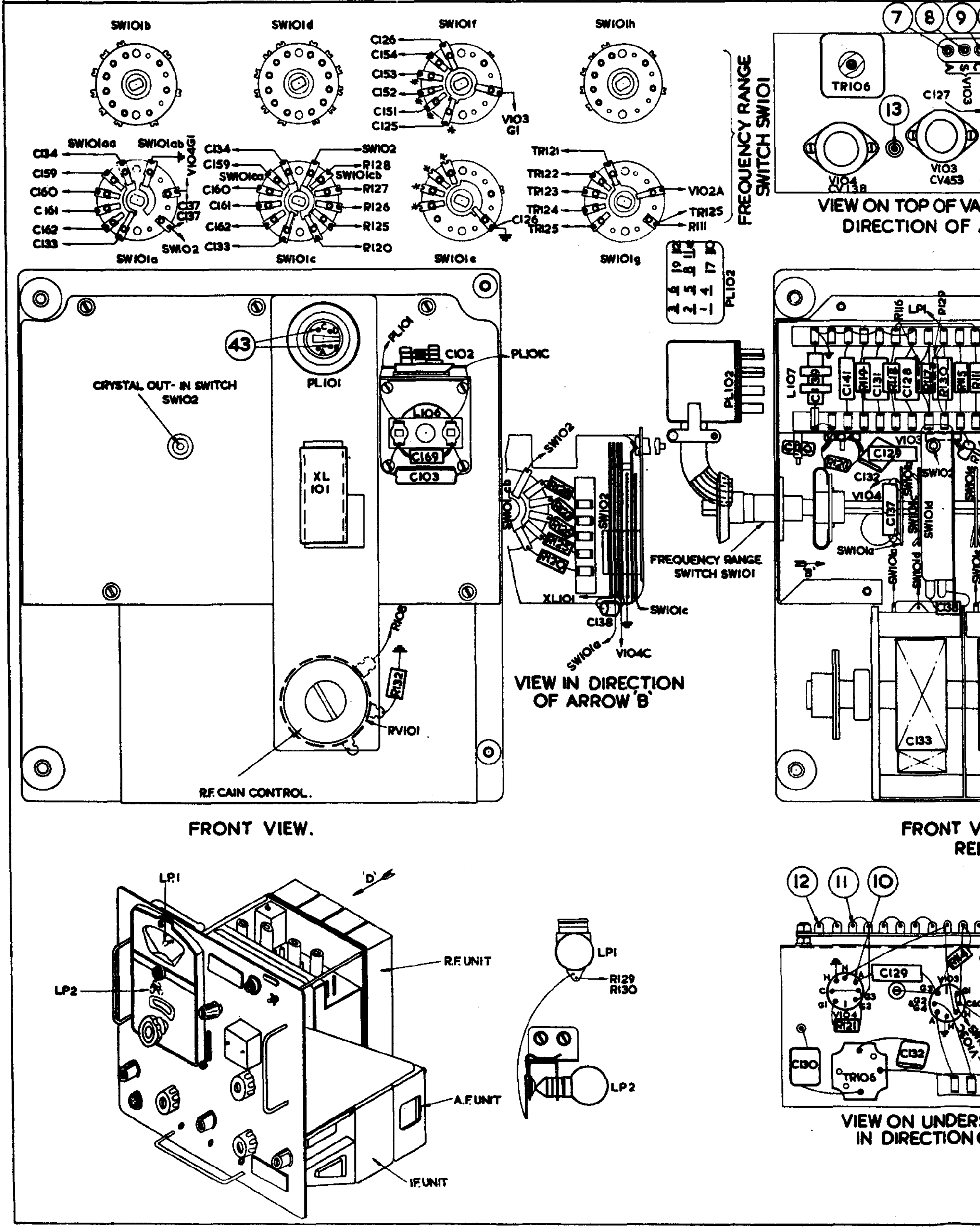
CIRCUIT POINT NO.	INPUT FOR OUTPUT OF 500 mW	INPUT FOR OUTPUT OF 2W	REMARKS.
36	0·23 VOLTS	0·46 VOLTS	FREQUENCY 400 c/s.
	0·14 VOLTS	0·29 VOLTS	FREQUENCY 1000 c/s.
37	2·6 VOLTS	5·2 VOLTS	FREQUENCY 400 c/s.
	2·6 VOLTS	5·2 VOLTS	FREQUENCY 1000 c/s.
38	11·0 VOLTS	22·5 VOLTS	FREQUENCY 400 c/s.
	8·75 VOLTS	18·75 VOLTS	FREQUENCY 1000 c/s.
39	354 μ VOLTS	690 μ VOLTS	FREQUENCY 800 K c/s.
40	3·6 m VOLTS	7·6 m VOLTS	FREQUENCY 800 K c/s.
41	109 m VOLTS	207 m VOLTS	FREQUENCY 800 K c/s.
42	246 μ VOLTS	523 μ VOLTS	FREQUENCY 800 K c/s.
43	0·3 μ VOLTS	0·6 μ VOLTS	FREQUENCY 118 K c/s.
	0·32 μ VOLTS	0·65 μ VOLTS	FREQUENCY 344 K c/s.
	0·2 μ VOLTS	0·4 μ VOLTS	FREQUENCY 2·91 M c/s.
	0·6 μ VOLTS	1·15 μ VOLTS	FREQUENCY 8·8 M c/s.
	0·85 μ VOLTS	1·8 μ VOLTS	FREQUENCY 21 M c/s.
1	155 μ VOLTS	231 μ VOLTS	FREQUENCY 118 K c/s.
	31·0 μ VOLTS	43·0 μ VOLTS	FREQUENCY 344 K c/s.
	27·0 μ VOLTS	55·0 μ VOLTS	FREQUENCY 2·91 M c/s.
	23·0 μ VOLTS	44·0 μ VOLTS	FREQUENCY 8·8 M c/s.
	—	68·0 μ VOLTS	FREQUENCY 21 M c/s.
4	42 μ VOLTS	92 μ VOLTS	FREQUENCY 118 K c/s.
	10·8 μ VOLTS	23 μ VOLTS	FREQUENCY 344 K c/s.
	12·7 μ VOLTS	24·8 μ VOLTS	FREQUENCY 2·91 M c/s.
	27·0 μ VOLTS	50·0 μ VOLTS	FREQUENCY 8·8 M c/s.
	—	130 μ VOLTS	FREQUENCY 21 M c/s.
13	124 μ VOLTS	206 μ VOLTS	FREQUENCY 800 K c/s.

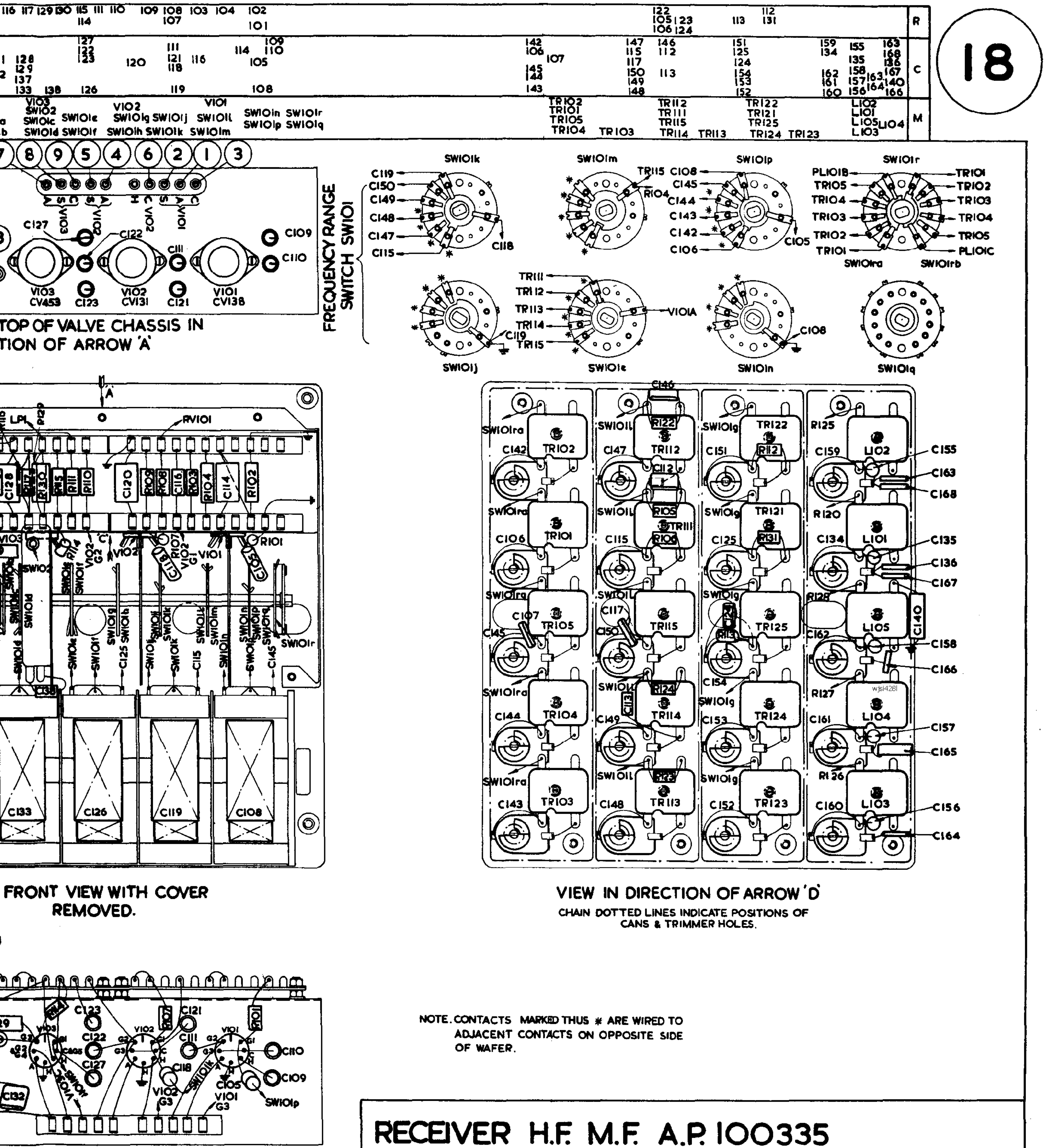
SENSITIVITY FIGURES REFER TO OPEN CIRCUIT SIGNAL GENERATOR VOLTS EXCEPT FOR AERIAL INPUT FIGURES WHICH ARE CORRECTED TO ALLOW FOR USE OF 20 dB PAD.

ABOVE FIGURES ARE INTENDED ONLY AS A GENERAL GUIDE TO THE STAGE GAINS AND VARIATIONS ARE TO BE EXPECTED BETWEEN UNITS.

A.P. 100335 RECEIVER H.F. M.F.
CIRCUIT DIAGRAM (SHEET 4).
TYPICAL VOLTAGE & SENSITIVITY READINGS.

R	132 · 128 126 120 · 127 125 · 121 · 119 118 116 117 129 130
C	102 169 103 · 139 130 · 141 · 131 132 · 128 129 137 133 · 138
MISC	PL101 XL101 RV101 · L106 · LP1 LP2 · PL102 · L107 · TR106 V104 · SW101a SW101b · V103 SW102 SW101c SW101d





FREQUENCY RANGE SWITCH SWIOI

TOP OF VALVE CHASSIS IN
TION OF ARROW 'A'

FRONT VIEW WITH COVER REMOVED.

VIEW IN DIRECTION OF ARROW 'D'

CHAIN DOTTED LINES INDICATE POSITIONS OF CANS & TRIMMER HOLES.

NOTE. CONTACTS MARKED THUS * ARE WIRED TO ADJACENT CONTACTS ON OPPOSITE SIDE OF WAFER.

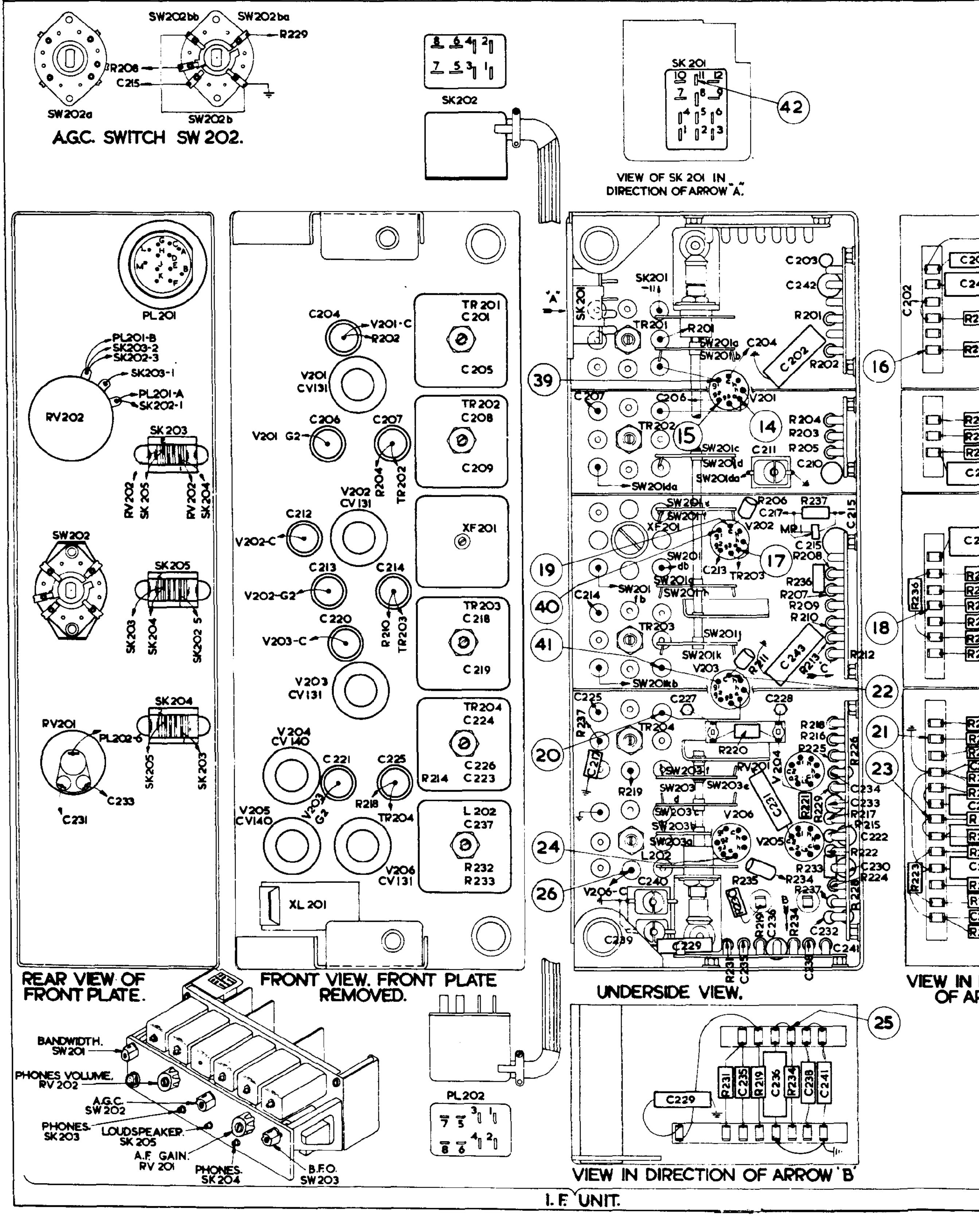
ON UNDERSIDE OF VALVE CHASSIS
IRECTION OF ARROW 'C'

RECEIVER H.F. M.F. A.P. 100335

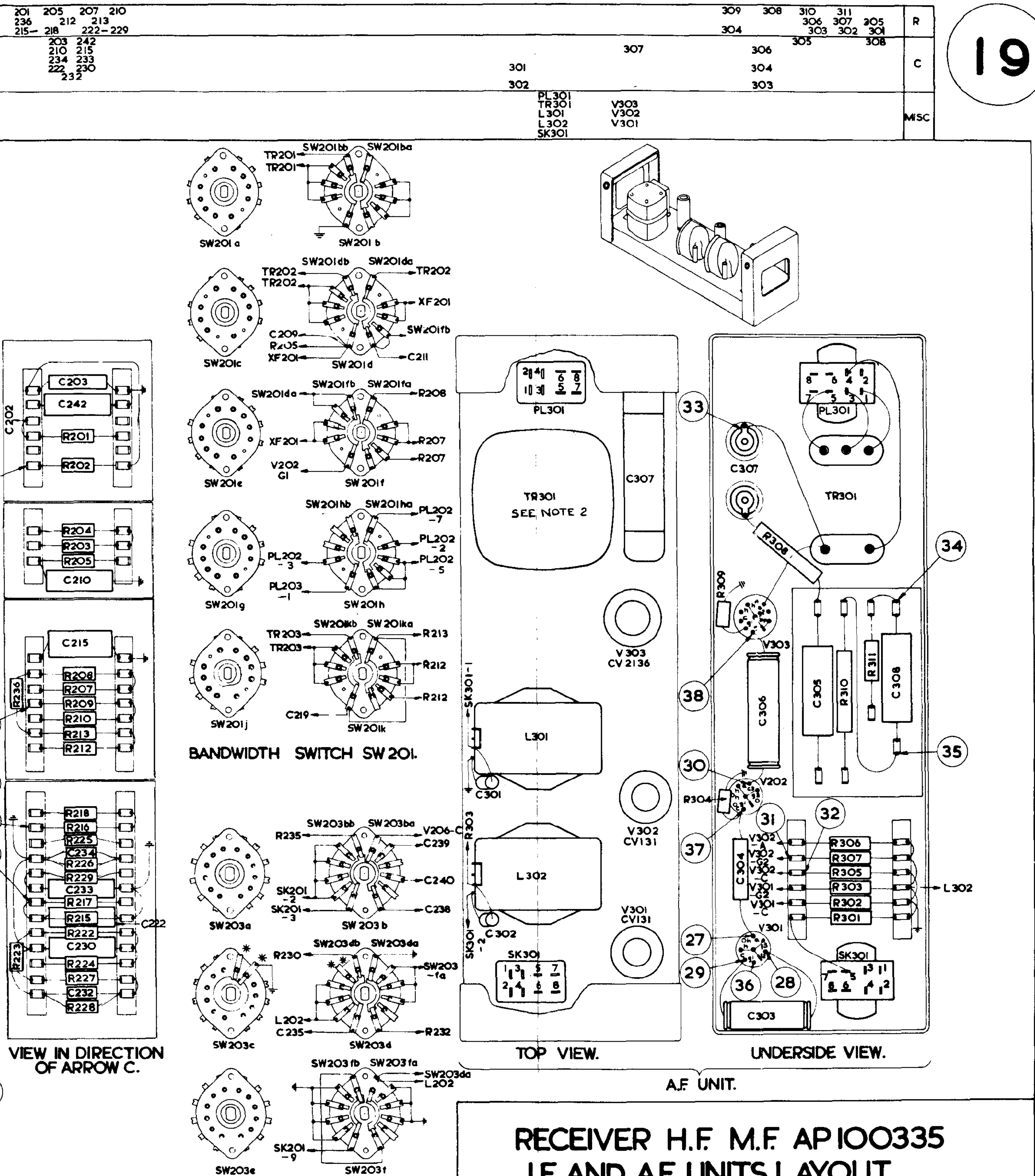
R.F. UNIT LAYOUT AND SWITCH

WIRING DIAGRAM. (SHEET I)

R				214 232 233		206 237 230 211 235 211 231 220 219 234	201 205 236 212 215– 218
C			204 206 207 212 213 214 220 221 225	201 205 208 209 224 218 219 226 223 237	217	240 239 227 229 202 211 243 228 231 235 236 238 241	203 210 234 222 23
MISC.	RV202 SW202 RV201	PL201 SK203 SK205 SK204	V201 V204 V202 V205 V203 XL201 V206	SK202 TR201 TR202 XF201 TR203 PL202 TR204 L202	SK201	SW201a SW201k SW203f SW203a	MR1



I. F. UNIT.

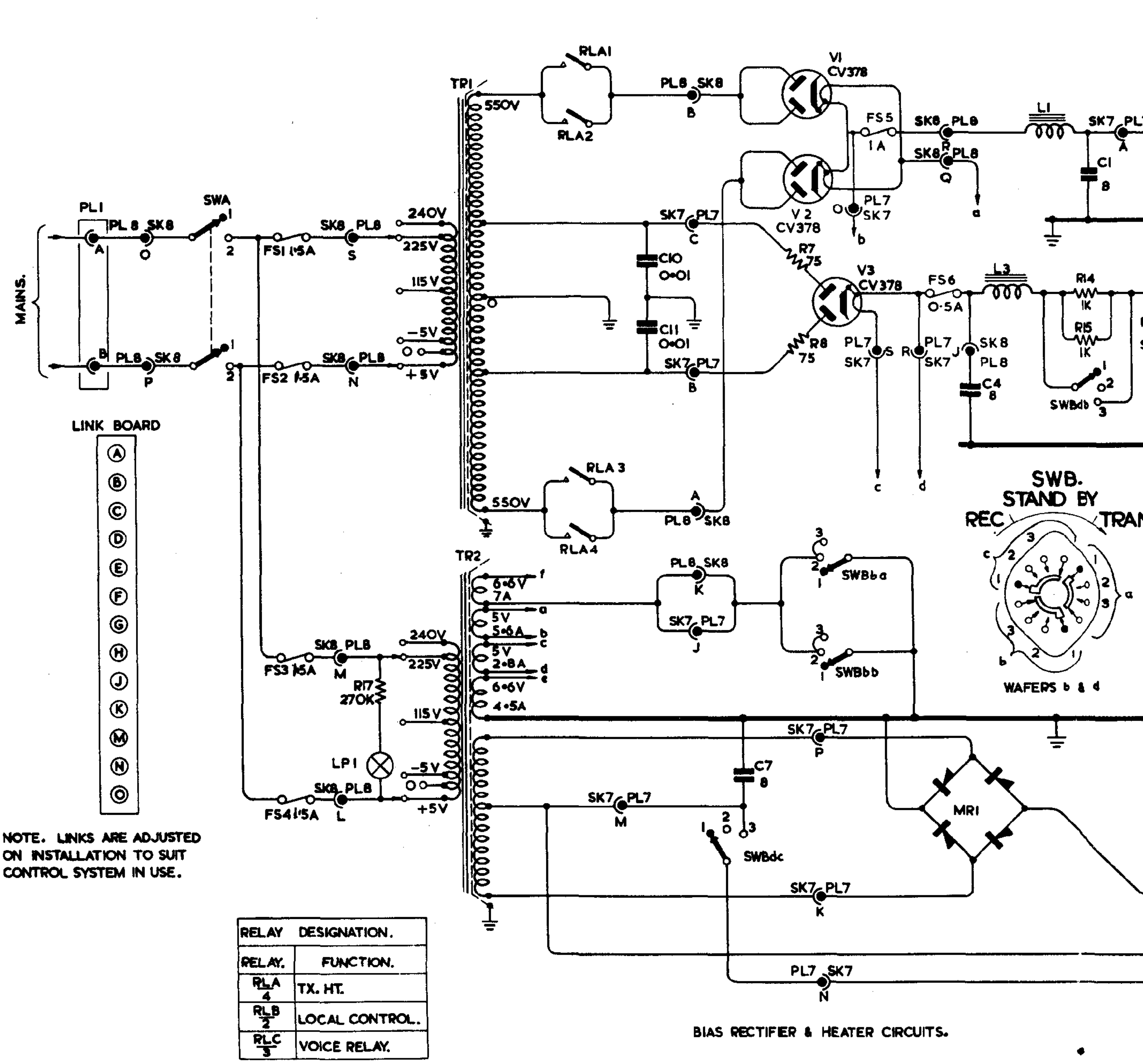


RECEIVER H.F. M.F. AP100335
I.F. AND A.F. UNITS LAYOUT
AND SWITCH WIRING DIAGRAM
(SHEET 2)

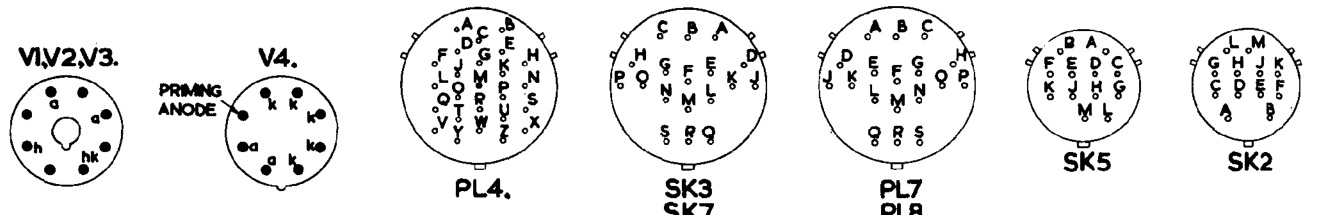
NOTE 1 CONTACTS MARKED THUS * ARE WIRED TO ADJACENT CONTACTS ON OPPOSITE SIDE OF WAFER.

2. IF TR301 IS REPLACED IT IS IMPORTANT TO READ THE NOTE ON PAGE 81

R	17		7 8		14 15
C		10 11	7	4	1
MISC.	PL1 PL8O SK8O PL8P SK8P SWA FS1 FS2 FS3 FS4 SK8S SK8N SK8M SK8L PL8S PL8N PL8M PL8L LP1 TR1 TR2	RLA1 RLA2 FS5 RLA3 RLA4 SK7M PL7M	PL8B SK7C SK7B PL8A PL8K SK7J SK8B PL7C PL7B SK8A SK8K PL7J SWBdc V1 V2 V3	SWBba SWBbb SK7P PL7P SK7K PL7K PL7N PL7O SK7O SK7N MR1 SK8R PL8R PL7S SK7S PL7R SK8Q PL8Q SK7R SK8J PL8J L3	L1 SWBdb SK7A PL7A

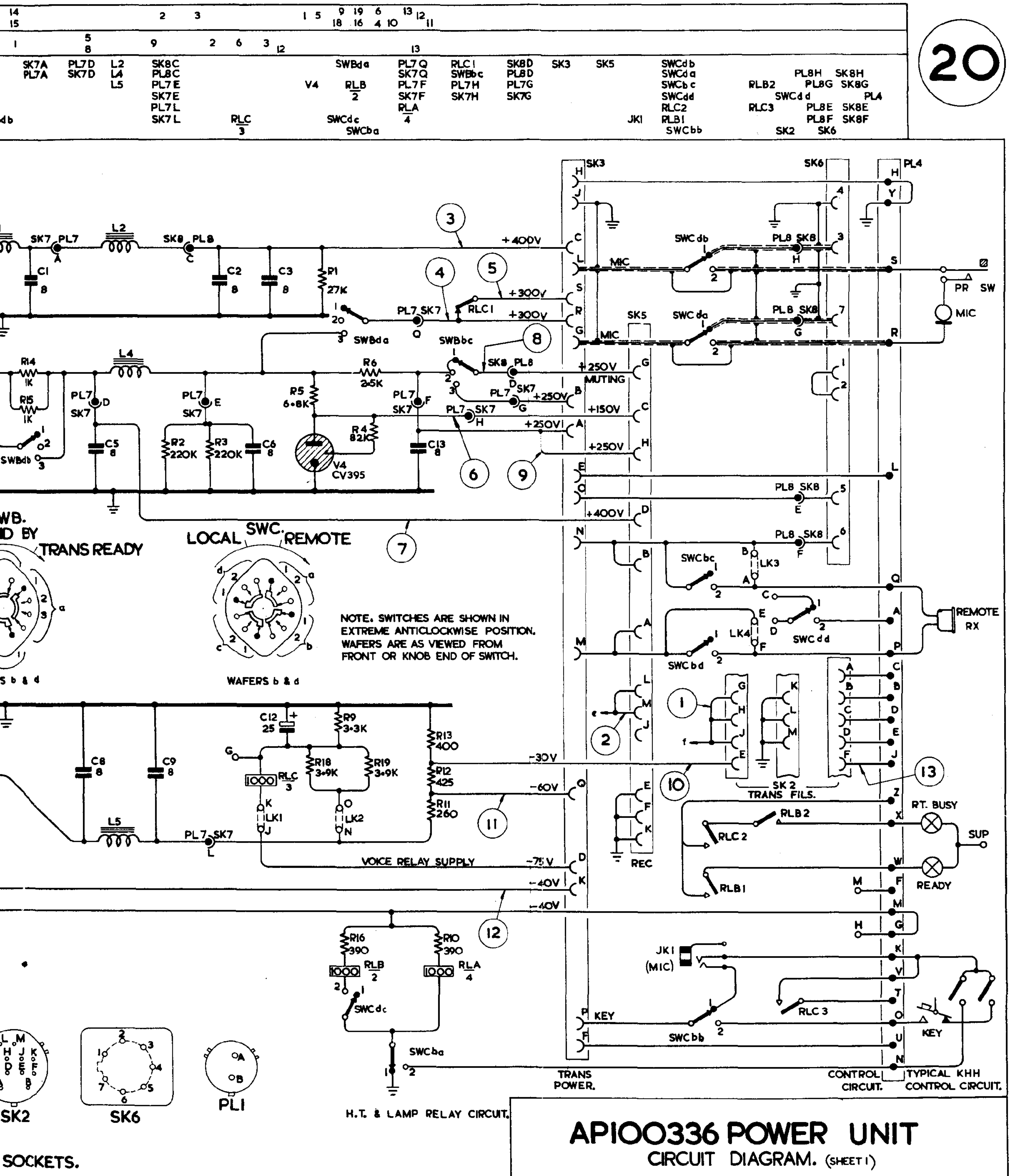


RELAY DESIGNATION.	
RELAY.	FUNCTION.
RLA 4	TX. HT.
RLB 2	LOCAL CONTROL.
RLC 3	VOICE RELAY.



VALVE BASE CONNECTIONS.

REAR VIEWS OF PLUGS & SOCKETS



AP100336 POWER UNIT

CIRCUIT DIAGRAM. (SHEET 1)

CONDITIONS.

UNIT ON LOAD.

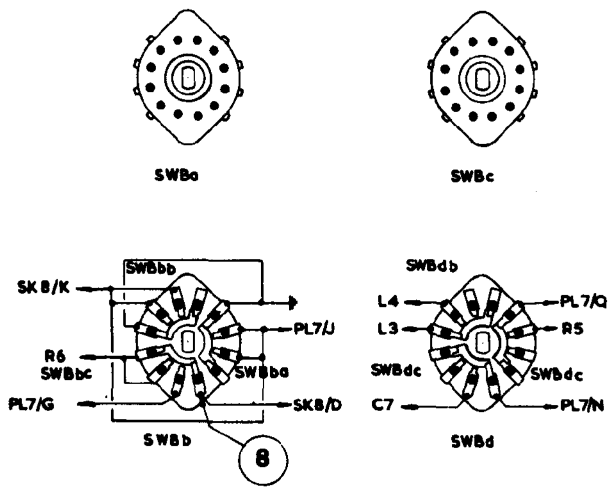
CIRCUIT POINT No.	VOLTAGE.			RIPPLE			RE-MARKS	POWER UNIT CONN.
	REC.	STAND BY.	TRANS. READY	REC	STAND BY	TRANS. READY		
1	—	6·3	6·2	—	—			SK 2. G.H. J.
2	6·45	6·4	6·35	—	—			SK 5. L.M.
3	—	—	414	—	—	1·5		SK 3. C.
4	—	—	303	—	—	0·96		SK 3. R.
5	—	—	304	—	—	0·8		SK 3. S.
	—	—	0	—	—		VOICE ON	SK 3. S.
6	152	152	150	10·6 mV	—			SK 5. C.
7	369	369	320	1·4 V	—		MUTING OFF.	SK 5. D.
8	263	263	219	80 mV	—		MUTING ON.	SK 5. G.
	263	263	0	90 mV	—			SK 5. G.
9	263	263	218	35 mV	—			SK 5. H.
10	31 -ve	31 -ve	30 -ve	—	—	4·0	VOICE OFF	SK 2 E
11	62 -ve	62 -ve	61 -ve	—	—	4·0		SK 3. Q.
10	-ve 30·0	-ve 29·5	-ve 28·5	—	—	1·0	VOICE ON.	SK 2. E.
11	61 -ve	61 -ve	59 -ve	—	—	6·2		SK 3. Q.
12	52 -ve	52 -ve	42 -ve	—	—			SK 3. K.
13	—	—	42 -ve	—	—			SK 2. F.
	—	—	41 -ve	—	—			SK 2. F.

A.P. 100336 POWER UNIT.

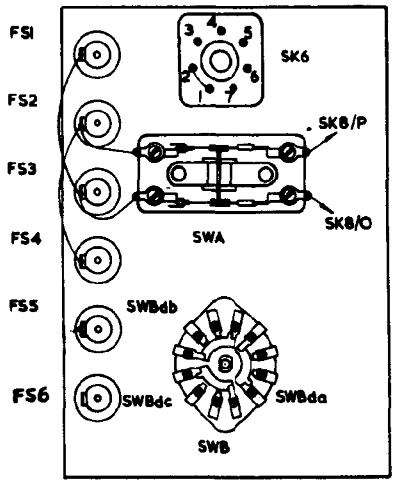
CIRCUIT DIAGRAM (SHEET 2).

TYPICAL VOLTAGE READINGS.

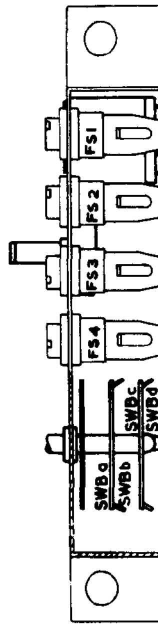
R	6 5
C	
MISC.	FS1 FS2 FS3 FS4 FS5 FS6 SK 6 SWA SWB

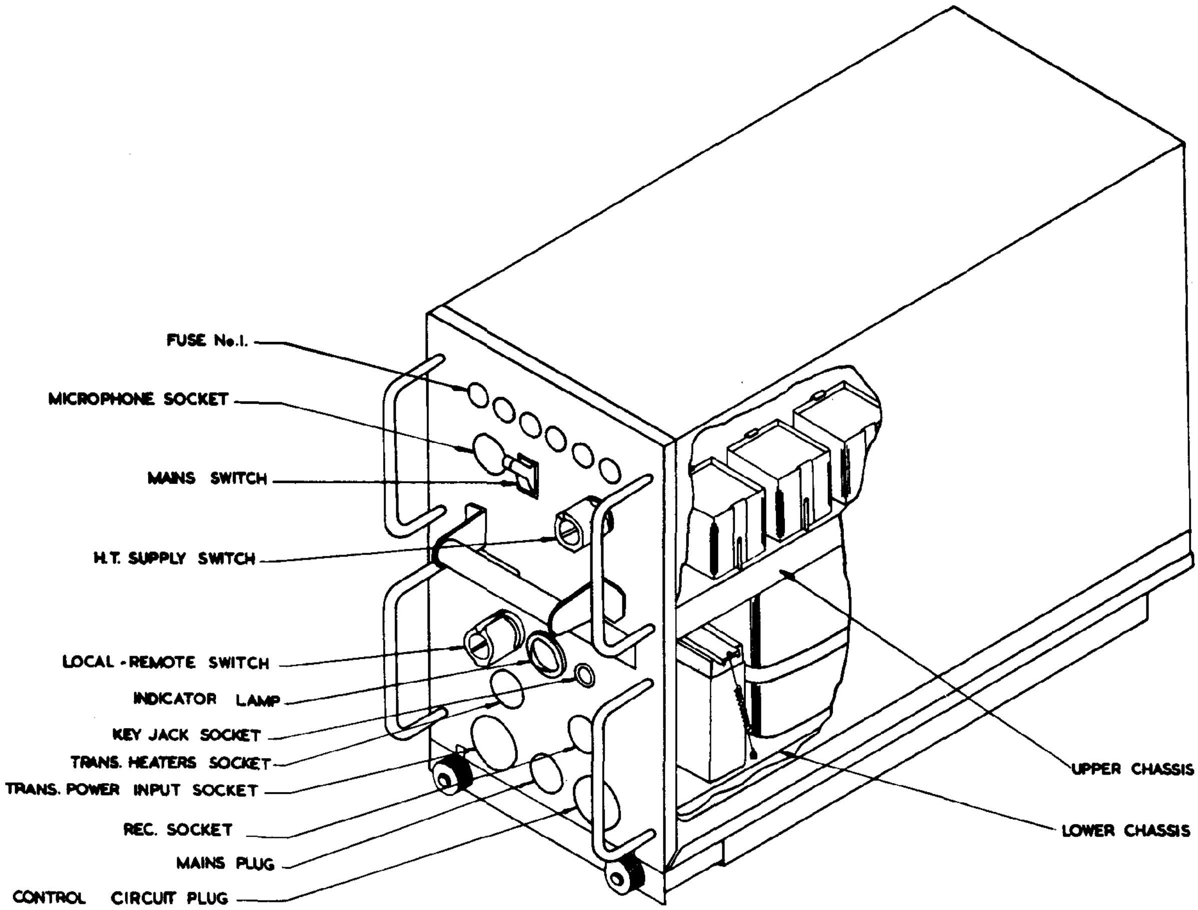


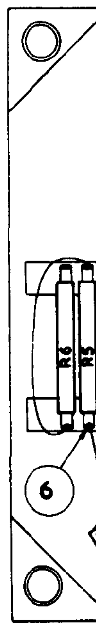
H.T. SUPPLY SWITCH SWB.



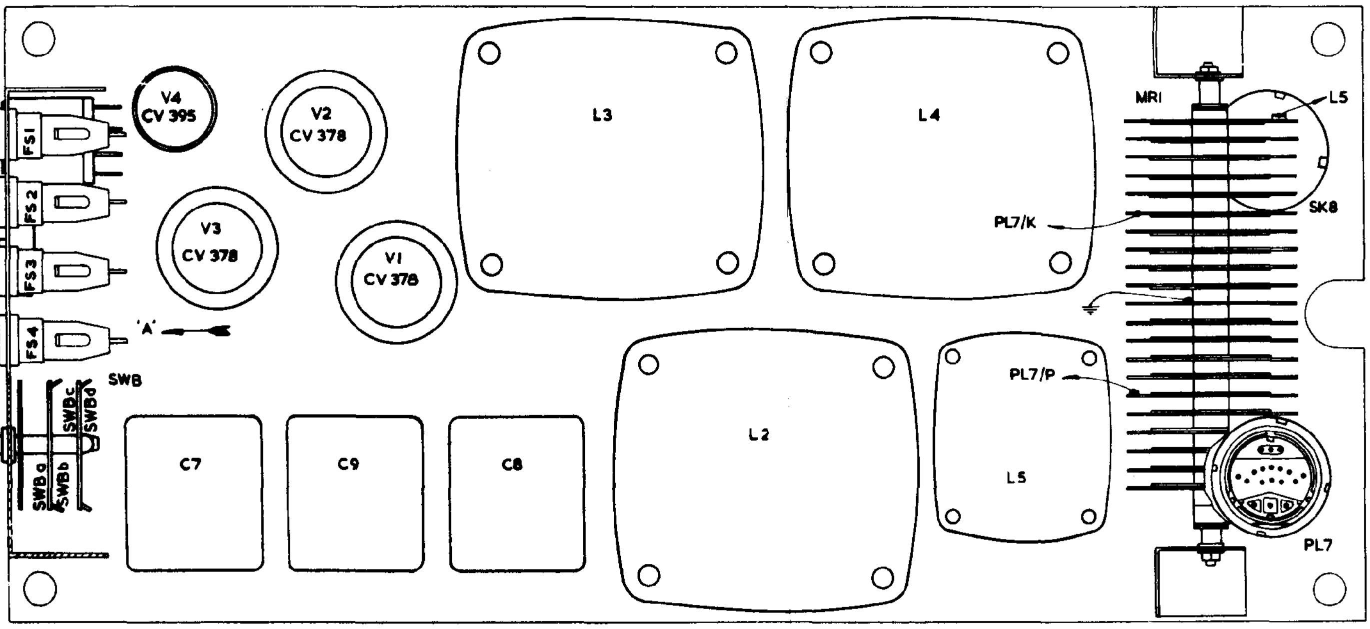
VIEW IN DIRECTION OF ARROW 'A'



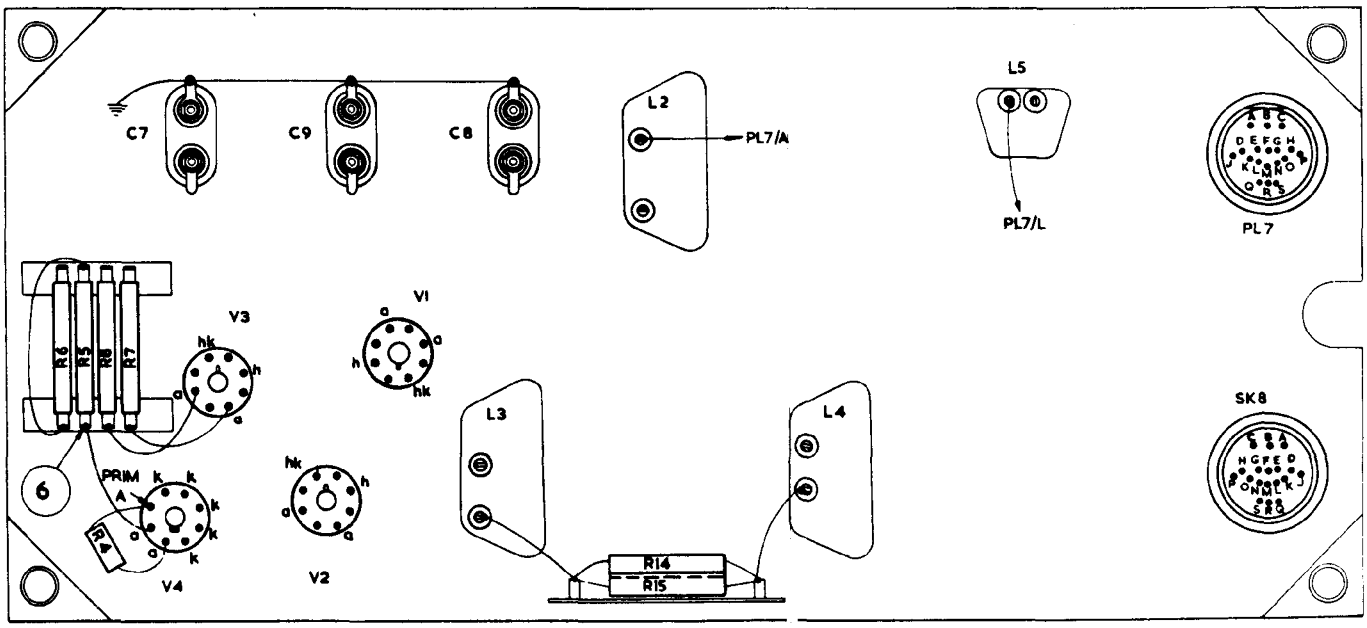




6 5 8 7 4 14 15	R
7 9 8	C
V3 V4 V1 V2 L3 L2 L4 L5 MRI SK8 PL7	MISC.



PLAN VIEW OF UPPER CHASSIS

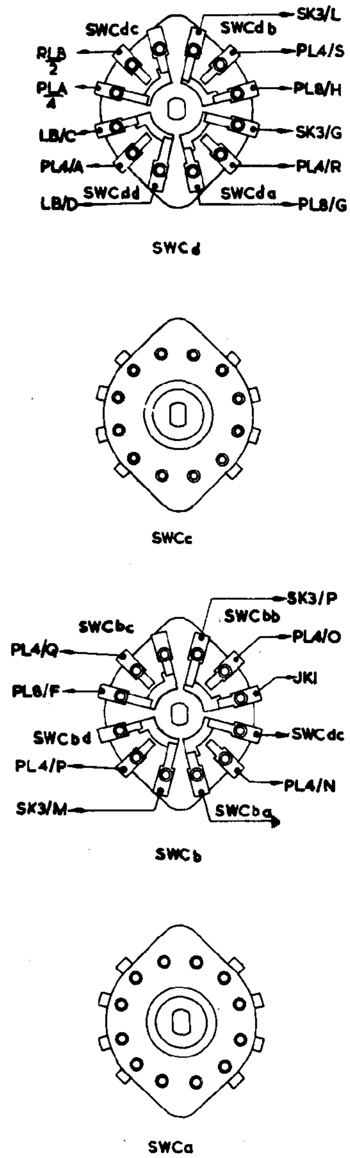


INVERSE PLAN VIEW OF UPPER CHASSIS

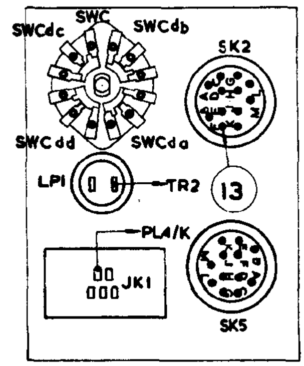
POWER UNIT AP. 100336
LAYOUT & SWITCH WIRING DIAGRAM.

(SHEET. 1.)

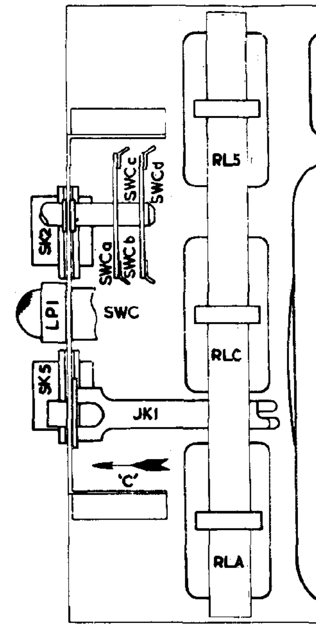
R	9 18 19 16 10
C	
MISC.	SWC LP1 JK1 SK2 SK5 PL4 PL1 SK3 RLA/4 RLC/3 RLB/2 RLA1 RLA2 RLC1 RLC3 RLB1 RLA3 RLA4 RLC2 RLB2 (LB)



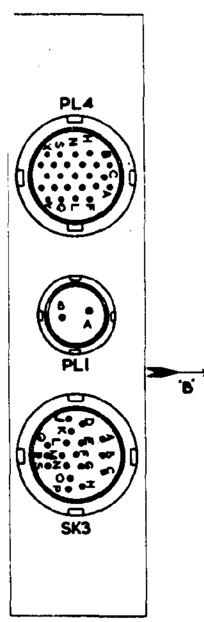
LOCAL-REMOTE SWITCH-SWC.



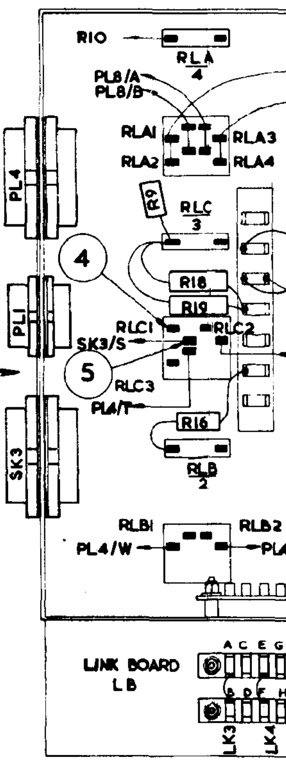
PART VIEW IN DIRECTION OF ARROW 'C'



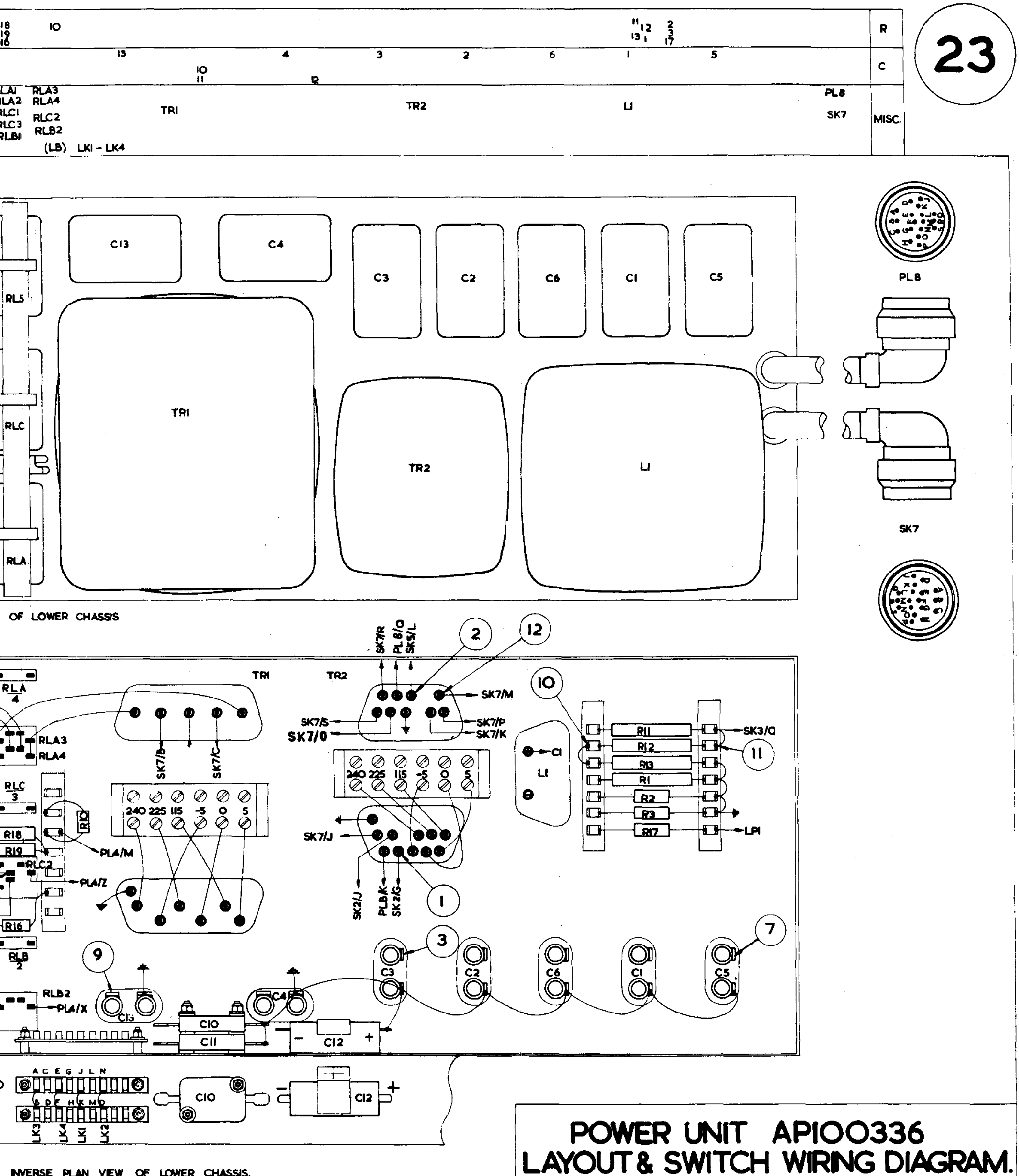
PLAN VIEW OF LOWER



PART VIEW IN DIRECTION OF ARROW 'B'

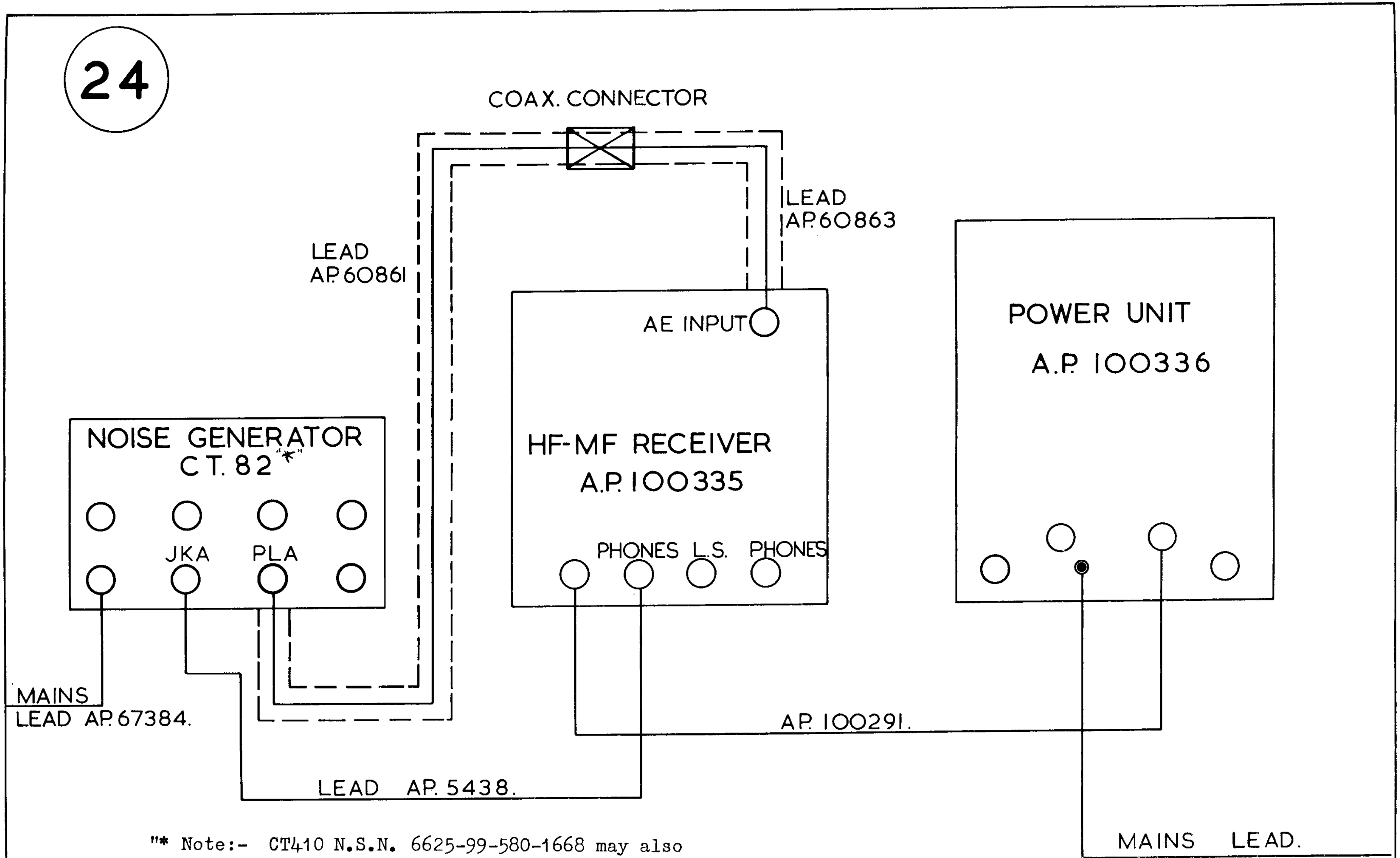


INVERSE PL

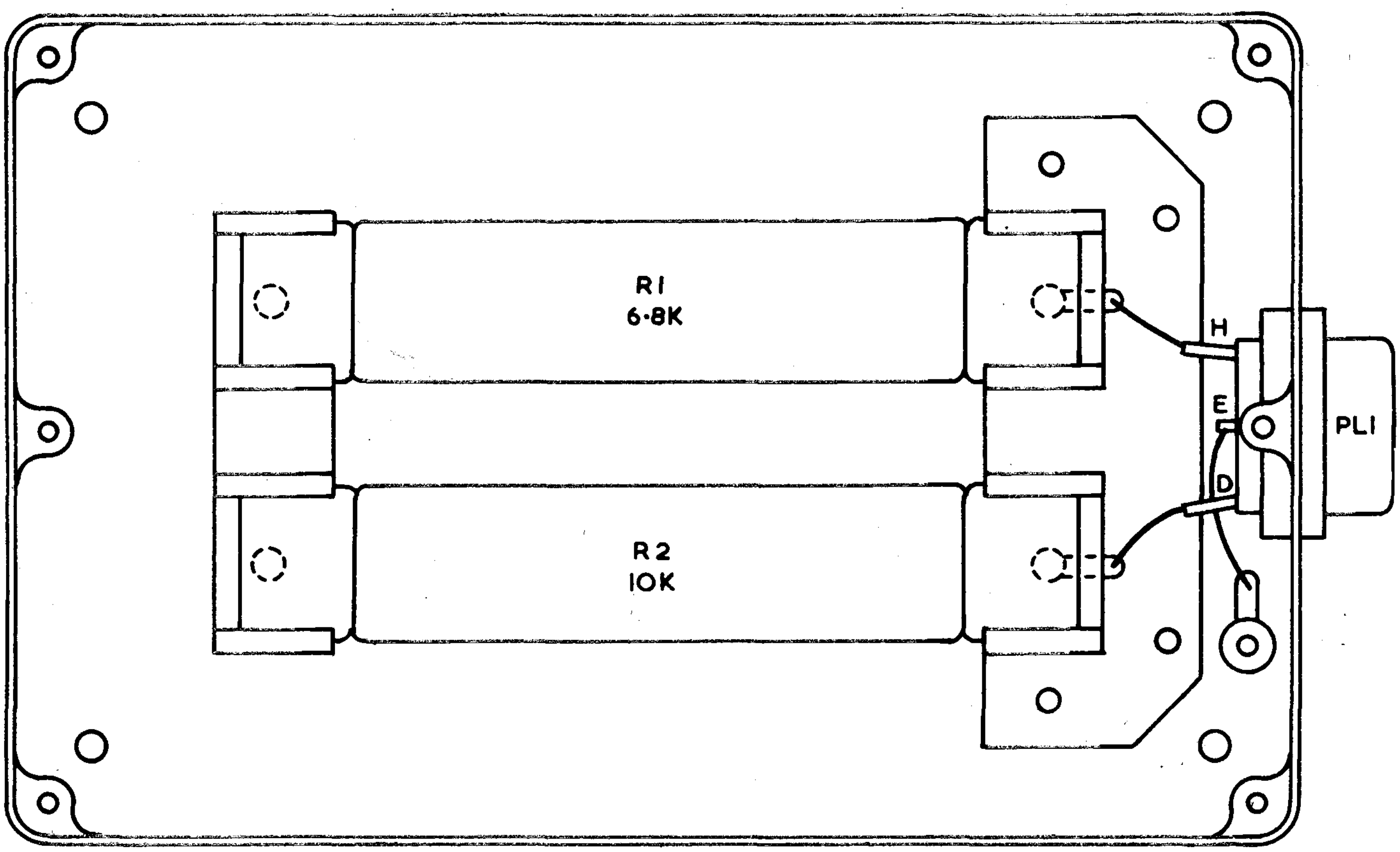


POWER UNIT AP100336
LAYOUT & SWITCH WIRING DIAGRAM.

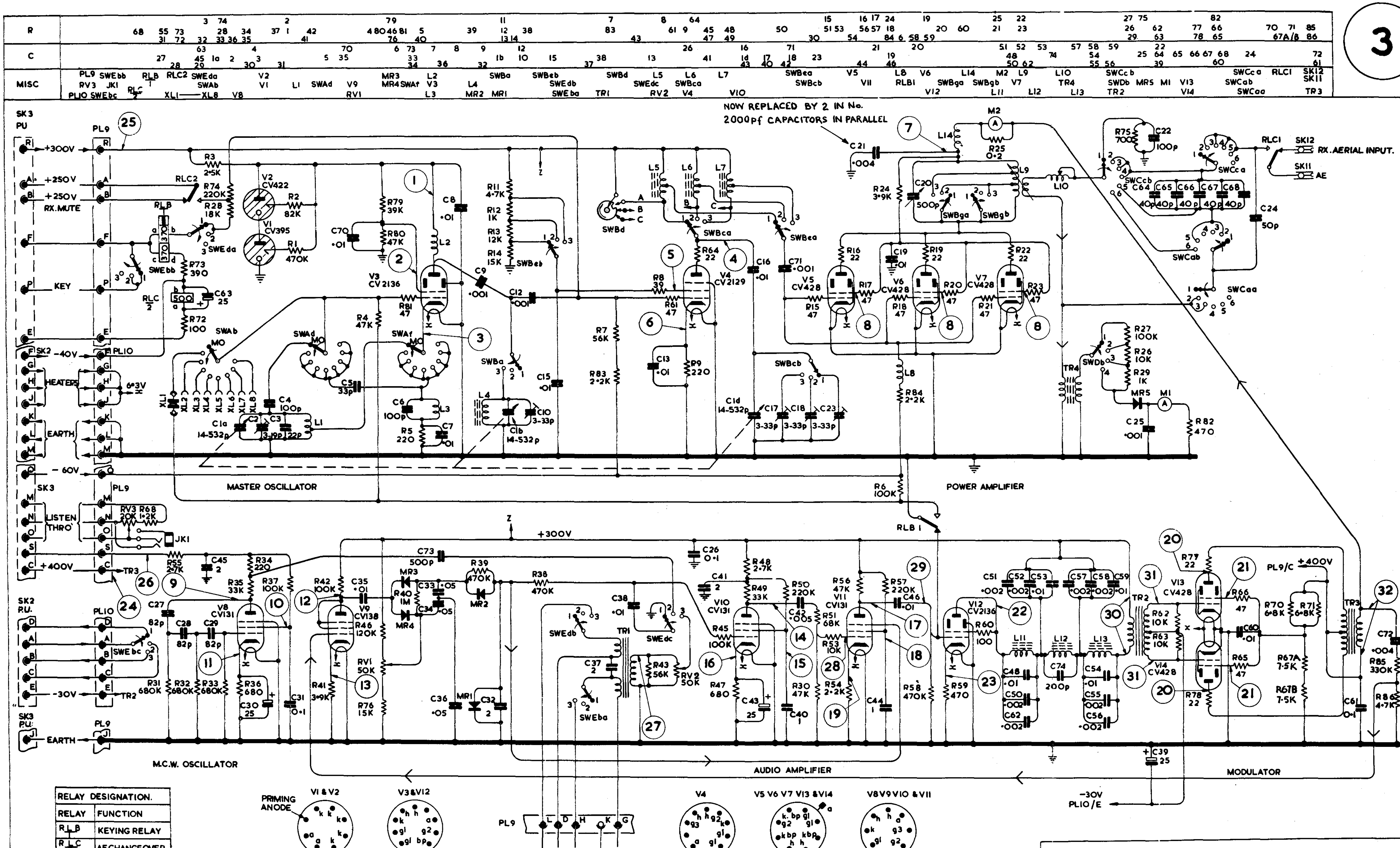
(SHEET 2)



"* Note:- CT410 N.S.N. 6625-99-580-1668 may also be used, set INPUT IMPEDANCE to 600 ohm, connect AUDIO INPUT to receiver L.S. socket for all tests and read Noise Factor on 75 ohm scale. See B.R.1771(43)



A.P.103099 DUMMY LOAD, ELECTRICAL



RELAY DESIGNATION.	
RELAY	FUNCTION
RLB	KEYING RELAY
RLC	AE CHANGEOVER

SWB FREQUENCY RANGE SWITCH	POS^N	BAND	M^C/s
	1	1	1·5-3·5
	2	2	3·5-8
	3	3	8-16

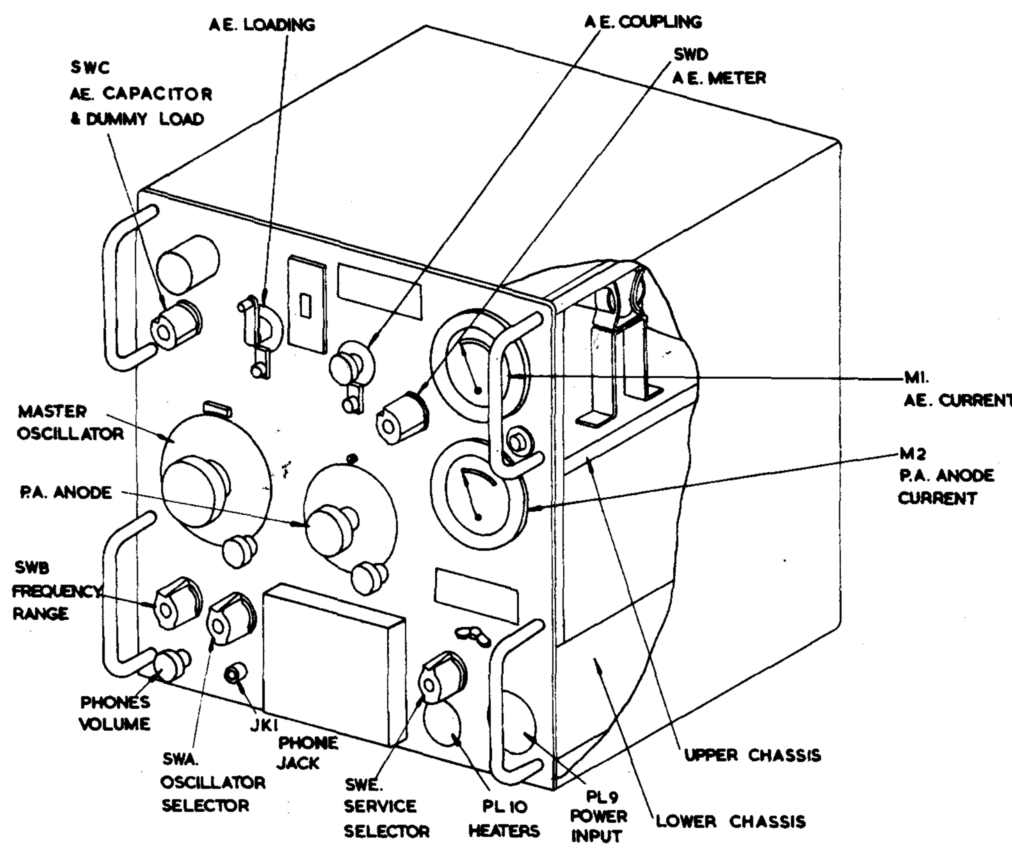
SWC AERIAL TUNING SWITCH	POS	
	1	DUMMY LOAD
	2	PAR. 1
	3	PAR. 2
	4	OFF
	5	SER. 1
	6	SER. 2

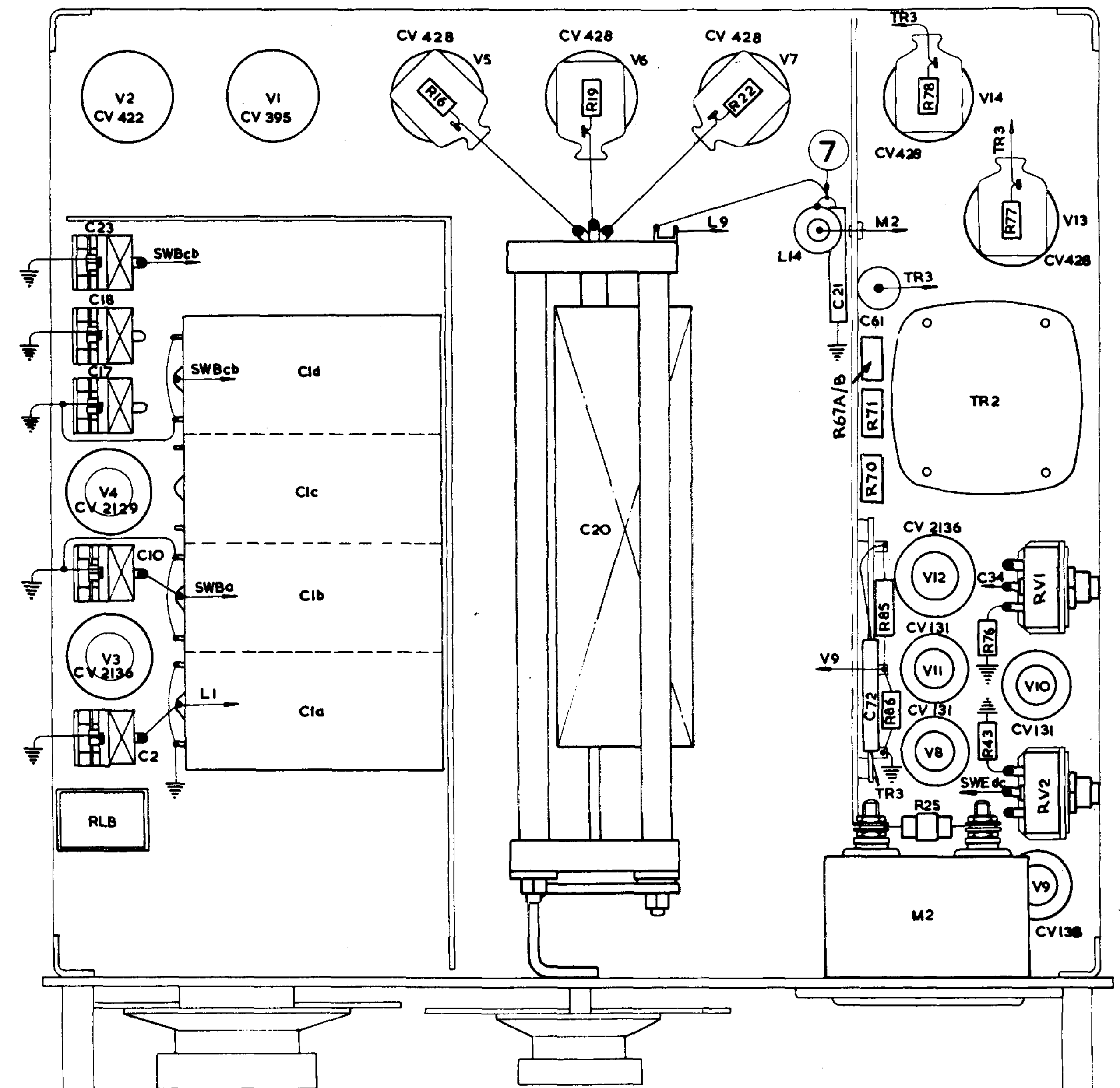
SWE SERVICE SELECTOR SWITCH	POS^N	
	1	C.W.
	2	M.C.W.
	3	VOICE

AP100333 TRANSMITTER H.F.

CIRCUIT DIAGRAM (SHEET 1.)

R	16 19 22 67A/B 71 70 85 86 78 25 76 43 77	R
C	23 18 10 2 17 1a - 1d 20 21 61 72	C
MISC	V2 V4 RLB V3 V1 V5 V6 V7 L14 V14 V12 V11 V8 TR2 M2 V13 V10 V9 RV2 RV1	MISC



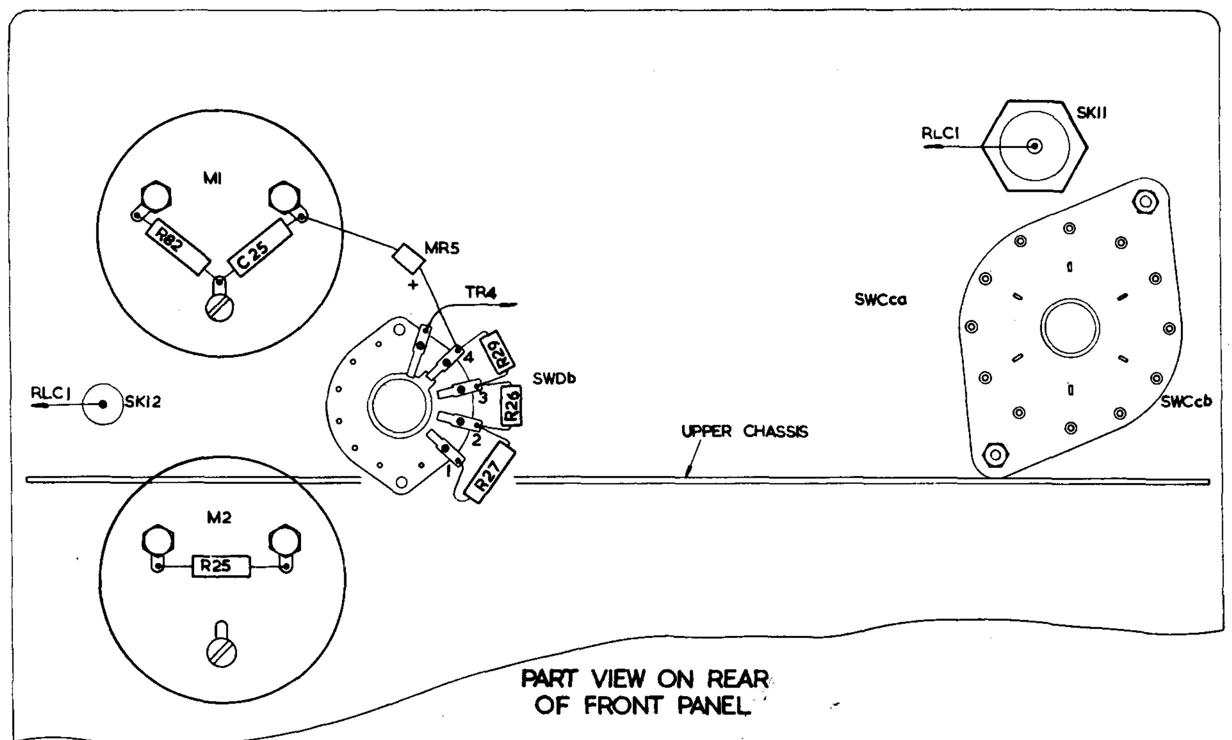


PLAN VIEW OF LOWER CHASSIS

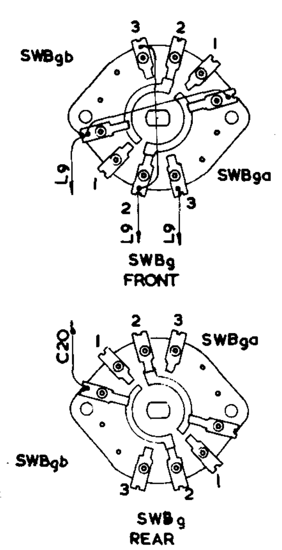
TRANSMITTER H.F. AP.100333
LAYOUT & SWITCH WIRING DIAGRAM.
(SHEET 1)

R	82	25	29 26 27				72			75		82	R
C		25		68 67	65 66	64	24			22	25		C
MISC	SK12	M1 M2	MR5 SWDb	SK11 SWC			RLC2 RLC1 RLC 2 SWCc SWCa SK11	L10	SWBg SWBh	L9 L8	SWDb SWDa	TR3 TR 4 M1	MISC

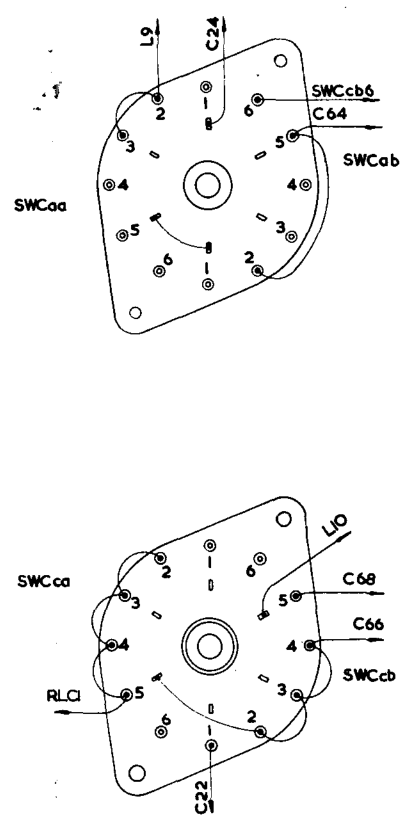
7



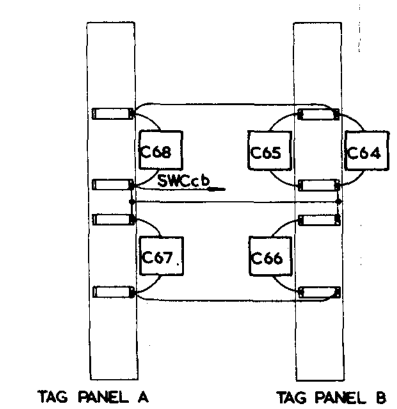
PART VIEW ON REAR OF FRONT PANEL



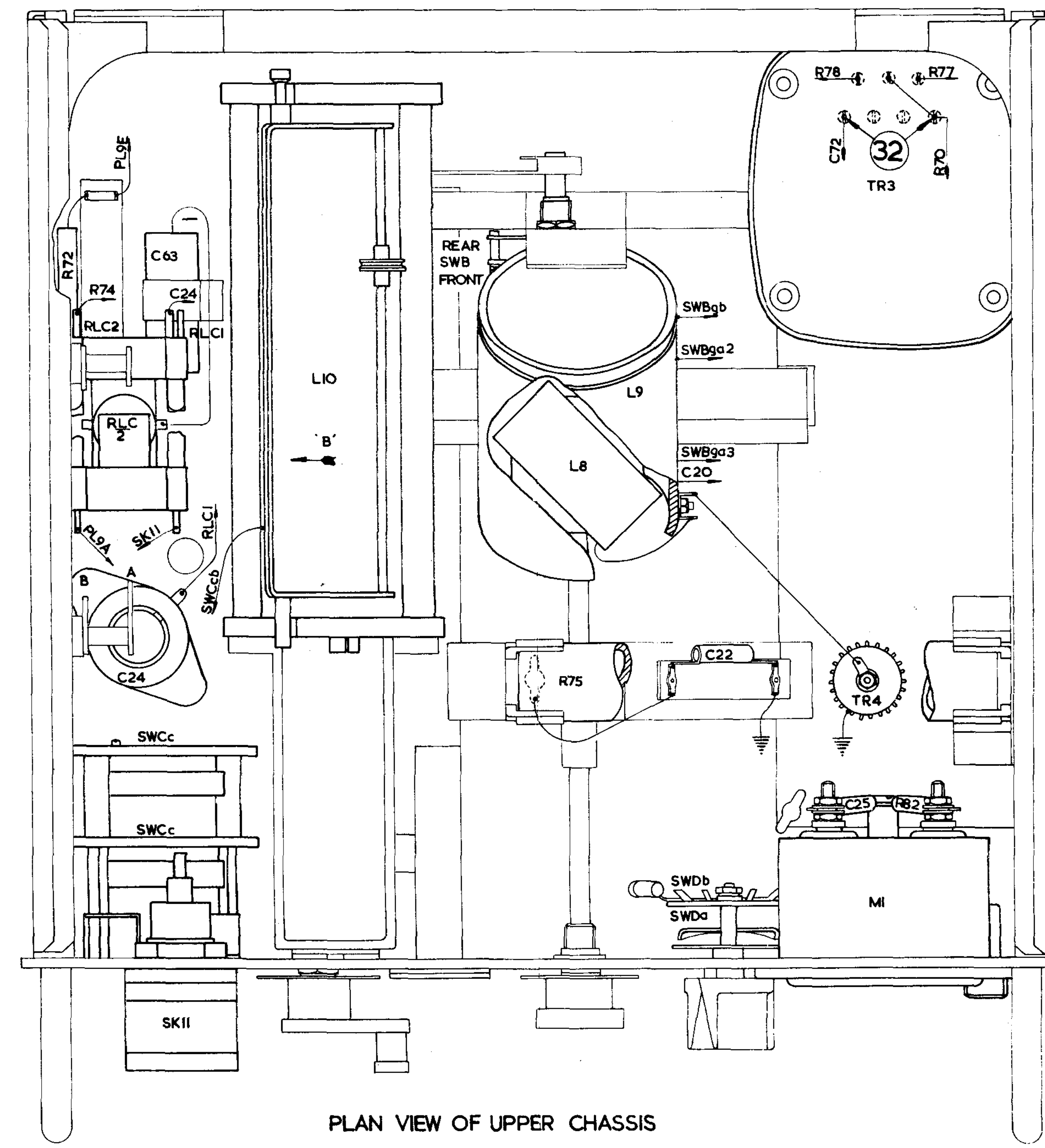
PART OF SWB. FREQUENCY RANGE



SWC AE CAPACITOR & DUMMY LOAD

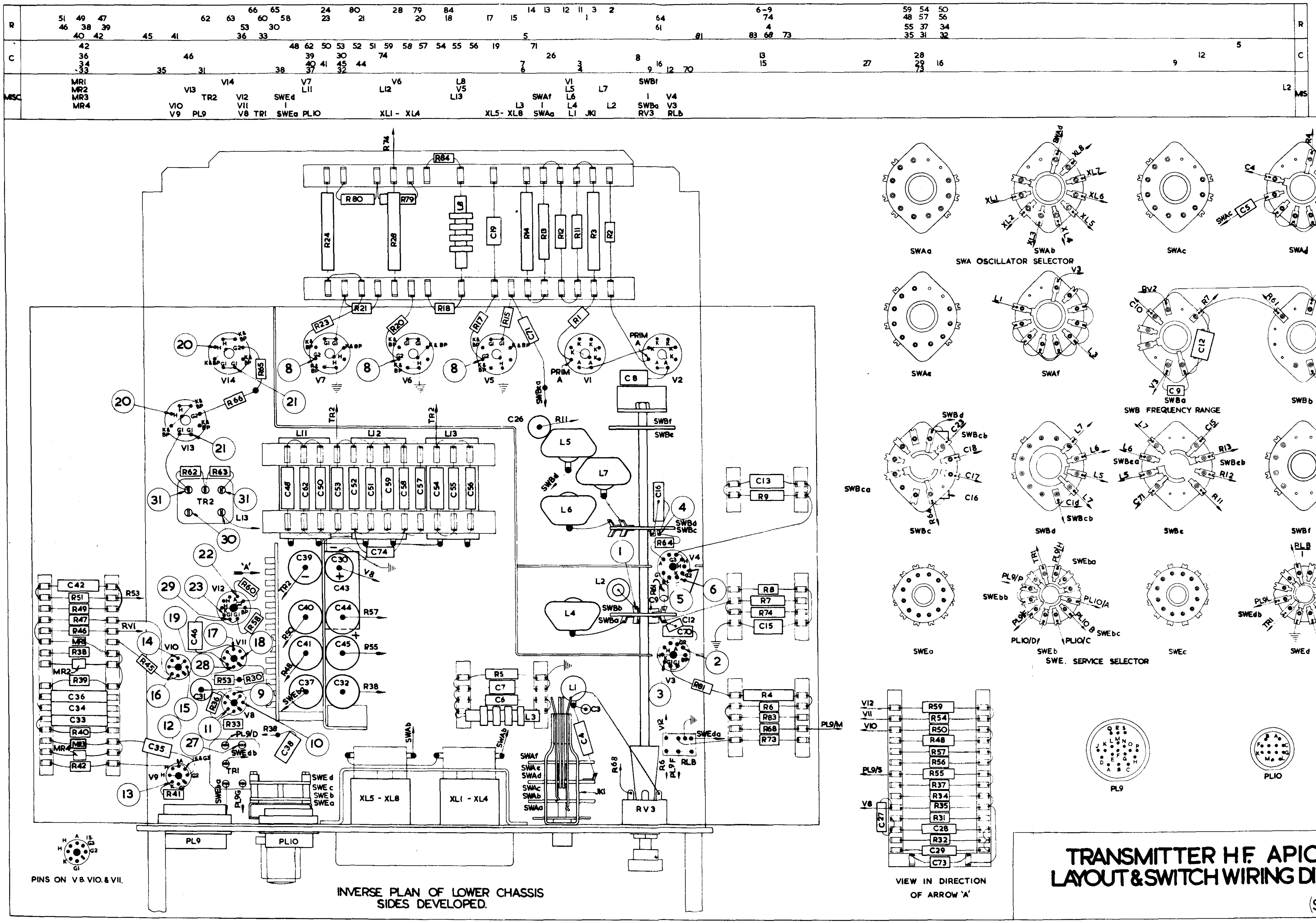


SCRAP VIEW IN DIRECTION OF ARROW 'B'



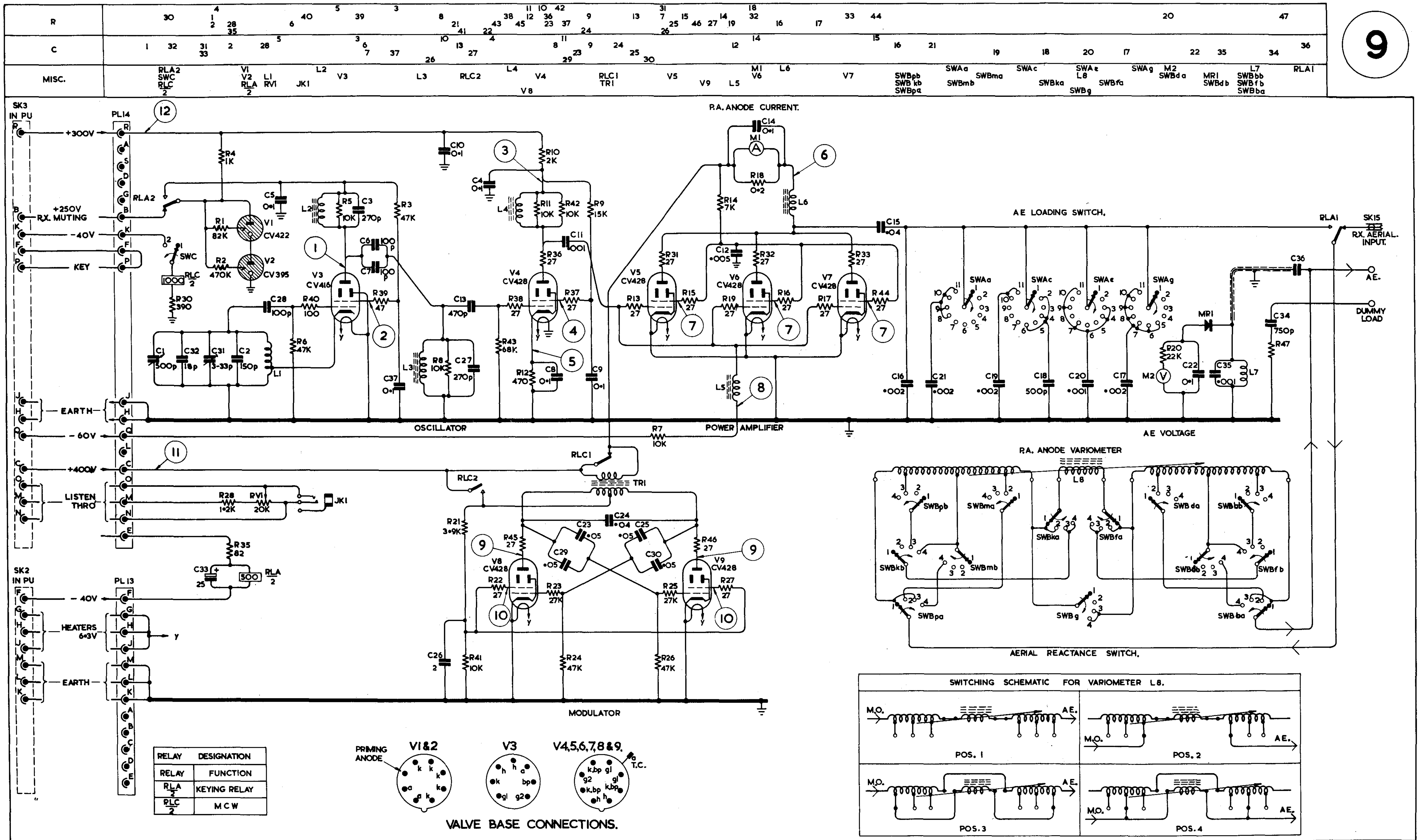
PLAN VIEW OF UPPER CHASSIS

TRANSMITTER H.F. AP. 100333
LAYOUT & SWITCH WIRING DIAGRAM
(SHEET 2)



TRANSMITTER H.F. AP100333
LAYOUT & SWITCH WIRING DIAGRAM

(SHEET 3)



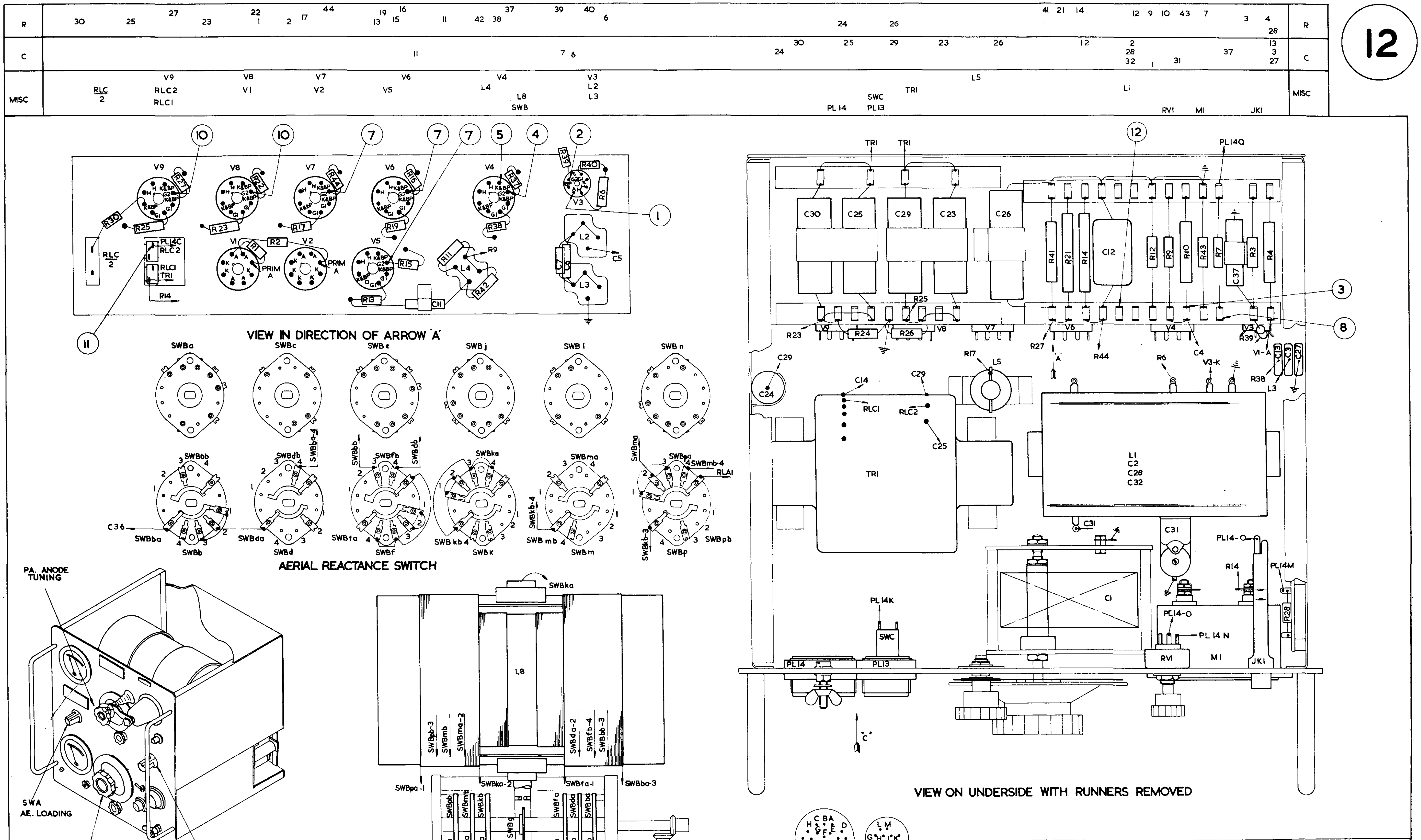
SWA AERIAL LOADING SWITCH	POS.
	1-11 VARIABLE LOADING

SWB AERIAL REACTANCE SWITCH	POS.
	1-4 VARIABLE REACTANCE

SWC CARRIER SELECTOR SWITCH	POS.	CARRIER
	1	C.W.
	2	M.C.W.

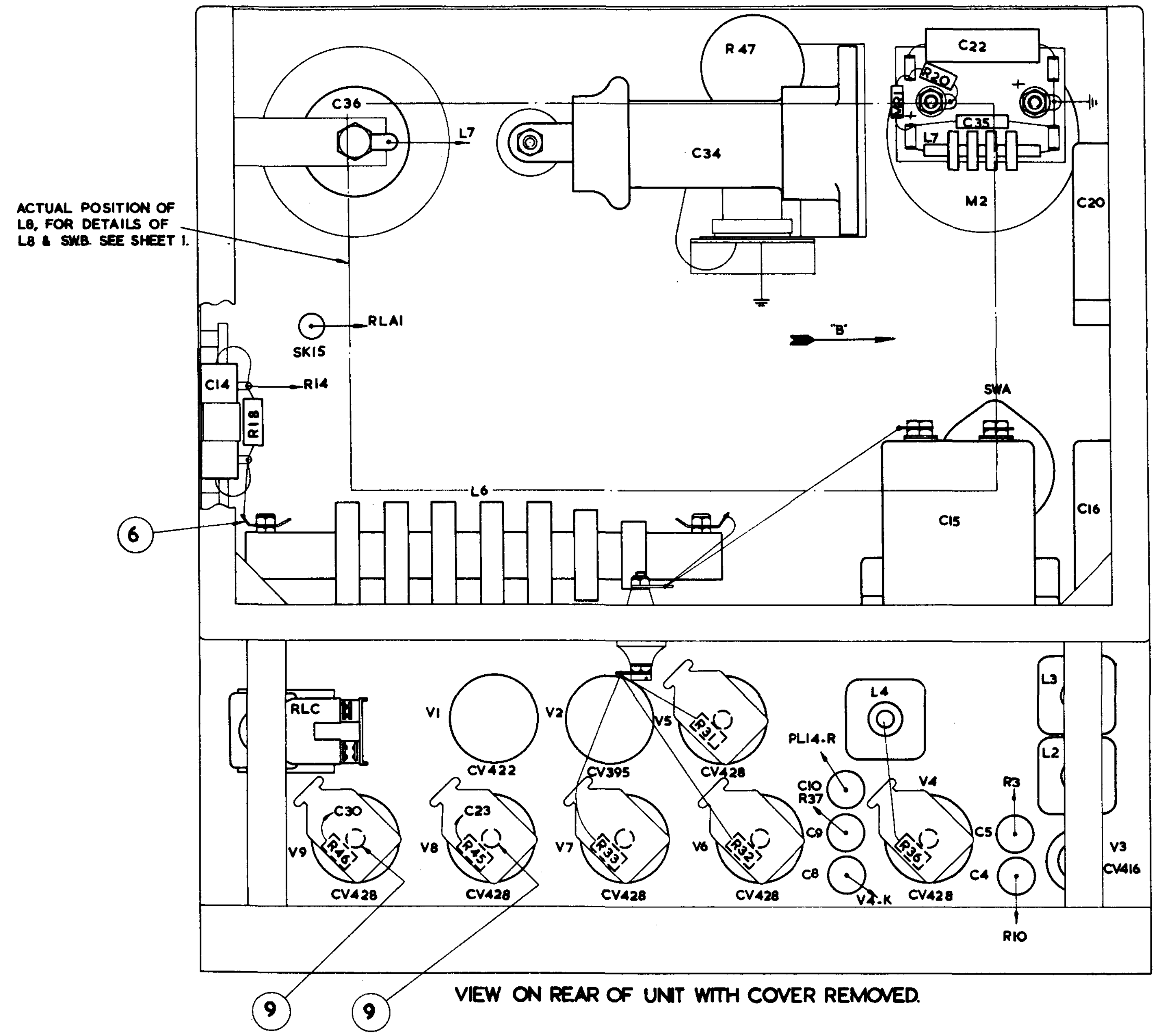
AP 100334 TRANSMITTER M.F.

CIRCUIT DIAGRAM. (SHEET 1)

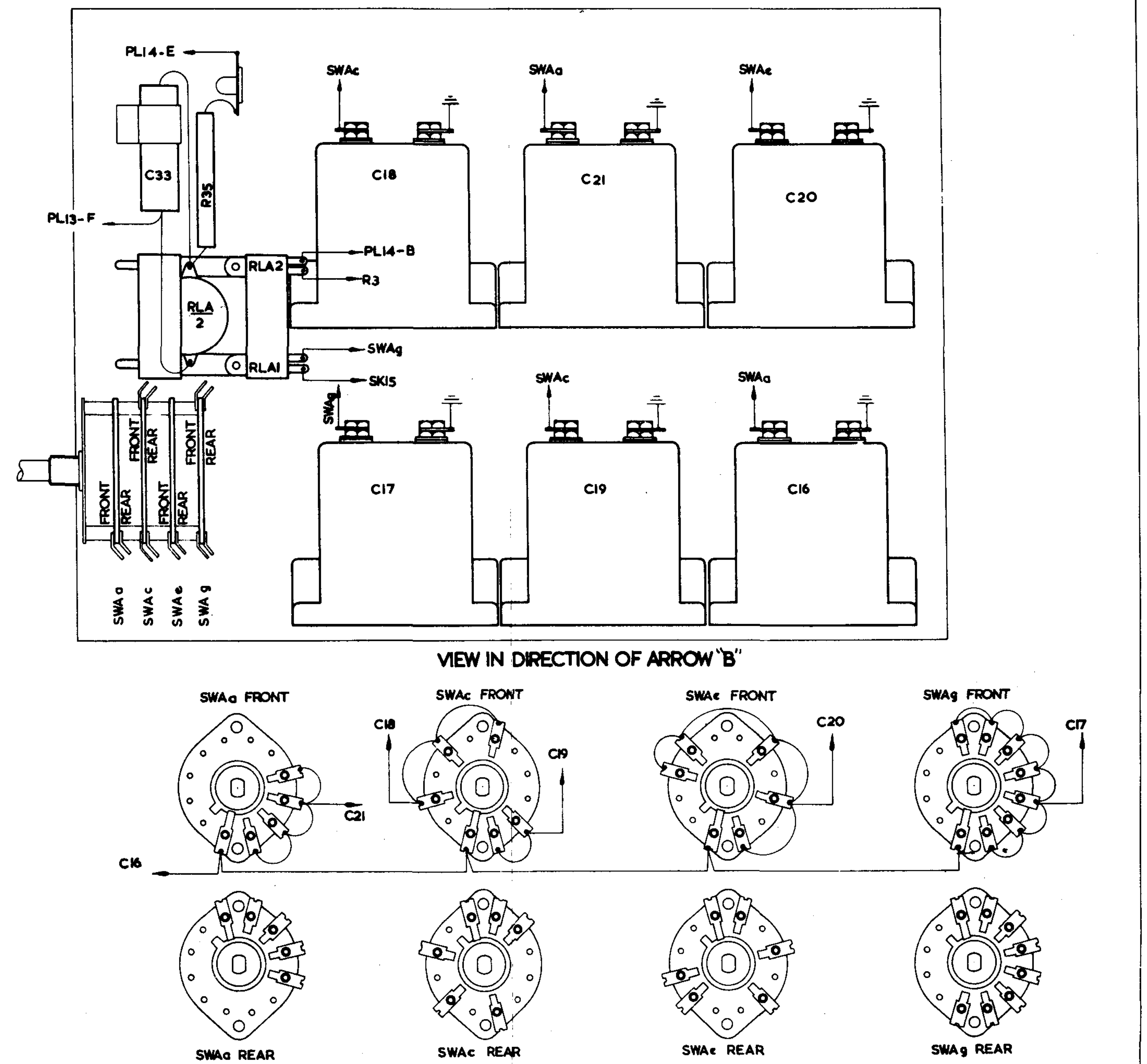


TRANSMITTER M.F. A.P. 100334
LAYOUT & SWITCH WIRING DIAGRAM.
(SHEET 1.)

R	18, 46, 45, 33, 47, 31, 32, 20, 36, 35	R
C	14, 36, 34, 10, 9, 8, 15, 22, 35, 5, 4, 33, 18, 17, 21, 19, 20, 16	C
MISC.	SK15, RLC, V9, L6, V1, V8, V2, V7, V5, V6, MR1, L4, V4, L7, M2, SWA, L3, L2, V3, RLA/2, SWA, RLA2, RLA1	MISC.



VIEW ON REAR OF UNIT WITH COVER REMOVED.



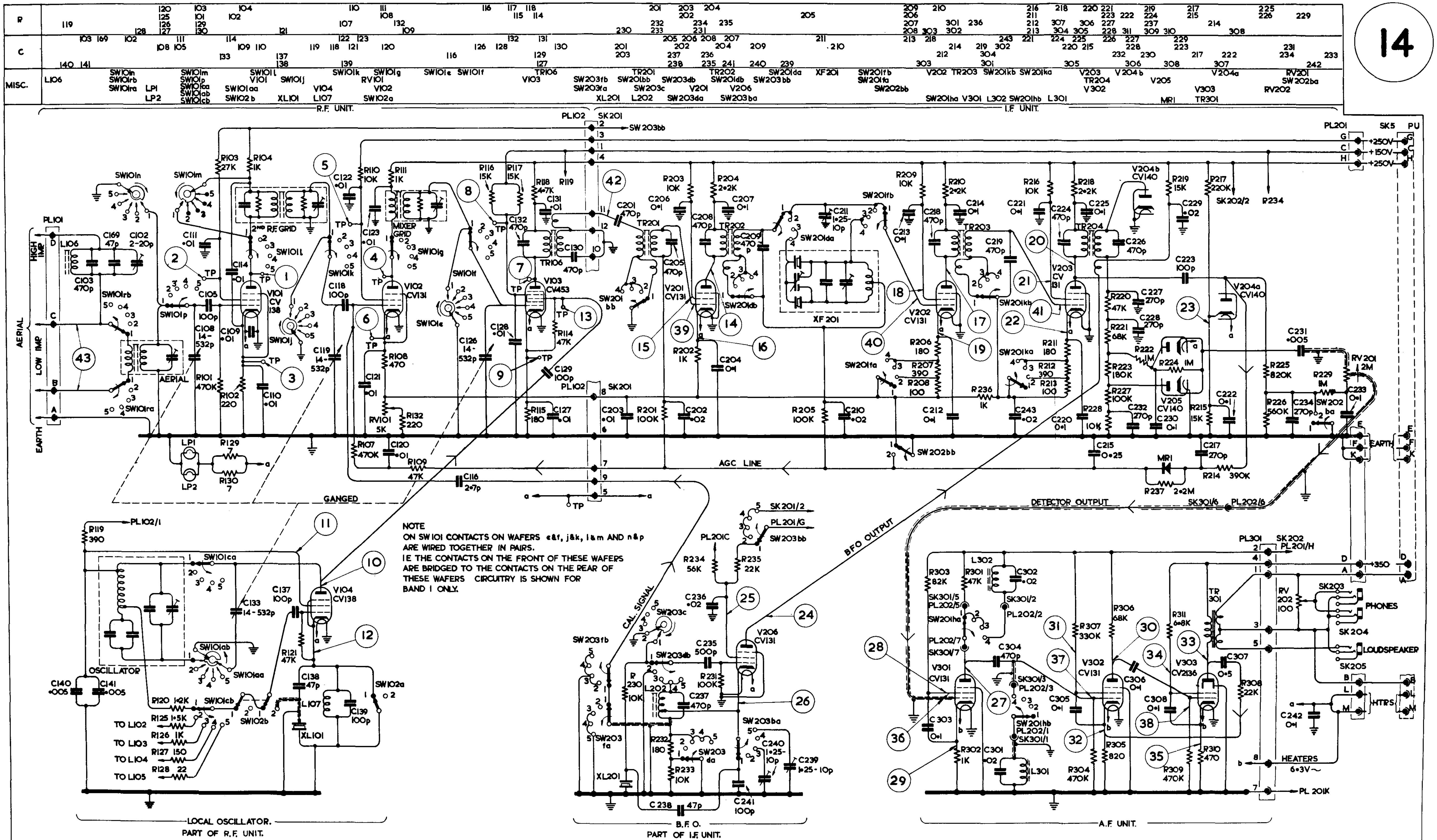
VIEW IN DIRECTION OF ARROW "B"

AERIAL LOADING SWITCH SWA.

NOTE.
ON SWA. CONTACTS ON FRONT OF WAFERS ARE WIRED TO ADJACENT CONTACTS ON REAR OF WAFERS.

TRANSMITTER M.F. AP.100334 LAYOUT & SWITCH WIRING DIAGRAM.

(SHEET 2)



SW101 FREQUENCY RANGE SWITCH.

POSITION	BAND	FREQ. RANGE
1	1	60 - 180 Kc/s
2	2	180 - 550Kc/s
3	3	1·5 - 4·7Mc/s
4	4	4·7 - 14·7Mc/s
5	5	14·7 - 30Mc/s

SW102 CRYSTAL SWITCH.

POSITION	
1	OUT
2	IN

SW201 BANDWIDTH SWITCH.

POSITION	
1	8Kc/s
2	3Kc/s
3	1Kc/s
4	200c/s

SW202 AGC ON-OFF SWITCH.

POSITION	
1	ON
2	OFF

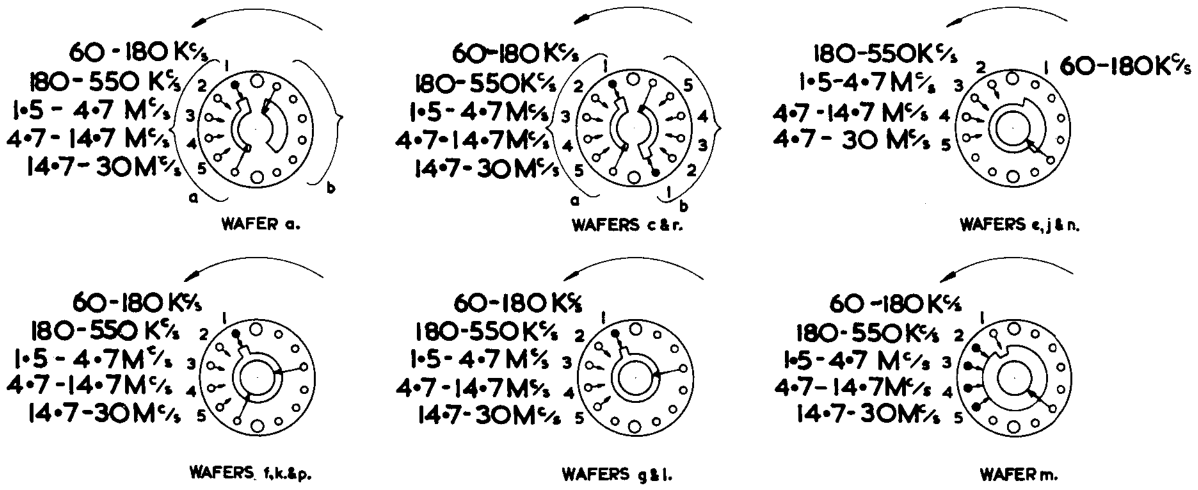
SW203 BFO SWITCH.

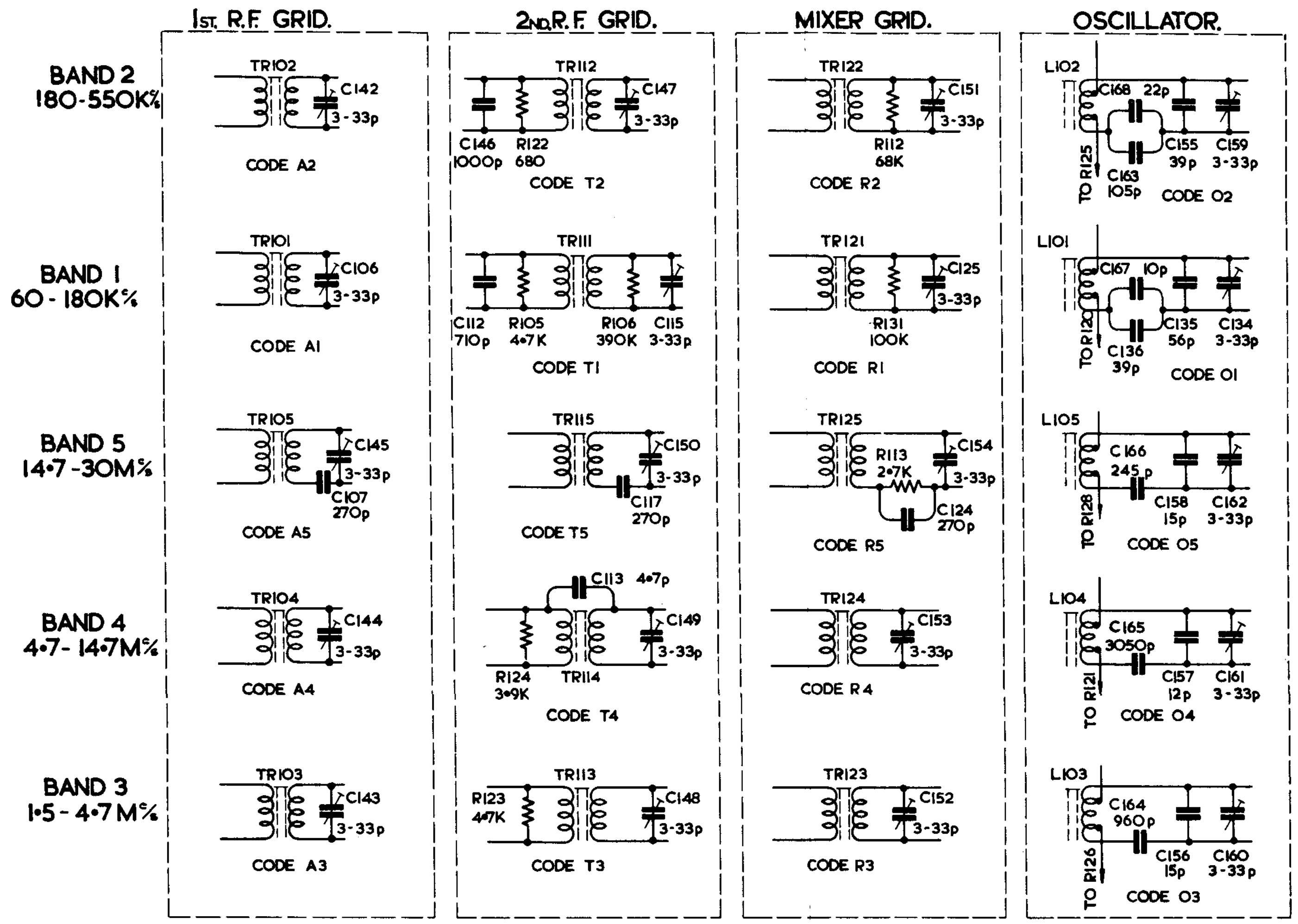
POSITION	
1	CAL.
2	OFF
3	TUNE
4	HIGH
5	LOW

AP100335 RECEIVER H.F M.F

CIRCUIT DIAGRAM (SHEET 1)

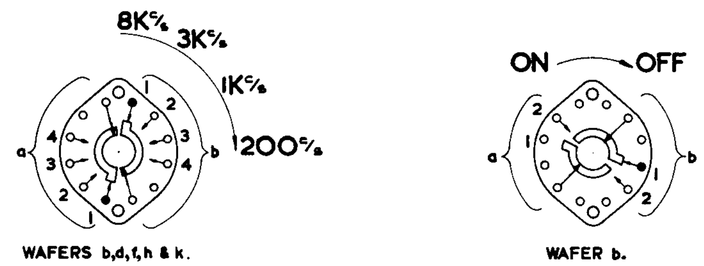
SW 101
FREQUENCY RANGE.



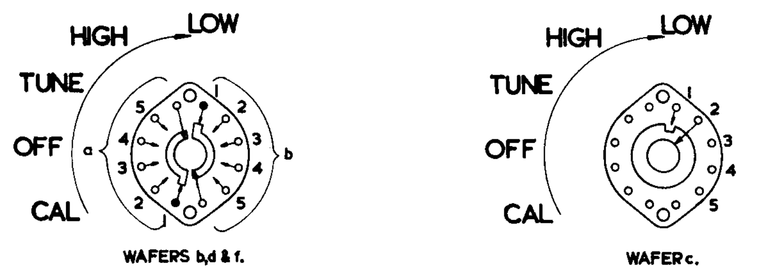


SW201 BANDWIDTH

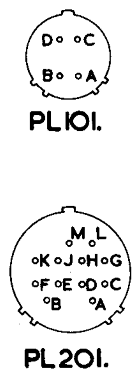
SW202 AGC



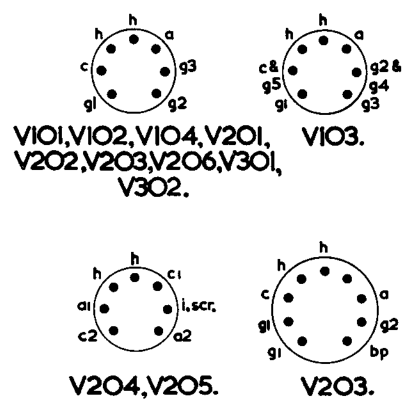
SW 203
BFO



NOTE. ALL SWITCHES ARE SHOWN WITH CONTROL KNOB IN EXTREME ANTI-CLOCKWISE POSITION. WAFERS ARE AS VIEWED FROM FRONT OR KNOB END OF SWITCH.



REAR VIEW OF PLUGS.

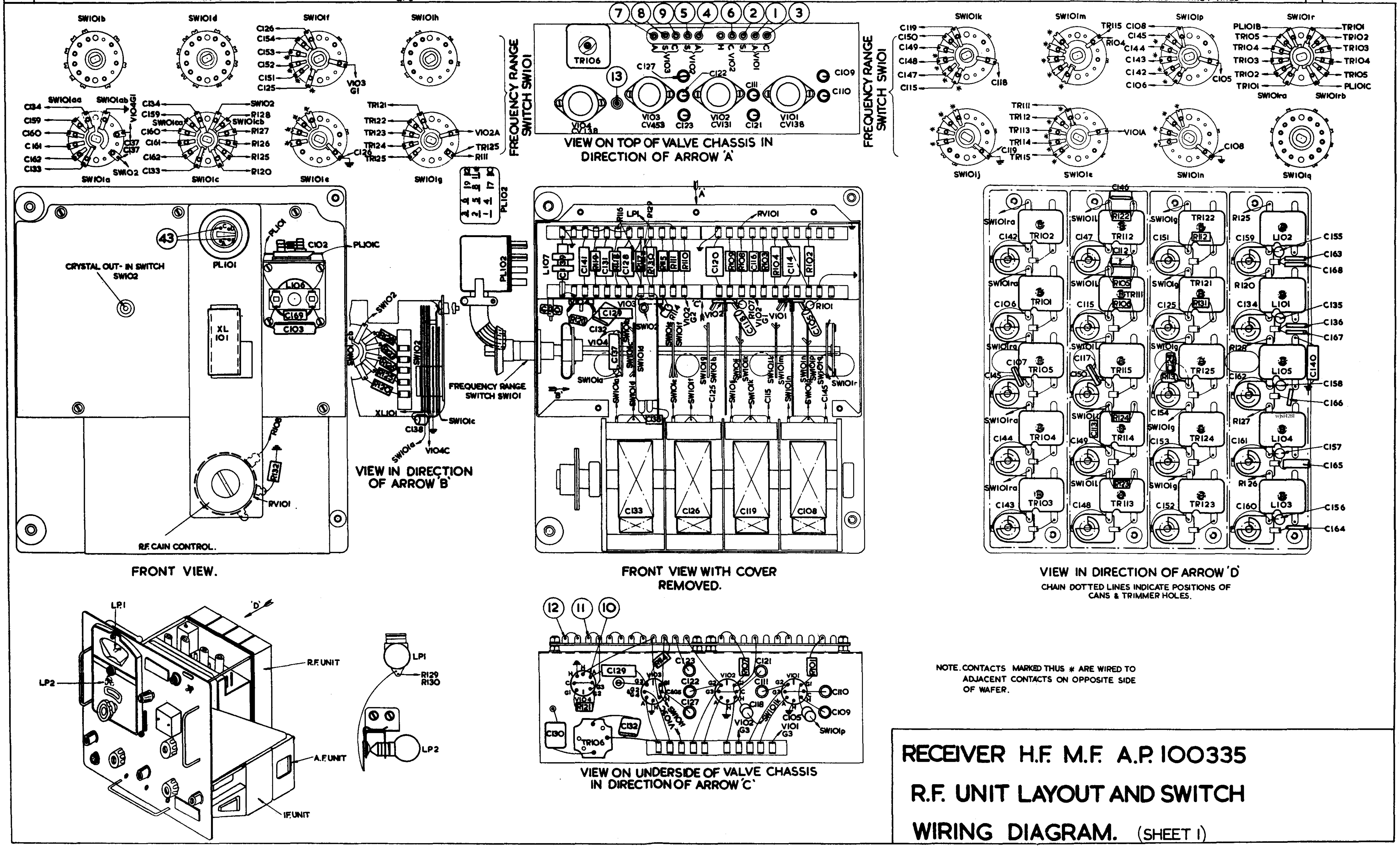


VALVE BASE CONNECTIONS.

AP100335 RECEIVER H.F. M.F.

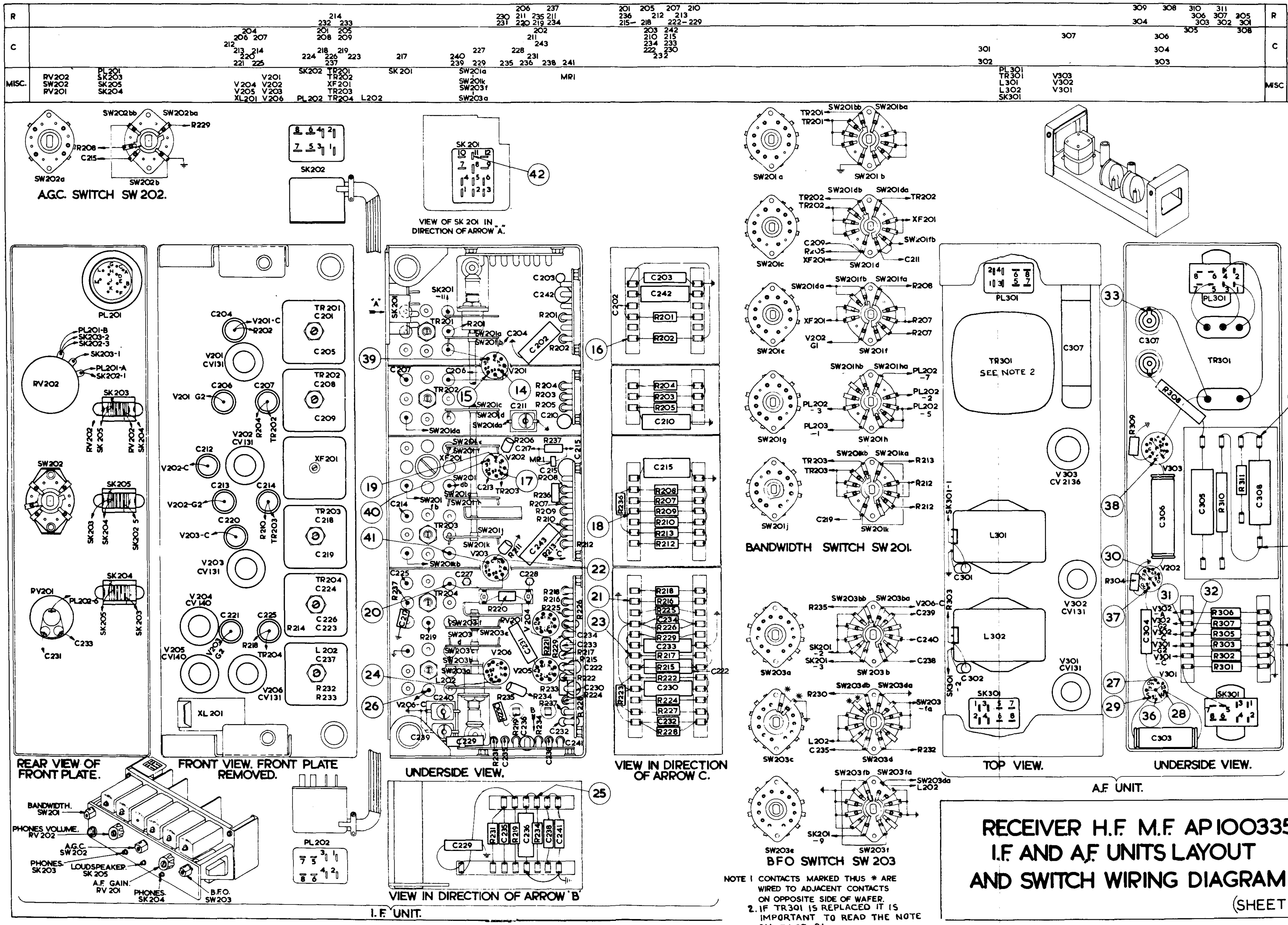
CIRCUIT DIAGRAM (SHEET 2)

R	132 128 126 120 127 125 121 119 118 116 117 129 130 115 111 110 114 109 108 107 103 104 102 101 122 105 106 123 124 113 112 131	R
C	102 169 103 139 130 141 131 132 128 129 137 133 138 127 122 123 126 120 111 121 118 116 119 114 110 109 105 108 142 106 107 145 144 143 147 115 117 150 149 148 146 112 113 151 125 124 154 153 152 159 134 162 161 160 155 135 158 157 156 163 164 168 136 167 140 166	C
MISC	PL101 XL101 RV101 L106 LP1 LP2 PL102 L107 TR106 V104 SW101a SW101b V103 SW102 SW101c SW101d SW101e SW101f V102 SW101g SW101h SW101j SW101k V101 SW101L SW101m SW101n SW101p SW101r SW101q TR102 TR101 TR105 TR104 TR103 TR112 TR111 TR115 TR114 TR113 TR122 TR121 TR125 TR124 TR123 L102 L101 L105 L103 L104	M



RECEIVER H.F. M.F. A.P. 100335

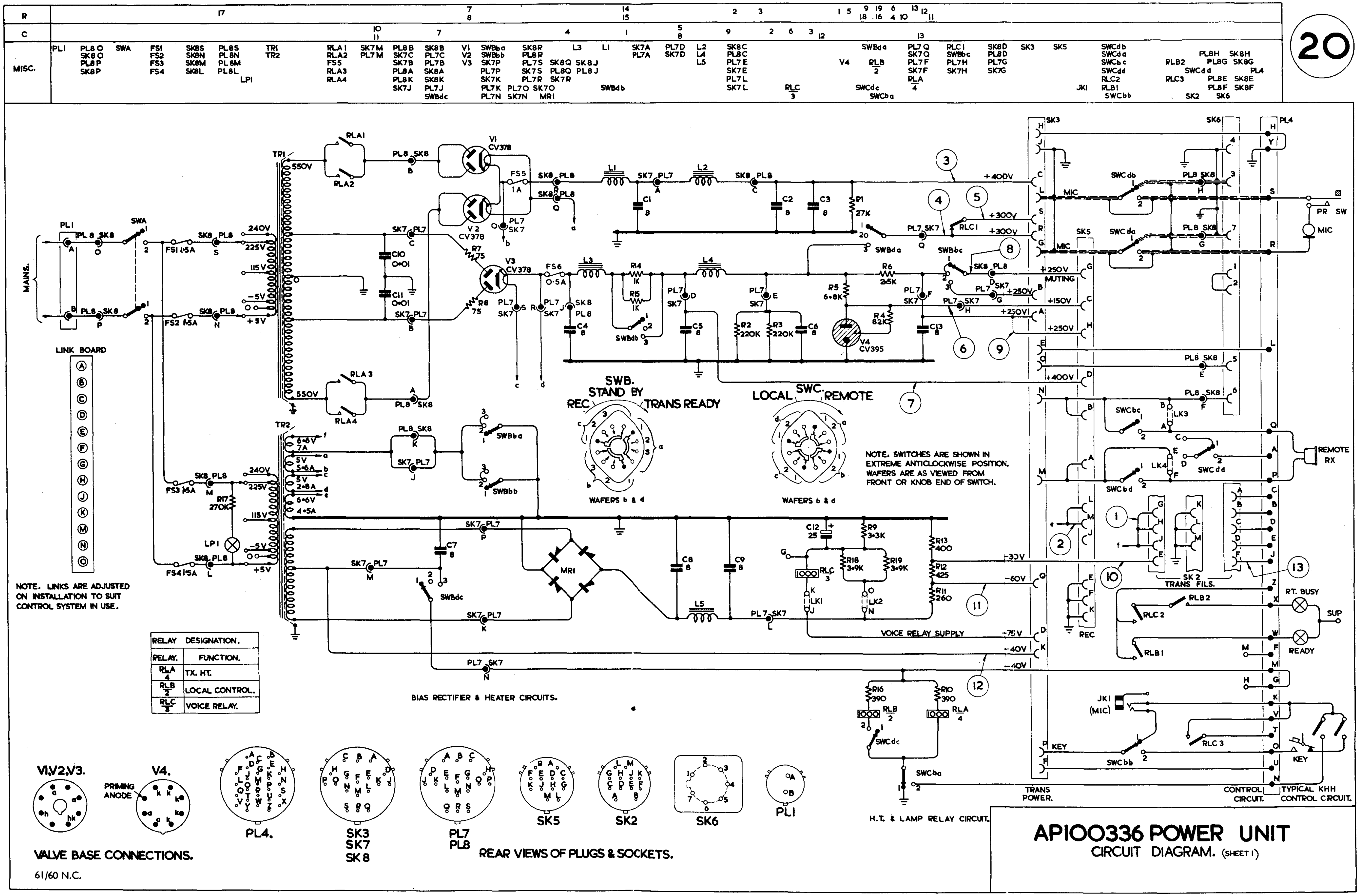
R.F. UNIT LAYOUT AND SWITCH WIRING DIAGRAM. (SHEET 1)



NOTE 1 CONTACTS MARKED THUS * ARE WIRED TO ADJACENT CONTACTS ON OPPOSITE SIDE OF WAFER.
2. IF TR301 IS REPLACED IT IS IMPORTANT TO READ THE NOTE ON PAGE 81

RECEIVER H.F. M.F. AP100335
I.F. AND A.F. UNITS LAYOUT AND SWITCH WIRING DIAGRAM

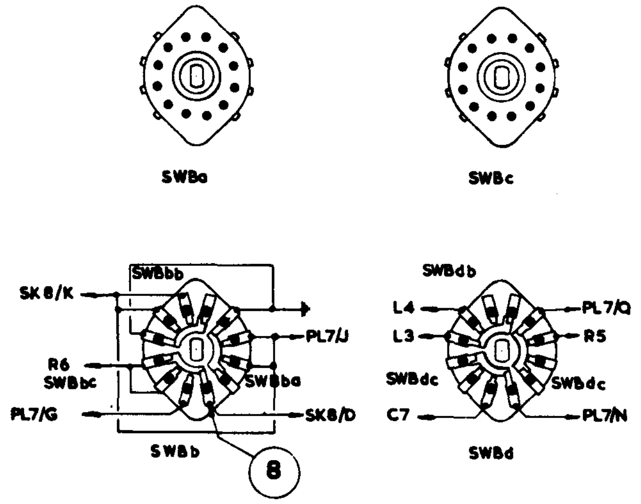
(SHEET 2)



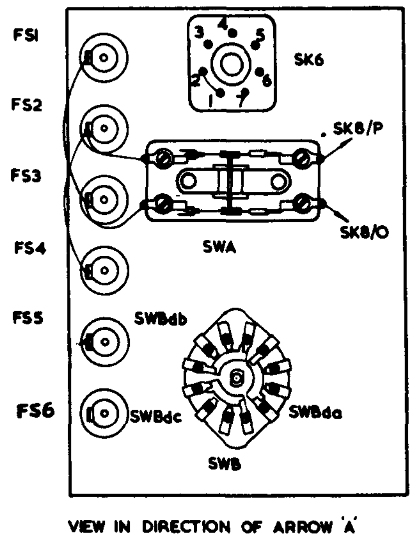
RELAY DESIGNATION.	
RELAY.	FUNCTION.
RLA 4	TX. HT.
RLB 2	LOCAL CONTROL.
RLC 3	VOICE RELAY.

AP100336 POWER UNIT
CIRCUIT DIAGRAM. (SHEET 1)

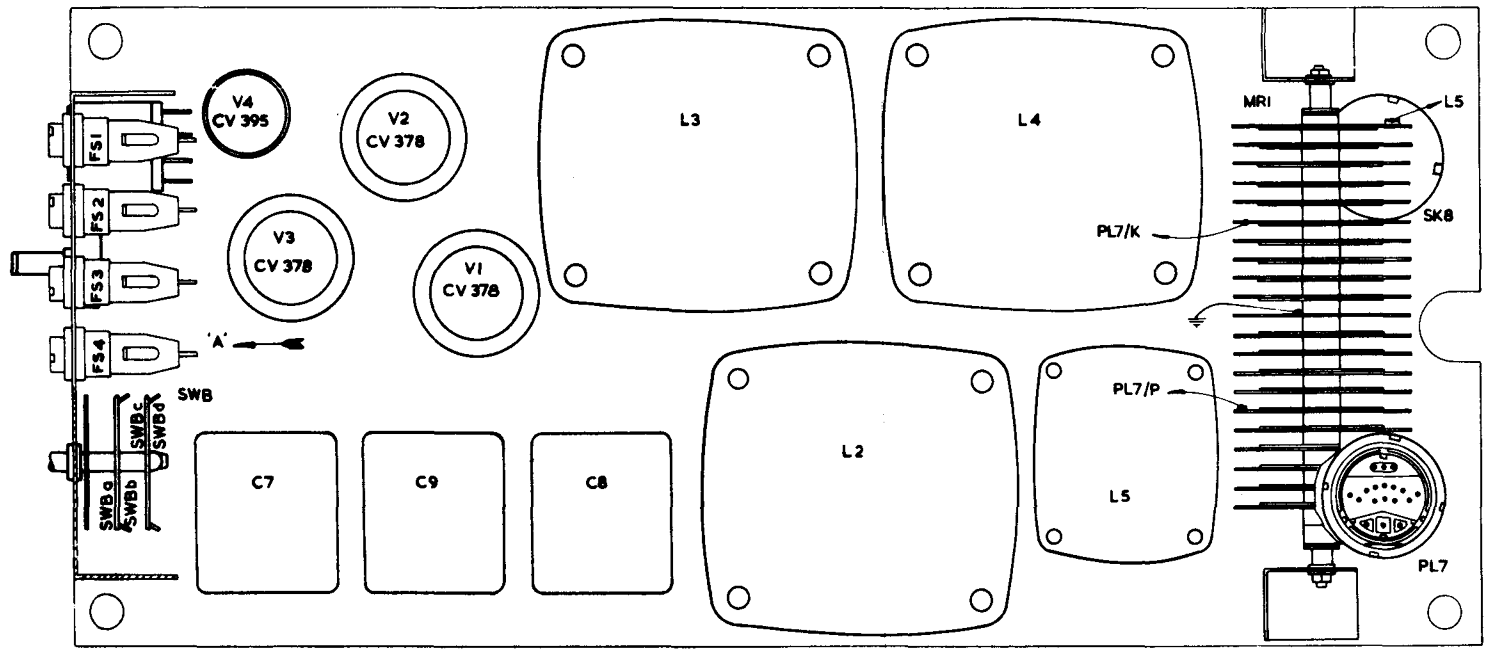
R	6 5 8 7 4 14 15	R
C	7 9 8	C
MISC.	FS1 FS2 FS3 FS4 FS5 FS6 SK 6 SWA SWB V3 V4 V1 V2 L3 L2 L4 L5 MR1 SK8 PL7	MISC.



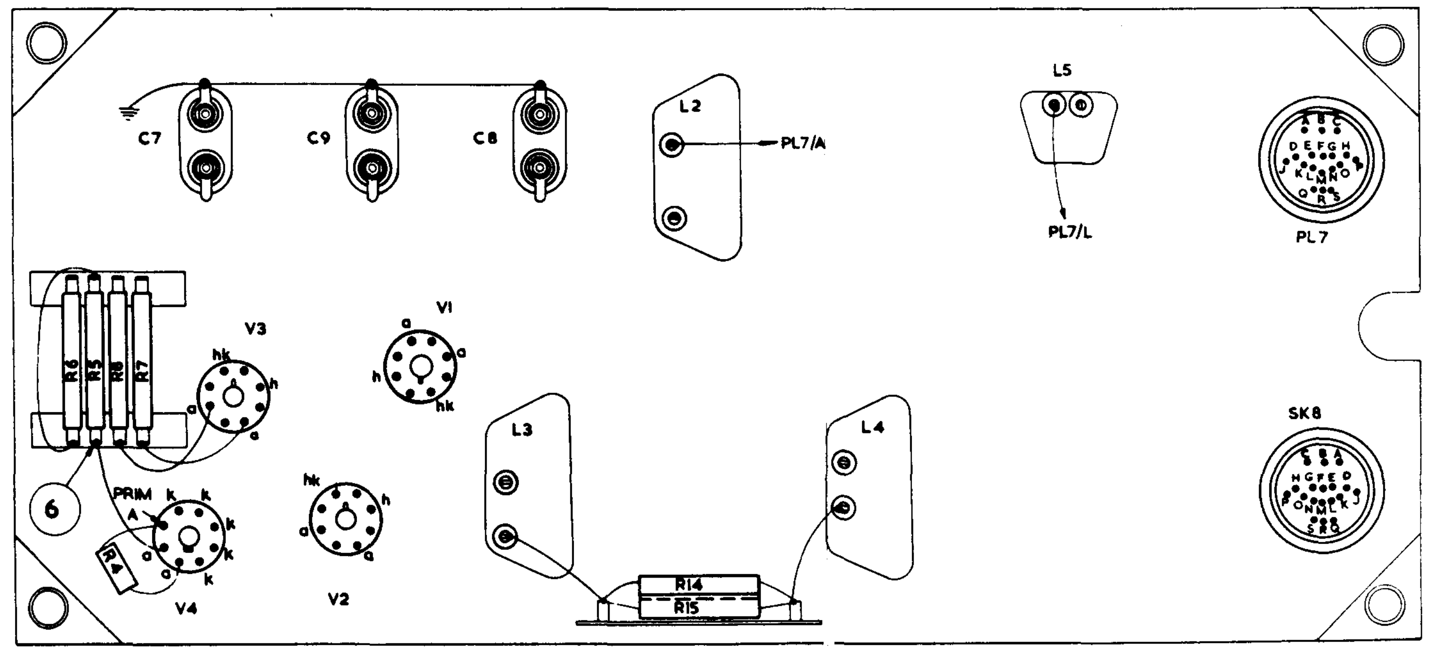
H.T. SUPPLY SWITCH SWB.



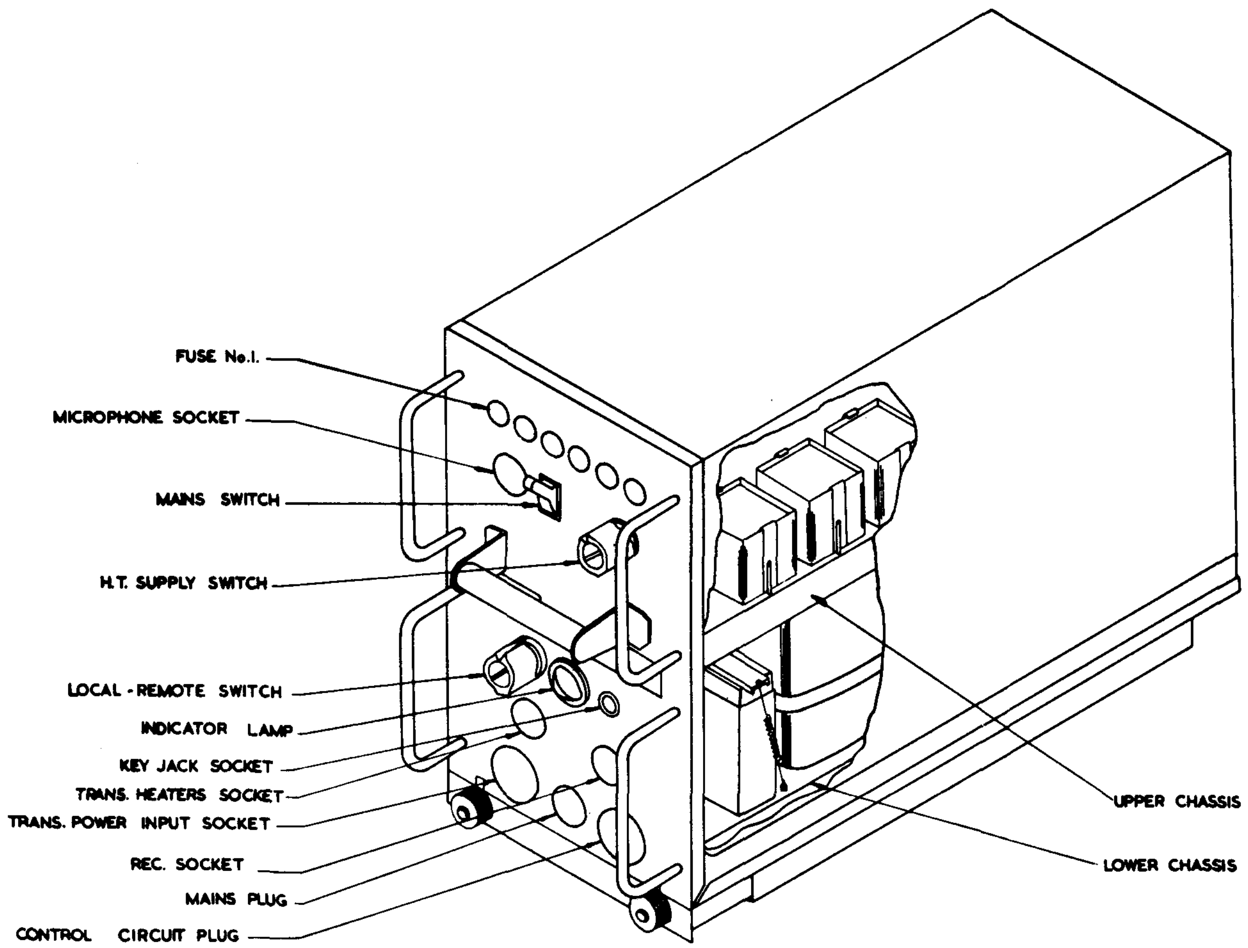
VIEW IN DIRECTION OF ARROW 'A'



PLAN VIEW OF UPPER CHASSIS



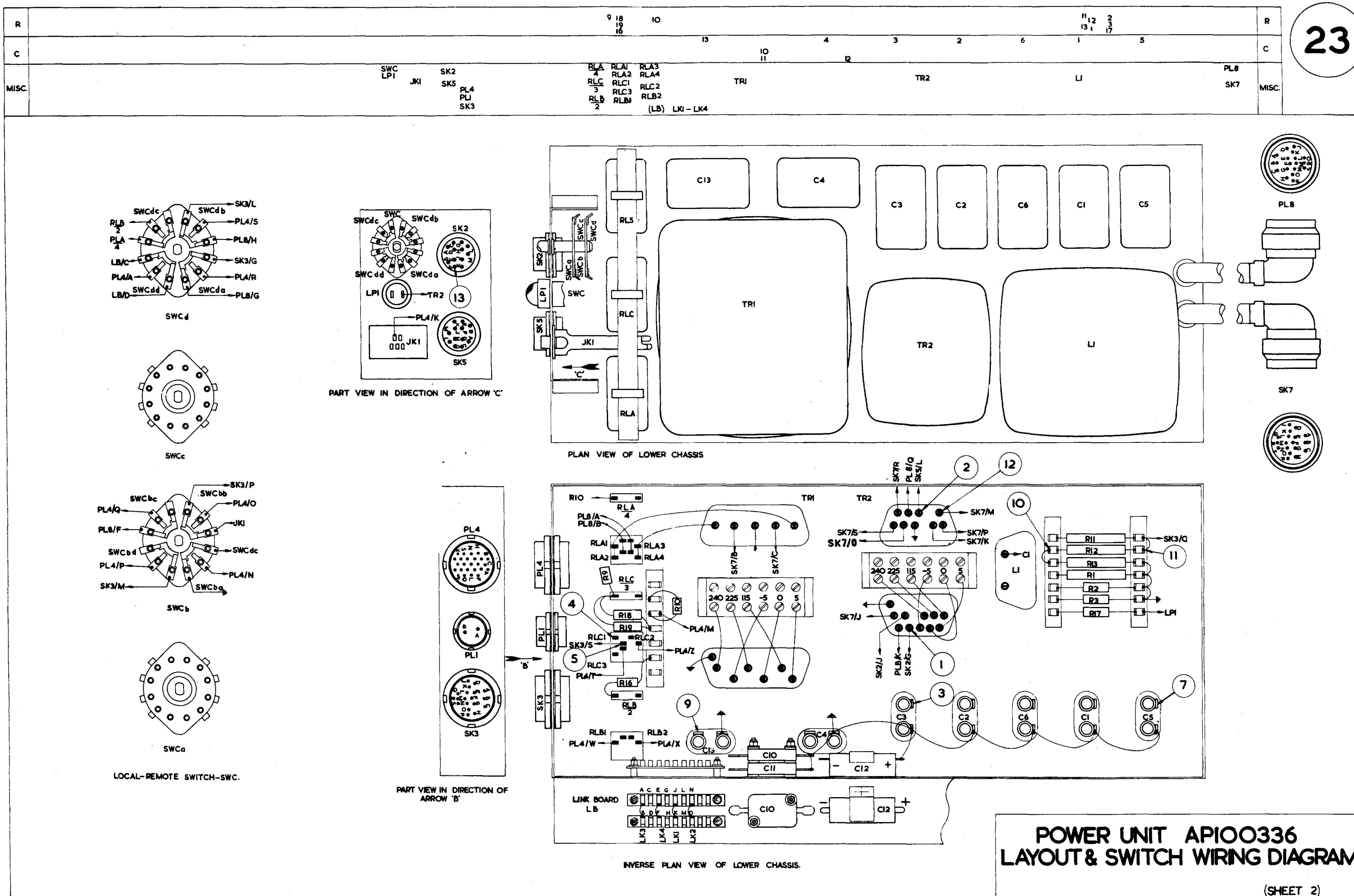
INVERSE PLAN VIEW OF UPPER CHASSIS



POWER UNIT AP. 100336
LAYOUT & SWITCH WIRING DIAGRAM.

(SHEET. 1.)

23



POWER UNIT AP100336
LAYOUT & SWITCH WIRING DIAGRAM.

(SHEET 2)