WIRELESS SETS No. 19

MK. I and MK. II

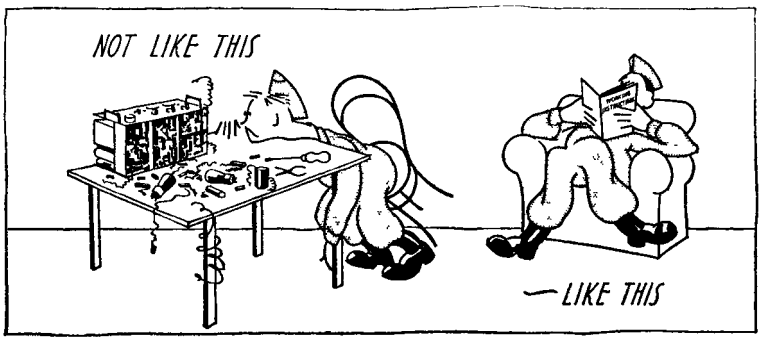
WORKING INSTRUCTIONS

PART II

TECHNICAL DESCRIPTION
AND FIRST-LINE MAINTENANCE

ZA. 10416

PATIENCE PAYS



DISTRIBUTION

R. Signals field units			Scale B
Training establishments:—			
R.A.C. training regiments		each	5
R. Signals, HQs. S.T.Cs.		,,	2
	Operators Trg. Bns.	,,	20
	Gen. Trades Trg. Bns.	,,	20
	Holding Bns.	,,	10
	School of Signals	,,	50
	Spl. Oprs. Trg. Bn.	,,	20
	Arty. Sig. Sec. Trg. Bn.	,,	10
	N.C.Os. Trg. Bn.	,,	10
R.A.O.C.	Depot Donnington	,,	500
O C.T.Us.	R.A.C.	,,	5
	R. Signals	,,	20
Dominion Forces			
Same scale as analogous British formations.			
Miscellaneous:—			
A.F.V. School		,,	10
Wireless Mechanics' School		,,	20
Military College of Science		,,	10
C.I.E.S.S.		,,	4
S.E.E.		,,	4
Ministry of Supply (pool)		,,	100
India		,,	200
Middle East		,,	100

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CHAPTER I

TECHNICAL DESCRIPTION

1. Power supplies.

1. *Batteries.*—The set is operated from a 12-volt accumulator.

2. *H.T. supplies.*—i. The H.T. supplies are obtained from a Wireless set No. 19, Supply Unit No. 1. This supply unit contains a three-commutator rotary transformer, working off the 12-volt D.C. input from the accumulator, which supplies 50 mA at 500 volts and 110 mA at 275 volts. The unit also contains the necessary R.F. and A.F. filters. Supply Unit Mark I* contains additional R.F. filtering.

ii. The circuits of the Mk. I and Mk. I* Supply Units are shown in Figs. 30 and 39.

3. *L.T. supplies.*—The valve heaters are supplied from the 12-volt accumulator. The details of the valve heater circuits are shown in Fig. 6.

4. *Power consumption.*

TABLE I. L.T. BATTERY CONSUMPTION

"A" set (*a*)	*"B" set* (*b*)	*Inter-comm. Amplifier* (*c*)	*Current taken from 12-volt accumulator* (*d*)
			amps.
Receive	Off	Off	7·0
Send R/T.	,,	,,	7·8
Receive	,,	On	8·4
Send R/T.	,,	,,	9·2
Receive	Receive	,,	8·9
Send R/T.	,,	,,	9·7
Receive	Send	,,	9·5
Send R/T.	,,	,,	10·3
Send C.W.	,,	,,	11·4

2. "A" set—General.

1. *Frequency coverage.*—i. Mk. I sets have a frequency range of 2·5–6·25 Mc/s (120–48 metres) covered in one band.

ii. Mk. II sets have a frequency range of 2·1–8 Mc/s (142·8–37·5 metres) covered in two bands, 2·1–4·5 Mc/s and 4·5–8 Mc/s. The bands are selected by the wave change switch S11A.

2. *Circuit arrangements.*—i. The receiver is a superheterodyne, which uses an I.F. of 465 kc/s. The valve stages are described in section **4**.

ii. Several valves are used both on RECEIVE and on SEND. The arrangement is shown in detail on the block schematic diagram in Fig. 2, from which it can be seen that the frequency of the sender is controlled by the tuning of the receiver L.O. and B.F.O. There is, therefore, no separate control for selecting the frequency of the sender.

3. Flick Mechanism

The preselector arrangement consists mainly of 2 circular plates driven from the main condenser spindle. A V cut on the periphery of each plate allows a spring loaded flick locating arm to engage in the V slot. The two plates are free to move on the main spindle until locked into the required position by two clamping screws. Each plate can be individually adjusted to the required preselected frequency.

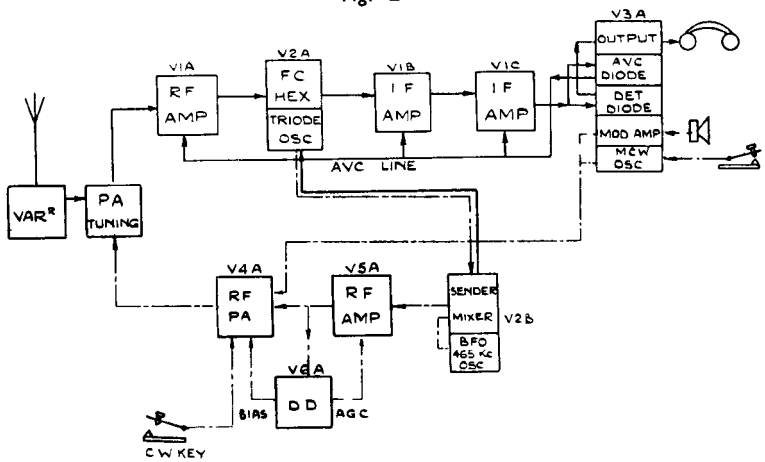
The two spring loaded arms operate also two flags so that a visual indication is given for each preselected frequency. A flick lever is incorporated to give the following facilities.

1. *Tune* — In this position the flick mechanism is disengaged, and the slow motion drive is in operation to enable the operator to tune the set.
2. *Set* — In this position both flick and slow motion mechanisms are engaged to enable the operator to set the tuning dial for flick working.
3. *Flick* — The slow motion drive is disengaged and the flick mechanism in operation.

Setting up procedure is given in Working Instructions, Part 1, Fig. 5.

BLOCK SCHEMATIC "A" SET SENDER/RECEIVER.

Fig. 2



4. "A" set—Receiver.

1. *R.F. amplifier.*—The signal from the aerial passes through the aerial tuned circuit (*see* Section **9**, 3) and is fed through C2A to the control grid of the valve V1A. V1A is a variable-μ R.F. pentode, which is used solely for R.F. amplification. It is self-biased by R2A and receives A.V.C. bias through the choke L10A. The anode circuit of the valve consists of the primary of the R.F. transformer, L7A and B in Mk. I sets and L22A and B or L23A and B in Mk. II sets. The secondary of the transformer is tuned by C9A, and is connected to the control grid of the hexode portion of the frequency-changer valve V2A.

2. *Frequency-changer.*—i. The frequency-changer valve, V2A, is a triode-hexode. The triode section acts as the local oscillator, working at a frequency 465 kc/s above the signal frequency. The oscillator circuit comprises the transformer L6A and B in Mk. I sets and L24A and B or L25A and B in Mk. II sets, the secondary, in each case, being tuned by C9B.

ii. The triode grid of V2A is connected internally to the injector grid of the hexode section, which acts as the mixer. The hexode anode is coupled, through the I.F. transformer L8A, to the control grid of the 1st I.F. amplifier, V1B.

Note.—The triode section of V2A also acts as a part of the sender. This is described in Section **5**, 1.

3. *1st I.F. stage.*—V1B is a variable-μ R.F. pentode, used solely for I.F. amplification. The valve is self-biased by R9A and receives A.V.C. bias through the secondary of L8A. The anode is coupled through the I.F. transformer, L8B, to the control grid of the 2nd I.F. amplifier, V1C.

4. *2nd I.F. stage.*—V1C is another variable-μ R.F. pentode, used solely for I.F. amplification. The valve is self-biased by R3B and receives A.V.C. bias through the secondary of L8B. It is coupled through the I.F. transformer, L9A, to the signal detector diode anode of V3A.

5. *Detector, A.V.C. and output stage.*—i. V3A is a double-diode pentode. One diode acts as the signal detector, the other diode as the A.V.C. detector and the pentode as the A.F. amplifier.

ii. *Signal detector.*—The anode of the signal detector diode is directly connected to the "live" side of the secondary of the I.F. transformer, L9A. The diode load is provided by R7C and R1B. A filter consisting of R7C, C14A and C15A serves to keep I.F. signals out of the A.F. amplifier. The A.F. is fed through C17A to the A.F. volume control R13A, which is connected by a screened lead, through a contact of the send-receive relay to the control grid of the pentode section of V3A.

iii. *A.V.C. detector.*—(*a*) The A.V.C. diode is fed from the signal detector diode through a small coupling condenser C18A. R8A is the diode load across which a voltage is developed by the flow of rectified current through the diode. This voltage is applied as negative bias through R8B to the control grids of the valves V1A, V1B and V1C. R8B and C38A act as a filter, and their values determine the time constant of the circuit.

(*b*) The diode load R8A is connected to earth; this places a negative bias on the anode of the A.V.C. diode equal to the D.C. volts developed across the cathode resistor R10A and R11A by the cathode current of V3A. No rectification takes place, therefore, in the A.V.C. diode, until the amplitude of the incoming signal is great enough to overcome this bias, thus delaying the A.V.C.

iv. *Output stage.*—The output stage is the pentode section of V3A, acting as an A.F. amplifier. The input is resistance-coupled by R13A, the L.F. volume control. The anode is coupled by the transformer, T2A, to the headphones.

Note —V3A is also used by the sender, as described in Section **5**, 5.

6. *Beat frequency oscillator.*—i. The triode portion of the triode-hexode valve V2B acts as the B.F.O.

ii. *Reception of C.W.*—For the reception of C.W., the B.F.O. is switched on by the C.W.–R/T switch S7A/6. The pitch of the heterodyne beat note can be adjusted by means of the variable resistance R14A, which varies the B.F.O. frequency by shunting the coupling coil L5B.

iii. *Netting.*—The B.F.O. is brought into operation when the NET button S3B is pressed, oscillating at the I.F. of 465 kc/s. The inter-electrode capacity of V2B provides coupling with the I.F., *via* the hexode control grid of V2B and the triode grid of V2A. In this manner, the B.F.O. heterodynes with the I.F., thus enabling the receiver to be tuned accurately to an inaudibly low beat note with the received signal.

5. "A" set sender.

1. *Master oscillator stage.*—The triode section of the receiver frequency-changer valve, V2A, acts as the master oscillator when the set is on send. It oscillates at a frequency 465 kc/s above the carrier frequency. It is coupled through C21A and R23A in Mk. I sets and R42C in Mk. II sets to the hexode control grid of the sender frequency-changer, V2B.

2. *Sender frequency-changer.*—i. V2B is a triode-hexode valve; the triode section, which is the B.F.O. of the receiver, oscillates at 465 kc/s. The output of this oscillator is mixed with the output of the master oscillator in the hexode section of the valve, producing a signal of carrier frequency.

ii. The output from the hexode is tuned by the circuit L4B and C9D in Mk. I sets and by L7A or L21A and C9D in Mk. II sets. The signal is fed through C2C to the control grid of the valve V5A.

3. *Buffer stage (R.F. amplifier).*—i. V5A is a steep-slope pentode valve, used to amplify the drive voltage to the power amplifier valve, V4A. The output from V5A is tuned, by L4A and C9C in Mk. I sets and by L4A or L6A and C9C in Mk. II sets, and fed through C2E to the control grid of V4A and to the anodes of the double-diode valve V6A.

ii. One of the diodes of V6A provides a control voltage which is fed back through R1D and R1E to the control grid of V5A. This control voltage is delayed to an extent determined by the setting of the variable resistance R43A, the effect being to maintain the drive voltage applied to the control grid of V4A constant at a pre-determined value.

4. *Power amplifier stage.*—i. V4A is a beam tetrode valve which acts as the power amplifier. On R/T and M.C.W., modulation is applied to the control grid of the valve; keying on C.W. is described in para. 6 below.

ii. *Bias.*—(*a*) On R/T and M.C.W., a negative bias developed by the second diode of V6A is applied to the control grid of V4A. This bias is proportional to the R.F. drive voltage which reaches the diode, and therefore to the drive applied to the control grid of V4A.

(*b*) On C.W. the bias from the diode of V6A is removed, and V4A is self-biased by grid current through R7D.

iii. The output of V4A is tuned by L3A and C3A and fed from a low impedance tap on L3A, through the aerial feeder, to the variometer, which tunes the aerial. The R.F. current from the variometer to the aerial is passed through the primary of transformer T1A, the current in the secondary is taken through the rectifier W1A. The D.C. current produced by the rectifier is passed through the R.F. choke L2A, the aerial feeder and the R.F. choke L2B, to the panel meter.

5. *Modulation.*—i. R/T.—The pentode section of the valve V3A acts as a modulation amplifier. The input from the microphone comes through the microphone transformer T3A. The output is applied, through C17B and R7G, to the control grid of V4A. Sidetone is taken through the transformer T2A to the headphones.

ii. M.C.W.—For M.C.W., the valve V3A is made to oscillate by coupling its control grid to the reaction winding on T2A. The anode and screen grid of V3A are keyed through the key-jack J1A.

6. C.W. *keying.*—On C.W., keying is done, through the key-jack J1A, on the H.T. supplies of the following:—

The screen grid of V4A, the anode and screen grid of V5A, the

anode and screen grids of the hexode section of V2B and, on Mk. I sets, the resistance R18A.

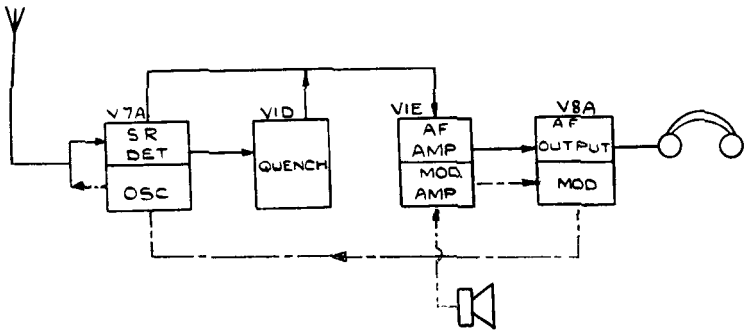
6. "B" set.

1. *General.*—i. The "B" set is an U.H.F. transceiver, with a frequency range of about 229–241 Mc/s. When switched to receive, it acts as a super-regenerative receiver, using a "quench" or interruption frequency of between 158 kc/s and 228 kc/s; when switched to send it acts as an anode-modulated oscillator.

ii. A block diagram of the "B" set is shown in Fig. 3.

BLOCK SCHEMATIC "B" SET SENDER/RECEIVER.

Fig. 3



2. *Receiver.*—i. *Detector stage.*—(*a*) V7A is an U.H.F. triode which acts as an oscillating detector and is tuned to the frequency of the incoming carrier by the circuit L11A and C25A. The oscillation of V7A is periodically interrupted by the application of the output from the quench oscillator V1D. V1D is tuned by L14A, C28A and C37A to oscillate at the quench frequency. This arrangement keeps V7A in the most sensitive condition, and the circuit is equivalent to a leaky grid detector with very critically adjusted reaction.

(*b*) The output from the detector is fed through C29A to the volume control R35A, which is connected to the control grid of the 1st A.F. amplifier, V1E. A filter circuit, comprising C30A, R6H and C30B, is provided, to prevent the quench frequency getting into the A.F. stages.

ii. *1st A.F. amplifier.*—V1E is a R.F. pentode, used solely for A.F. amplification. Its output is fed through C29B and is resistance-coupled by R8D to the control grid of the output valve V8A.

iii. *Output stage* (*2nd A.F. amplifier*).—V8A is a beam tetrode

power valve, used for A.F. amplification. Its output is coupled by the transformer T5A to the headphones.

3. *Sender.*—i. *Modulation amplifier.*—The output from the microphone is taken through the microphone transformer T4A to the control grid of V1E, which acts as the modulation amplifier. The output from the valve is fed through C29B to the control grid of the modulator valve V8A.

ii. *Modulator.*—(*a*) The beam tetrode power valve V8A acts as the modulator. The output from the valve is taken through the output transformer T5A to the anode of the oscillator V7A.

(*b*) Negative feed-back is taken from the phone winding of T5A and applied to the primary winding of the transformer T4A.

(*c*) Sidetone is taken from T5A to the headphones.

iii. *Oscillator.*—The U.H.F. triode valve, V7A, acts as an anode-modulated oscillator, producing the carrier. It receives its H.T. supply through T5A.

7. Send-Receive switching.

1. Changing over from receive to send is performed by the pressel switch on the Microphone and Receiver Headgear No. 1. This actuates the relay of the set to which the control unit is switched, relay S5A for "A" set, relay S5B for "B" set.

2. Following the circuit through on the "A" set, it will be seen that when the pressel switch is closed, one side of L19A, the relay energizing coil, is earthed (Pin 7, 12-pt. plug). The other side has a standing voltage of 12V. (Pin 3, 6-pt. plug). The relay then pulls over, and H.T. is applied to the sender valves (by S5A 2 and 3), and the microphone is put in circuit (by S5A 4) with the microphone amplifier V3A.

3. When using M.C.W. or C.W., send-receive switching is automatically performed by pushing the key-plug into the key-jack for send, and half withdrawing it for receive.

8. Inter-communication amplifier.

1. The inter-communication amplifier is a two-stage A.F. amplifier, which uses negative feed-back.

2. The output from the microphone is taken through the transformer, T4B, to the 1st A.F. amplifying valve V1F. The output from V1F is fed through C29C and resistance-coupled by R8F to the control grid of the 2nd A.F. valve V8B.

3. The output from V8B passes through the transformer T6A to the headphones.

4. Negative feed-back is taken from the secondary of T6A and applied to the primary of T4B.

9. Aerials and associated equipment.

1. *"A" set aerials.*—The "A" set is designed primarily for use with 8-ft. or 12-ft. rod aerials of the type supplied with the equipment. When short-range communication only is required, a single 4-ft. mast section may be used, if the 8-ft. rod aerial is regarded as too conspicuous.

2. *"A" set horizontal aerials.*—i. It should first be understood that the aerial matching variometer on the No. 19 set loads the mast aerial to a quarter wavelength, and the impedance of the concentric line to the variometer is 40 ohms approximately. An aerial such as the Wyndom with its medium impedance feed is unsuitable, but a three-quarter wave aerial can be used. For example, at a frequency of 3 Mc/s we should need 156 feet of wire for a half wavelength, the practical length being 95% of the theoretical length. We know that the variometer will load a 12-ft. mast to one quarter wave at 3 Mc/s; if, therefore, a further 12 feet are added to the half-wave aerial and the complete aerial is attached to the variometer, it will be possible to load the aerial to three-quarter wave, for which the input impedance is approximately the same as for a quarter wave.

ii. A number of experiments have been carried out working on this basis, and ranges up to 180 miles have been worked on speech with strength 9 signals at each end. The tests have not been sufficiently extended to make it possible to formulate any rules as to what the range is, using this type of aerial. It must *not* be assumed:

(*a*) that 180 miles is the maximum range, *or*
(*b*) that this range will always be attained,

but it is evident that ranges of this order are possible under reasonable conditions.

iii. In order to simplify the erection of aerials, the following standard lengths of wire have been calculated and checked by experiment as being suitable to cover the approximate frequency bands shown:—

TABLE II. LENGTHS OF HORIZONTAL AERIALS

Total length of wire (*a*)	*Frequency band covered* (*b*)
Feet.	Mc/s.
250	2–2·65
185	2·6–3·5
150	3·45–4·5
110	4·45–5·6
90	5·55–6·65
70	6·6–8·0

iv. The wire should preferably be erected as high as possible, *e.g.*, an inverted "L" with the horizontal portion 30 ft. from the ground would be extremely good; good results, however, may be obtained with the horizontal portion of the aerial no more than 18 ft. from the ground. A quick and easy method of erecting an aerial, which will give results good enough for many purposes, is to attach one end of the wire to a tree, mast or other support and the other end to the vehicle in which the set is carried, the vehicle being so placed that the wire is stretched taut between them.

v. The aerial current indicated by the panel meter of the set, when used with a horizontal aerial, will be of the same order as the current indicated with the 12-ft. rod. In certain circumstances it may be less, but it should not be assumed that for this reason the radiation will be less.

vi. The use of an elaborate earth, *e.g.*, a radial earth with the spokes not less than half the wavelength of the frequency in use, will improve radiation markedly. Even a simple earth pin near the vehicle will effect some improvement in radiation, and will avoid the noticeable drop in aerial current which would occur through people near the truck touching the parts of its chassis to which the set is earthed. An earth will also, in many cases, improve the signal-to-noise ratio on receive.

3. *The "A" set aerial circuit.*—A common tuned circuit (labelled P.A. tuning) is used to tune the grid of V1A when receiving and the anode of V4A when sending. The aerial is tuned to resonance by the variometer L1A, forming a series resonant circuit, which is connected to a low impedance tapping on the tank coil, L3A, *via* a low capacity feeder. The entire aerial circuit within the vehicle is fully screened to reduce interference from other electrical equipment in the vehicle.

4. *"B" set aerial.*—This is a half-wave rod aerial fed by a feeder which is a multiple of a half wavelength. Only two standard feeders are available. These are cut to correct lengths and must, therefore, on no account be shortened. The lengths are:—

Aerial leads,	No. 2.	4ft. 2in.	$1\frac{1}{2}$ wavelengths.
,, ,,	No. 3.	7ft.	$2\frac{1}{2}$,,

Note.—These physical lengths are not the equivalent of the electrical wavelengths. They have been calculated by taking into account the impedance of the feeder and of the coil circuit.

10. Audio equipment.

1. *Microphone and Receiver Headgear No.* 1.—This has a moving coil microphone. To exclude noise, it is necessary to speak right into the

mouthpiece of the microphone. The pressel switch contacts are used for switching from receive to send and for bringing the microphone into circuit.

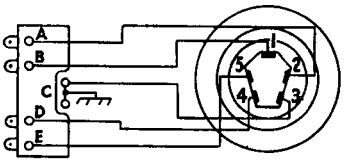
The head-phones are also of the moving coil type and are fitted with rubber caps to exclude external noise. Moving coil units are used to give a good response over a wide frequency band, as this gives greatly increased intelligibility under noisy conditions.

2. *Microphone and Receiver Headgear No.* 2.—The microphone fitted to the Microphone and Receiver Headgear, No. 2, is of the carbon granule "power" type and is intended for use without any amplification.

3. The connections of the two types of headgear are shown in Fig. 4.

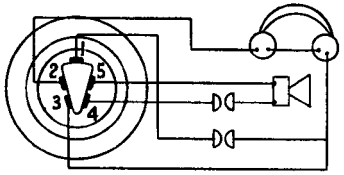
VIEW LOOKING INTO PLUG SHOWING CONTACTS.

Fig. 4

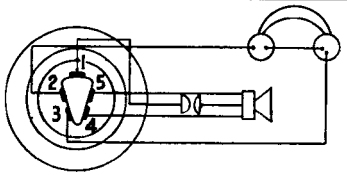


DROP CORD

A	TELEPHONE	+	GREEN
B	RELAY	+	BLUE
C	RELAY TELEPHONE	−	BLACK
D	MICROPHONE	+	WHITE
E	MICROPHONE	−	RED



MICROPHONE AND RCR HEADGEAR N° 1



MICROPHONE AND RCR HEADGEAR N° 2

II. Control system.

1. *Systems used.*—The No. 19 set may be used in many different types of vehicle, and therefore the variations in the control system are many. The following list of Control Units and Junction Distribution Boxes, read in conjunction with the control switching charts Nos. 1–3, explains the working of the various systems.

2. *Control Unit No.* 1.—This is a single size unit, with a 12-pt. input plug and two drop leads. The left-hand bottom lead can be switched to "A," "IC" and "B," while the right-hand lead is permanently on IC.

This is normally connected by a 12-pt. connector to Control Unit No. 2, which in turn is connected by a 12-pt. connector direct

to the set. Control Unit Nos. 1 and 2 together give full switching facilities (*see* Chart 1).

3. *Control Unit No. 1 Mk. II.*—This is a No. 1 with the addition of a four-way terminal strip to enable connections to be made to the I.C. amplifier circuits. It supersedes No. 1.

4. *Control Unit No. 1A.*—This is a No. 1 with both drop leads connected in parallel to the switch.

5. *Control Unit No. 1A Mk. II.*—This is a No. 1 Mark II with both drop leads connected in parallel to the switch. It supersedes No. 1A.

Note.—On some early two-man turret installations only the No. 1 or 1A was used (in these cases the fuse in the Control Unit is removed). This, of course, did not provide full switching facilities (*see* Chart 2) and has been superseded by Control Unit No. 3.

6. *Control Unit No. 2.*—A single size unit with 12-pt. input and output plugs, one switched drop lead and one "A" unattended indicator lamp. It is normally used with a No. 1 or No. 1A; the lamp lights when both controls are switched to "B." For switching facilities *see* Chart 1.

7. *Control Unit No. 2 Mk. II.*—This supersedes No. 2 and gives additional switching facilities for re-broadcasting (*see* Chart 3).

8. *Control Unit No. 3.*—A double size unit with a 12-pt. input plug and two drop leads, switched independently, and an "A" unattended indicator lamp. This unit combines the circuits of Nos. 1 and 2 without the I.C. drop lead, and was designed for use in a two-man turret. It gives full switching facilities (*see* Chart 1).

9. *Control Unit No. 3 Mk. II.*—This supersedes No. 3 and gives re-broadcasting facilities (*see* Chart 3).

10. *Control Unit No. 3A.*—This is a No. 3 with the addition of an I.C. drop lead, and is designed for use in three-man turrets. For switching facilities, *see* Chart 1.

11. *Control Unit No. 3A Mk. II.*—This supersedes No. 3A and gives re-broadcasting facilities (*see* Chart 3).

12. *Control Unit No. 3B.*—This is a No. 3 with the addition of an extra drop lead connected in parallel to one of the switched drop leads. It is primarily intended for use with ground stations and training sets (*see* Chart 1).

13. *Control Unit No. 3B Mk. II.*—This supersedes No. 3B and gives re-broadcasting facilities (*see* Chart 3).

14. *Control Unit No. 3C.*—This is a double size unit with a 12-pt. input plug, two drop leads, one switched and one I.C., and an "A" unattended indicator lamp. A four-way terminal strip is provided

for a commander's extended drop lead. In this unit the buzzer signal is applied to the operator's phones, the operator controlling the commander's switch. It was developed for the M3 MED (American) turret, where the set and control units are in the hull and the commander's extended drop lead passes through the slip rings into the turret and terminates on a Junction Distribution No. 3. The commander uses the buzzer to signal to the operator. A second four-way terminal strip is also provided to enable connections to be made to the I.C. circuits. (For switching facilities *see* Chart 1.)

15. *Control Unit No. 3C Mk. II.*—This supersedes No. 3C and gives re-broadcast facilities (*see* Chart 3).

16. *Control Unit No. 4.*—This is a single size unit with 12-pt. input and output plugs and one switched drop lead. It is designed for A.C.Vs.

17. *Control Unit No. 5.*—This is a single size unit with a 12-pt. input plug and two drop leads, one switched, and one I.C. It is designed for A.C.Vs.

18. *Control Unit No. 6.*—This is a single size unit with 12-pt. input plug, one switched drop lead and a variable modulation control. It has provision for receiving or re-broadcasting on a No. 19 set or alternatively a No. 14 set. It is designed for A.C.Vs.

19. *Control Unit No. 7.*—This is a double size unit with a 12-pt. input plug and two switched drop leads. It is designed for A.C.Vs.

20. *Control Unit No. 8.*—This is a single size unit with a 12-pt. input plug and one standard and one 15-ft. drop lead. The phone circuit of the long drop lead is connected in parallel with the standard drop lead which is switched, the microphone circuit of the long lead being connected to I.C. This control has been designed for a special installation. (For switching facilities, *see* Chart 2).

21. *Junction Distribution No. 1.*—i. This is a single size "box" with a three-way terminal strip for output connections, one drop lead for a power microphone headgear (Mic. and Rec. Headgear No. 2) and a press-button and buzzer circuit.

ii. It is normally a driver's "box," I.C. only, and is connected to the nearest 12-volt supply and to the set by two screened leads (speech, signal) *via* the slip rings.

iii. The buzzer circuit is for calling the commander's attention when he is switched to one of the sets.

iv. The output from the power microphone transformer is fed direct to the I.C. headphone circuit. Thus a two-way conversation can be carried on with the turret crew, using one wire through the slip rings and an earth return. The driver will be heard by the turret crew who cannot reply unless the I.C. amplifier is switched

on. For this reason the I.C. headphone lead which passes through the power unit and 6-pt. connector is labelled "speech," since it serves both the microphone and the headphones.

22. *Junction Distribution No.* 2.—This is similar to Junction, Distribution No. 1, but without the press-button buzzer circuit, and is intended for a co-driver. It is connected in parallel to Junction, Distribution No. 1.

Note.—Junctions, Distribution Nos. 1 and 2 are designed for Mic. and Rec. Headgear No. 2.

23. *Junction Distribution No.* 3.—i. This is a single size "box" with two 3-way terminal strips for input connections. Two drop leads are provided (for Mic. and Rec. Headgear No. 1) and a press-button and buzzer circuit. Junction, Distribution No. 3 is used for connecting extra crew to the I.C. circuit *via* a Control Unit No. 1 Mark II or No. 1A Mark II by a 3- or 4-way screened connector. It is connected to the nearest 12-volt supply.

ii. In some cases, where the number of available slip rings permits, Junction, Distribution No. 3 is used for a driver and/or co-driver. The moving coil microphones in Headgear No. 1 give improved performance over the power microphones in Headgear No. 2 as used with Junctions Nos. 1 and 2.

24. *Junction Distribution No.* 4.—This is a Junction, Distribution No. 3 without the press-button and buzzer circuit, and up to four drop leads may be accommodated. It is not in general use.

CHAPTER II

ELECTRICIAN'S MAINTENANCE

12. General.

Regular and careful maintenance is essential for keeping the set in good working order. The maintenance described in this Chapter should be carried out by an electrician at least once a fortnight, or more often if possible; Part I of this pamphlet refers to it as "Monthly maintenance," but experience has shown that a month is too long a period. Whenever the electrician maintains the set he should fill in the maintenance chart, which is kept by the Signal Officer for each set under his control. A specimen chart is shown at the end of this chapter.

13. Aerials.

1. *Rods* ("A," "B" and spare).—Straighten. Clean ends and apply a little vaseline to them.

2. *"A" Base.*—Check and clean spring contact and insulator.

3. *"B" Base.*—Clean thread. Inspect insulator for dirt and cracks.

4. *Pigtails.*—Open "A" and "B" bases and inspect pigtails. Replace if frayed. Check connexions. THIS MUST BE DONE VERY CAREFULLY.

14. Variometer.

1. *Friction.*—Check that control knob turns easily but is not so loose as to turn with vibration (*see* Sec. **28**).

2. *Earth.*—Check contact of spring with aerial feeder plate.

3. *Grubscrew.*—Check that aerial feeder ferrule is tightly held.

4. *Cleaning.*—If internal dampness is suspected, open variometer and dry out. Clean, and see that scale is easily readable.

15. Aerial leads.

1. *Feeder* (*i.e.*, lead between variometer and "A" aerial).—Check for fraying, especially where feeder passes through turret and under cleats. Clean plugs and sockets at ends and check for burning.

Note.—In some installations the aerial is mounted on the variometer and there is no feeder.

2. *"A" set lead* (*i.e.*, lead from set to variometer).—As for feeder (*see* para. 1 above).

3. *"B" set lead.*—As for feeder (*see* para. 1 above). Lead must not be shortened.

16. Supply unit.

1. *Fuses.*—Unscrew and check that fuse wires are of correct gauge. Clean ends and screw in firmly.

2. *Commutators.*—Inspect thoroughly. Wipe with clean, soft rag, moistened with petrol if necessary. Replace brushes if too worn or badly bedded. Do NOT oil bearings except in emergency, since special lubricant is needed.

3. *Variometer screws.*—Where variometer is mounted on supply unit, check tightness of fixing screws.

4. *Cleaning.*—Clean inside thoroughly and dry out if necessary. Inspect 6-pt. sockets.

17. Set.

1. *Lubrication.*—Clean slow motion drives, rims of dials and "flick" discs (behind panel), using a rag moistened with petrol and wrapped round a sharpened stick similar to a toothpick. Apply oildag to all these or, if none is available, thick oil. Apply thin oil to all moving parts of flick mechanism. Check tightness of screws securing flick arms and dial stops. If latter are loose, fix them so that condensers are just prevented from fully opening and closing.

2. *Controls.*—Check mechanical action of all controls. Work from left to right. Most important points are:—

i. *Tuning B.*—Should have no side-play. Check tightness of grubscrew on hub. Check stops.

ii. *Quench.*—Should make 12 revolutions, stiff but smooth.

iii. *Switches.*—Check for clean action.

iv. *Het tone.*—Should turn through 360°, stiffly but smoothly. Only early models have stops.

v. *Net button.*—Should have clean action.

3. *Valves.*—Remove lids of screening cans and see that they make good contact with cans. Check that screening cans are pushed home into bases. Check that valves are firmly held in sockets; if loose, lightly squeeze contacts of sockets. Check that clips fit firmly on top caps of valves. Inspect grid leads where they pass through screening cans; if worn, replace if possible or insulate with tape.

4. *Cleaning.*—Clean interior of set, and inspect for loose or dirty connexions; dry out if necessary. Inspect carefully: aerial terminals, 6-point and 12-point connectors, lid of "B" set screening box and (Mk. I sets only) clamping band of R29A.

18. Harness.

1. *Control Units.*—Check action of switches and buzzer. Clean interior of boxes. Inspect 12-point sockets. Inspect drop cords for fraying and snatch sockets for cracks.

2. *Connectors.*—Examine for external fraying. Inspect pins in all connector plugs. Check that heads cannot rotate.

3. *Headsets.*—Inspect leads for fraying and snatch plugs for cracks. Clean out microphone, checking terminals and capsule contacts. Check action of pressel switch, adjusting contacts if necessary. Inspect connexion and anchoring of leads to headphones.

4. *Key.*—Clean. Check leads for fraying.

19. Operation.

1. *Meter.*—Switch supply unit on and check freedom of movement of meter on L.T. Switch off and set zero of meter.

2. *Set test.*—Carry out "Tests for Daily Maintenance" (*see* Part I of this pamphlet, page 26), checking operation of each control.

20. Valve tests.

1. *Purpose.*—By noting at regular intervals the performance of certain valve stages, the electrician can detect when any one of

these stages begins to become inefficient, and can thereby keep the general performance of the set at a high level

2 *Conditions for tests* —i The value of the test figures depends on their being taken under the same conditions on each occasion These conditions are —

(*a*) "A" set switched to R/T

(*b*) Four-foot rod or dummy aerial on "A" set (the same on each occasion)

(*c*) "A" set tuned to about 3500 kc/s, except where otherwise stated The set must NOT be tuned to an incoming signal

(*d*) Batteries at least three-quarters charged and battery leads of such a resistance as to give a reading of 11 volts on the set meter Electricians should use their own batteries, whose state of charge they know, and should have a stock of leads of various resistances

11 *Voltmeter* —The same voltmeter must be used on every occasion A Universal Avometer is preferable, but a Voltmeter, Pocket, No 2 or No 3 is also suitable If no high resistance voltmeter is available, the meter in the set may be disconnected and used A length of wire with a prod on it should be connected to one terminal and two lengths, in parallel each with prods, to the other These latter two lengths should have high quality series resistors in them of 6 000Ω and 200,000Ω respectively

111 *Test figures* —The tables below show readings which may be expected Those measured with the set meter are only a very rough indication

Note —Great care should be taken not to disturb the relative position of any wiring or components, as this will affect performance and calibration of set

3 *Tests with "A" set receiving*

TABLE III VALVE TEST FIGURES WITH 'A" SET RECEIVING

Circuit tested (*a*)	*Positive of Meter to* (*b*)	*Negative of Meter to* (*c*)	*Voltage* (*d*)	*Set meter*	
				Series Resistor (*e*)	*Reading on 600 scale* (*f*)
				Ohms	
V1A	Pin 8	Chassis	3	6000	450
V2A (Hexode)	Pin 8	Chassis	2½	6000	400
V2A (Triode)	Pin 6	Chassis	85	200,000	450
V1B	—	—	Normal A V C Reading		
V1C	Pin 8	Chassis	2½	6000	400
	Pin 8	Chassis	30	200,000	150

4. *Tests with "A" set sending.*

TABLE IV. VALVE TEST FIGURES WITH "A" SET SENDING

Circuit tested (*a*)	*Positive of Meter to* (*b*)	*Negative of Meter to* (*c*)	*Voltage* (*d*)	*Set Meter*	
				Series Resistor (*e*)	*Reading on 600 scale* (*f*)
				Ohms	
V2B (Hexode)	Pin 8	Chassis	2¼	6000	400
Drive	Check reading over whole frequency range. If difference is more than 1·5V (3 small divisions), check V2B, V2A and V5A.				
V2B (Triode)	Pin 6	Chassis	100	200,000	500
V5A	Pin 6	Chassis	1¼	200,000	220
V6A	Record drive readings at 2500 and 4000 kc/s.				
V4A	Record Æ readings at 2500, 4000, 5000 and 7500 kc/s.				

5. *Tests with "B" set receiving.*

TABLE V. VALVE TEST FIGURES WITH "B" SET RECEIVING

Circuit tested (*a*)	*Positive of Meter to* (*b*)	*Negative of Meter to* (*c*)	*Voltage* (*d*)	*Set Meter*	
				Series Resistor (*e*)	*Reading on 600 scale* (*f*)
				Ohms	
V1D	Pin 3	Chassis	75	200,000	380
V1E	Pin 8	Chassis	1¾	6000	300
V8A	Pin 8	Chassis	22	200,000	110

6. *Tests with "B" set sending.*—V7A.—Positive of meter to H.T.1, negative to anode. Reading should be about 60 V, or 300 on set meter with 200,000 Ω series resistance.

7. *Tests on "I–C."*

TABLE VI. VALVE TEST FIGURES ON "I–C"

Circuit tested (*a*)	*Positive of Meter to* (*b*)	*Negative of Meter to* (*c*)	*Voltage* (*d*)	*Set Meter*	
				Series Resistor (*e*)	*Reading on 600 scale* (*f*)
				Ohms	
V1F	Pin 8	Chassis	1¾	200,000	280
V8B	Pin 8	Chassis	18	200,000	18

8. *Loss of emission.*—Loss of emission is indicated by a fall in the test reading in the case of all valves except V1D and the triode portion of V2A and V2B. Loss of emission in V2A and V2B is indicated by a variation of the drive reading at various frequencies.

21. "A" set send-receive alignment.

Set a wavemeter to 7500 kc/s and tune the receiver to it, using the A.V.C. meter. Press the pressel switch and set the wavemeter to the frequency at which the set is sending. If the reading is more than 1·5 kc/s away from 7500 kc/s, the set needs to be realigned, and should be handed into R.A.O.C. workshops.

22. "A" set calibration.

Set a wavemeter to 2100 kc/s and tune the receiver to it. Record the setting of the "A" FREQUENCY Mc/s dial. Repeat this at 2500, 3000, 3500, 4000, 5000, 6000, 7000 and 7900 kc/s. In the last case, if using a Wavemeter, Class C, set it to 3950 kc/s and tune the set to the 2nd harmonic (*i.e.*, 7900 kc/s).

23. Vehicle suppression and screening.

Finally, operate the set in the vehicle, with the engine running and all electrical gear (*e.g.*, fans, power-operated turrets, etc.) switched on. If bad crackling is heard, the suppression and screening system of the engine and charging equipment are probably faulty.

24. The maintenance chart.

A specimen maintenance chart is shown opposite. The electrician, after carrying out each item of his maintenance, puts a tick (✓) in the corresponding square on the chart. If he carries out any minor repairs himself, he puts an "R" in the square and writes the details in the "remarks" column. If he finds that a major repair, which he cannot carry out, is needed, he puts an "X" in the square and hands the set in. He also notes in the remarks column the details of any work done since the set was last maintained; the chart thus gives a complete history of the set.

MAINTENANCE LOG – WIRELESS SET No 19 (See Working Instructions – Part II – Chapter II)

Vehicle No 2/Lt T45670 – Set No 24167 – –

To be completed fortnightly by SON Electrician & forwarded through SON Sig N C O to REGT SIG OFFR

B – Son 99th RAC Regt Supply Unit No 24256 Variometer No 24167

Date	Mechanical Overhaul: Aerials: Rods	Aerials: "A" Base	Aerials: "B" Base	Aerials: Pigtails	Variometer: Friction	Variometer: Earth	Variometer: Grubscrew	Variometer: Cleaning	A.E. Leads: Feeder	A.E. Leads: "A" Set	A.E. Leads: "B" Set	Supply Unit: Fuses	Supply Unit: Commutators	Supply Unit: Vario Screens	Supply Unit: Cleaning	Sets: Lubrication	Sets: Controls	Sets: Valves	Sets: Cleaning	Harness: Control Units	Harness: Connectors	Harness: Headsets	Harness: Key	Meter	Test	"A" Set Receiving: V1A + to B − to E 3500	V2A + to B − to E 3500	V2A − to 6 − to E 3500	V1B "A V C" 3500	V1C + to B − to E 3500	V3A − to B − to E 3500	"A" Set Sending: V2B + to B − to E 3500	V2B − to 6 − to E 3500	V5A + to 6 − to E 3500	V6A "Drive" MAX	V6A "Drive" MIN	V4A "AE" with 4' rod Aerial 2500	4000	5000	7500	"B" Set Sending: V7A + to HT − to Anode 5	"B" Set Receiving: V1D + to 3 − to E 5	V1E + to B − to E 5	V8A + to B − to E 5	V1F + to B − to E	V8B + to B − to E
1 Jan 42	✓	✓	✓	R	✓	✓	✓	✓	✓	✓	✓	✓	R	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	450	380	440	52	410	160	410	510	220	62	61	34	56	48	72	270	400	310	120	300	100
15 Jan 42	R	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	R	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	440	380	450	52	370	160	400	500	210	69	60	33	55	48	71	280	400	300	110	300	100

Date	Alignment: Net "A" Rec R. to 7500 on Wavemeter / Tune Wvmtr. to "A" Sender Read Wvmtr.	Calibration ("A" Set): Wavemeter Number	Set Wavemeter to Frequency: 2100	2500	3000	3500	4000	5000	6000	7000	7900	Net "A" set to Wavemeter & write down reading of "A Frequency MC/S"	Vehicle: Suppression	Charging	Remarks: Write here details of all repair work done during maintenance and also any done during the period since the last maintenance	Initials: Elec-trician Signals	Son Signal N C O	Regt Signal Officer
1 Jan 42	7500 0	90123	2080	2490	3000	3520	4000	5020	6025	7009	7900	✓	✓	Pigtail frayed, replaced. One HT2 brush worn, replaced	EJ	K.P.	EJ
15 Jan 42	7499 5	90123	2090	2490	3000	3490	3980	4985	5990	7000	7920	✓	✓	Top 4' rod cracked replaced. HT2 fuse had been replaced by solid wire	AA	K.P.	EJ

CHAPTER III
MECHANICAL REPLACEMENTS AND ADJUSTMENTS

25. General.

Normally, all mechanical replacements and adjustments within the set, the power unit and the variometer should be done by the R.A.O.C. When the operations described in this chapter are carried out by R. Signals they should be performed only by fully trained personnel.

26. Removal of HET TONE control.

1. *Mk. I sets.*—Loosen the screws holding the drive coils and remove the control.

2. *Mk. II sets.*—Remove the beat frequency oscillator assembly by undoing the two nuts which hold it to the chassis. Move the assembly aside and remove the HET TONE control. The leads to the assembly are long enough to allow this to be done.

27. Removal of meter.

Disconnect both leads and undo the clamp screws at the back of the meter.

Note.—The meter resistors are matched to the meter and must not be interfered with.

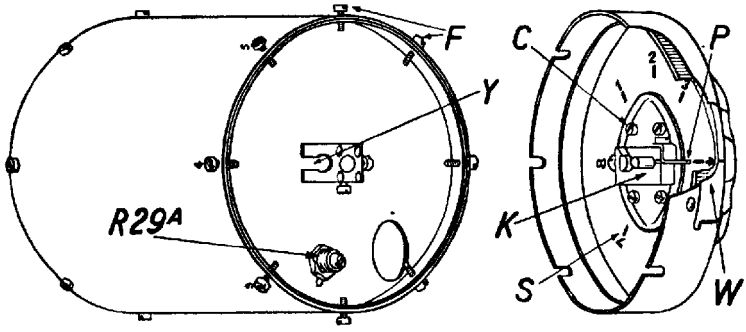
28. Variometer adjustments.

1. *Alteration of the window position.*—i. Choose a position for the window which will allow the scale to be read easily.

ii. Note the number stamped on the case over the fixing screw nearest to the chosen position.

iii. Loosen the eight screws F (*see* Fig. 1) and remove the end cover which carries the variometer knob.

Fig. 1



iv. Loosen the four screws C and turn the scale S so that the number on the scale corresponding to the number noted in ii. above comes opposite to the pointer P.

v. Tighten the four screws C until a stiff, smooth movement of the knob is obtained.

vi. Bring the pointer P opposite to the index window.

vii. Bring the coupling fork Y opposite to the number on the case corresponding to the setting of the pointer P.

viii. Replace the end cover and tighten the eight screws F.

2. *Adjustment of control knob movement.*—Remove the end cover as described in 1. above. Adjust the screws C until a stiff, smooth movement of the control knob is obtained.

3. *Adjustment of R29A* (Mk. II sets only).—R29A is the calibrating resistance for the metal rectifier used in the meter circuit. It should be adjusted only when the aerial current indicated on the meter is too high, or is too low to allow accurate tuning.

Note.—On Mk. I sets, R29A is contained in the set itself.

4. *Replacing the cork friction plates.*—i. Note the position of the window.

ii. Remove the end plate as described in 1. above.

iii. Remove the coupling K (*see* Fig. 1) by loosening the set screw.

iv. Remove the four screws C and take off the washers.

v. Smear the new washers with anti-freeze grease and replace them.

vi. When replacing the end plate, take care that the window is in its correct position.

5. *Variometer change-over contacts.*—By rotating the control knob of the variometer slowly, while listening carefully, with headset on and set on receive, check that the operation of the change-over contacts is smooth.

6. *Variometer earth return.*—If Mk. I variometers are dismantled, check that an earthing lead has been run from the transformer box to chassis. An instruction for retrospective action has been issued.

Note.—Mk. I variometers cannot be used with the Mk. II sets, but the Mk. II variometers can be used with the Mk. I sets, providing R29A on the set is short-circuited.

CHAPTER IV
THE LOCALIZATION OF FAULTS

29. Principles of fault-finding.

1. *General.*—If a fault develops in the installation, the simple tests for operator's daily maintenance, described in Part I, should be carried out; these will localize most faults. This chapter describes the action to be taken when the various symptoms are recognized. The instructions printed in ordinary type may be carried out without special apparatus and could, in an emergency, be done by the operator; those printed in *italics* can be carried out only by electricians, signals or instrument mechanics equipped with instruments for measuring voltage and resistance, and with a "test control box." The latter consists of a spare Control unit, No. 1, complete with 12-pt. connector and headset known to be in good order.

2. *Warning.*—By indiscriminate probing about in the wiring o the set, you will cause more faults than you cure. If the relative positions of wires and components are altered, the performance and calibration of the set will be upset. This is especially important in the oscillator sections of the "A" and "B" sets. For this reason operators must never remove the bottom board of the set, or the cover of the box containing V7A. Headsets are also liable to damage through unnecessary dismantling.

3. *System.*—Carry out the tests methodically and in the correct order. Correct each fault found and see that the test which led to the discovery of that fault is satisfactory before proceeding to the next test. Short cuts do not pay.

4. *External faults.*—Remember that external faults are much more common than internal ones, and if any test fails look for faults in the following order:—

i. Faults in setting of switches or knobs, *e.g.*, GAIN too low;
ii. External faults, *e.g.*, aerial, battery or headset connexions ;
iii. Internal faults.

5. *Valve circuit testing.*—i. The operator can test valves by replacing them with new ones. He must not, however, connect up or switch on the set until he has put it back into its case.

ii. An electrician, signals or instrument mechanic can test the receiver valve stages very simply, by tapping the top cap (*i.e.*, the control grid) of each valve in turn with a wet finger. A loud "plonk " in the headphones when the top cap is tapped means that all the stages between that point and the headphones are working

properly; a faint click indicates a fault. He must therefore work back through the receiver stages from the headphones to the aerial, thus testing stage by stage. The sequence for the "A" set receiver is: V3A, V1C, V1B, V2A, V1A.

iii. A fault in a valve stage does not necessarily imply a fault in the valve itself; the fault may be in one of the other components of the stage. The more likely components are mentioned in the tests in this chapter, but any component is liable to go wrong.

iv. Electricians, signals and instrument mechanics should have an ohmmeter or some instrument (home-made or otherwise) for checking components for short circuit or open circuit. Valve voltages should be checked with a high resistance voltmeter; a Universal Avo meter was used for the voltage readings of the valve analysis table (Table XVI). A condenser suspected of being open-circuited may be checked by connecting a condenser known to be good in parallel with it.

6. *Sequence of testing.*—The tables which follow show how to localize a fault. The tests should be carried out in the order shown, starting with Table VII, test No. 1. The tests are numbered to correspond with those in Table I of Part I of the Working Instructions.

TABLE VII TESTS FOR LOCALIZING FAULTS IN SUPPLY SYSTEM

Part tested (*a*)	*No* (*b*)	*Test* (*c*)	*Correct result* (*d*)	*Incorrect result* (*e*)	*Probable cause* (*f*)	*Action to be taken* (*g*)
Power supply	1	Switch OFF-ON B to OFF Switch A ONLY ALL to ALL Switch on supply unit.	Red lamp lights and machine runs steadily	1 Machine does not run and lamp does not light, or both are intermittent, with crackles in head phones	(*a*) Vehicle master switch OFF	Switch on
					(*b*) Battery flat	Run engine or replace battery
					(*c*) Battery connections faulty	Test by making temporary connexions direct from battery to 5 way block Check leads from batteries to base junction and from there to 5 way block Note effect of rotating turret Clean slip rings and check brushes in base junction if necessary
				11 Machine runs but no light from lamp or lamp is intermittent with crackles in headphones	(*a*) Bulb burnt out	Replace bulb
					(*b*) Heater battery flat (if vehicle has two separate batteries)	Run engine or replace battery
					(*c*) Battery connections faulty (if two separate batteries, connections to heater battery faulty)	Check 6 point connector from 5 way block to supply unit (lines 1 and 3) If separate battery for heaters, take action as in 1 (*c*) above
					(*d*) ON OFF switch faulty	Inspect heater pole of switch
				111 Lamp lights but machine does not run, or runs intermittently with crackles in head phones	(*a*) Machine battery flat (if vehicle has two separate batteries)	Run engine or replace battery
					(*b*) Battery connections faulty connections to machine battery faulty	Check 6 pt connector from 5 way block to supply unit (lines 4 and 6) If separate battery for machine, take action as in 1 (*c*) above
					(*c*) ON OFF switch faulty	Inspect machine pole of switch
					(*d*) Machine faulty	Clean L T commutator and brushes if necessary, replace the brushes
L T supply	2	Set METER switch to L T	Meter reads at least normal (11 to 12 volts)	Meter reads below 10 or 10 volts	(*a*) Battery flat	Run engine or replace battery
					(*b*) Connections faulty	Check 6 pt connector from supply unit to set (lines 1 and 3)
H T 1 supply	3	Set METER switch to H T 1	Meter reads about 275 volts	Meter reads zero, or intermittently with crackles in head phones, but machine runs steadily (*see* test 1, 11)	(*a*) Fuse blown	Replace fuse If new fuse blows at once look for dirt or damp between line 6 and shield of 6 pt connector from supply unit to set or of sockets *Localize by testing, first with connector removed, next with it plugged into supply unit only, then with switch to A ONLY and connector plugged in both ends, again with switch at ALL and finally, with switch at ON B If fault is localized to supply unit, C32A may have broken down, the set will work without this condenser but a bad hum will be heard Otherwise look for a short-circuit to earth in the part of set indicated*
					(*b*) Connections faulty	If fuse is intact look for fault in 6 pt connector (line 6)
					(*c*) Machine faulty	Clean H T 1 commutator and brushes if necessary replace the brushes
H T 2 supply	4	Set METER switch to H T 2	Meter reads about 500 volts	Meter reads zero, or intermittently	(*a*) Fuse blown	Replace fuse If new fuse blows at once look for dirt or damp between line 4 and shield of 6 pt connector from supply unit to set or of sockets *Localize as in test 3 but remember fault cannot be in 1–C or F set*
					(*b*) Connections faulty	If fuse is intact look for fault in 6 pt connector (line 4)
					(*c*) Machine faulty	Clean H T 2 commutator and brushes if necessary replace the brushes

TABLE VIII. TESTS FOR LOCALIZING FAULTS IN "I–C" SET

Part tested (*a*)	*No* (*b*)	*Test* (*c*)	*Correct result* (*d*)	*Incorrect result* (*e*)	*Probable cause* (*f*)	*Action to be taken* (*g*)
"I–C" system and headsets	5	Switch control unit to "I–C" Press pressel switch and speak Test all headsets	Voice should be heard clearly in all headsets	i Voice not heard, or heard only weakly	(*a*) Microphone faulty	Try another headset Change capsule, if necessary. Inspect pressel switch and adjust, if necessary Inspect microphone leads and snatch plugs Check driver's buzzer if it does not buzz, check 12 volt lead to driver's box
					(*b*) Headphones faulty	Try another headset Check leads to earpieces Short circuit each earpiece in turn, if faulty, the other one will work
					(*c*) Speech lead to driver earthing	*Check that lead does not short circuit to chassis of vehicle or set, between driver's box and set (line 2 in 6 pt connector)*
					(*d*) Control system faulty	*Try test control box* Check line 3 (microphone) and line 6 (headphones) in 12 pt connector
					(*e*) Internal fault	Check "A" set receiver (Table III) If O K, check that A ONLY ALL switch is at ALL and try replacing valves V8B, V1F, V8A and V1E in turn *Check V8B with wet finger or inject A F signal if no result, check primary and secondary of T6A for open circuit, check H T and L T voltages of V8B from Table XVI (remembering that faulty heater in V8A will put V8B out of action) check lead to pin 6 of 12 pt socket for open circuit or short circuit Check V1F with wet finger or inject A F signal if no result check H T and L T voltages from Table VI, (remembering that faulty heater in V1E will put V1F out of action), check coupling condenser C29C for open circuit or short circuit check primary and secondary of T4B for open circuit or short circuit check lead to pin 3 of 12 pt socket for open circuit or short circuit If result of testing V1F was weak, check V1F voltages from Table VI check screen condenser C4X for open circuit check decoupling condenser C31C*
				ii Voice is heard but reception is very noisy	Loose connexions	Check battery connexions and repeat (*a*) to (*d*) of 1 above
Buzzer	6	Switch commander's control unit to "A" Press button on driver's junction box	Buzz should be heard in commander's headphones when button is pressed	i No buzz heard, and no sound at junction box	(*a*) Buzzer faulty (*b*) 12 volt supply dis connected (*c*) Connexions faulty	Adjust buzzer Check 12-volt supply to box by checking driver's microphone Check button If buzzer is O K, *check signal lead from driver's box to set (line 5 in 6 pt connector) and on through 12-pt. connector (line 9) for open circuit or short-circuit*
				ii Buzz heard on "I–C" but not on "A"	Connexions faulty	*Test driver's signal and speech leads for short-circuit or reversal*
				iii Buzz heard without pressing button	Button jammed	Check operation of button

TABLE IX. TESTS FOR LOCALIZING FAULTS IN "A" SET RECEIVER (R/T)

Part tested (*a*)	*No.* (*b*)	*Test* (*c*)	*Correct result* (*d*)	*Incorrect result* (*e*)	*Probable cause* (*f*)	*Action to be taken* (*g*)
"A" set receiver.	7	Set switch on control unit to "A." Set MCW–CW–R/T switch to R/T. Set METER switch to A.V.C. Tune to any strong R/T signal, *e.g.*, civil broadcasting.	Signal heard in headphones in normal manner; meter reads normally.	i. Set "dead" and meter reads zero.	Internal fault.	Try replacing V1B and V1C.
				ii. Set "dead" but meter reads normally and dips when tuned.	(*a*) Headset connexions faulty.	*Try test control box. Check 12-pt. connectors (line 4) and control units.*
					(*b*) Internal fault.	Check sender. *If meter reading on Æ varies with speech, check coupling condenser C17A for open circuit: check GAIN control R13A for open circuit: check connexions of signal diode of V3A: check lead to pin 4 of 12-pt. connector for open circuit or short circuit (normal).* If meter reading on Æ does not vary, even with loud speech, try replacing V3A. *Check V3A with wet finger or inject A.F. signal: check V3A voltages from Table III.*
				iii. Set "dead" but meter reads normally and remains steady even when set is tuned.	Internal fault.	Try replacing V1C, V2A & V4A. *Check hexode portion of V2A with I.F. signal: check hexode portion of V2A from Table III, remembering that faulty heater in V4A will put V2A out of action: check I.F. transformers.*
				iv. Set sounds "allve" but no station is heard on either range.	(*a*) Aerial circuit faulty.	Tune sender; an unusually low setting of VARIOMETER and high one of A PA TUNING will probably be necessary. Touch aerial rod and see if Æ reading drops. If not, pigtail has probably broken and should be replaced. If there is no reading on Æ, fault is probably in variometer lead, which may be shortened slightly, if this is necessary to cure the fault.
					(*b*) Internal fault.	Try replacing V1A. *Check triode section of V2A from Table III: check C7A and C2B for open circuit or short-circuit. Check V1A with wet finger or inject R.F. signal: check V1A from Table III: check C5A for open circuit or short-circuit: check C2A, C36A, L3A and C1A for open circuit or short-circuit, if possible with R.F. signal injected at Æ terminal.*

Part tested (*a*)	*No* (*b*)	*Test* (*c*)	*Correct result* (*d*)	*Incorrect result* (*e*)	*Probable cause* (*f*)	*Action to be taken* (*g*)
				v Signals are audible but weak	Internal fault	Check as for set "dead" in III above if background noise is low, or as for set "alive" in IV above if background noise is high *Pay particular attention to high resistance windings or joints in I F transformers open circuit at C4M, C4N, C4O, C4H or C4E open circuit in R F anode coils (causes low A V C reading) open circuit or short-circuit at C4B, C1A or C2A open circuit at contacts 5 and 6 of S11A or short-circuited turns on R F coils*
				vi Signals good on one range but not on the other	Internal fault	*If 2–4 5 Mc/s is good, check L22A, L22B, L24A, L24B and corresponding poles of S11A (contacts 5 to 8) If 4 5–8 Mc/s is good, check L23A, L23B, L25A, L25B and corresponding poles of S11A*
				vii Signals unstable	Internal fault	*Check valves as in I to IV above according to symptoms paying particular attention to short-circuit in C16A open circuit in R7A or R7B open circuit at C38A (causes low A V C reading) open circuit at R42A or C4A*
				viii Signals very noisy	(*a*) Suppression faulty (*b*) Loose connexions (*c*) Internal fault (*d*) Atmospherics	Stop engine If this effects a cure, check vehicle suppression system Check aerial and aerial connexions *If loud hum, check L10A for open circuit If intermittent noise, look for faulty joint in set*
Netting whistle	8	Tune set to an incoming signal (strength 5 if possible), using NET button	Whistle heard	i No whistle	Internal fault	Try replacing V2B and V5A *Check triode section of V2B from Table IV, remembering that faulty heater in V5A will put V2A out of action* Check on C W and, if O K, check M C W –C W –R/T switch and NET button *Check L5A and C20A for open circuit and short-circuit*
				ii Weak whistle	Internal fault	Proceed as for I above *Check C21A for open circuit check grid of V2B for open circuit check C4U for open circuit or short circuit and R4D for open circuit*
				iii Unstable whistle	Internal fault	Try replacing V2B and V5A *Check screen voltage of V2B (short-circuit relay contacts)*

TABLE X. TESTS FOR LOCALIZING FAULTS IN "A" SET SENDER AND RECEIVER (C W)

Part tested (*a*)	*No* (*b*)	*Test* (*c*)	*Correct result* (*d*)	*Incorrect result* (*e*)	*Probable cause* (*f*)	*Action to be taken* (*g*)
"A" set sender	9	Set METER switch to Æ Press pressel switch and tune A PA TUNING and VARIOMETER for maximum meter reading	Meter reads in accordance with maintenance chart (*see* Sec **24**)	i Meter does not read, or reads very low, and no click is heard on pressing pressel switch No change in sound of supply unit	(*a*) Pressel switch circuit faulty (*b*) Control system faulty (*c*) Internal fault	Change headset and adjust, if necessary Inspect microphone leads and snatch plugs *Try test control box* Check line 7 in 12 pt connectors *Check relay connexions up to pin 7 on 12 pt* socket
				ii Meter does not read, or reads very low, but a click is heard on pressing pressel switch	(*a*) Aerial system faulty (*b*) Internal fault	Check receiver again *If DRIVE meter reading is normal, check H T 2 and try replacing variometer and V4A check C1A for short circuit check S8A for open circuit check V4A from Table IV, check C36A and C33A for open circuit or short circuit* *If DRIVE meter reading varies with frequency, try replacing V5A, V2A and V2B in turn Check V5A from Table IV* *If DRIVE meter reads zero, check receiver netting whistle again Try replacing V5A and V2B Check V5A from Table IV Check R42B and R15B for open circuit or short-circuit check L4A, L6A L7A and L21A for open circuit check contacts 1 to 4 of S11A Check hexode section of V2B from Table IV*
Modulation circuits	10	Speak into microphone	Æ reading should kick (On later Mk II sets, with selenium rectifiers in aerial metering circuit modulation will cause the needle to kick down instead of up)	i Meter reading steady and no sidetone in headphones	(*a*) Headset connexions faulty (*b*) Internal fault	Check "I C" and A" set receiver again *Try test control box* Check line 1 in 12 pt connectors *Check T3A for for open circuit or short circuit Check microphone connexions through S7A to pin 1 of 12 pt socket*
				ii Meter reading steady but sidetone O K	Internal fault	*Check C17B and R7G for open circuit*
Keying circuits	11a	Switch set over to CW Plug in key and press it	Meter reads in accordance with maintenance chart (*see* Sec **24**) and set stops receiving	i Set continues to receive with plug in socket	Key socket faulty	Check operation of jack springs
				ii Set stops receiving but meter reads zero	Fault in key circuit	Check key contacts key lead and plug Clean key jack if necessary *Check key connexions inside set*
	11b	Switch over to MCW with key pressed	Whistle heard in headphones	No whistle	Internal fault	*Check key connexions through S7A*
"A" set receiver on C W	12	Switch back to CW and withdraw key plug	Incoming signal should produce a whistle controllable by HEI TONE	No whistle	Internal fault	*Check again on R/T with NET button pressed Check R14A for open circuit or short circuit check connexion through S7A*

TABLE XI. TESTS FOR LOCALIZING FAULTS IN "B" SET RECEIVER

Part tested (*a*)	*No* (*b*)	*Test* (*c*)	*Correct result* (*d*)	*Incorrect result* (*e*)	*Probable cause* (*f*)	*Action to be taken* (*g*)
"B" set receiver	13a	Set OFF ON B switch to ON and control unit switch to B Turn up B GAIN.	Loud hiss in headphones	Set sounds "dead"	(*a*) Headset connexions faulty (*b*) Internal fault	Check line 5 of 12 pt connectors Check side-tone on send (*see* Table XII) If no side tone is heard Try replacing V8A and V1E *Check V8A with wet finger if O K, proceed to V1E* (see *below*), *if not, check T5A for open circuit and check connexion from T5A to pin 5 of 12 pt socket, then check V8A from Table V* *Check V1E with wet finger if no result, check C29B and C31B for short-circuit and open circuit then check V1E from Table V* If side tone is O K Try replacing V1D *Check V1D from Table V* *Check L15A and L14A for open circuit or short circuit* *Check C29A, C4V, C27A and R38A for open circuit* *Check relay contact* *Try replacing V7A VERY CAREFULLY*
	13b	Tune "B" set to an incoming signal	Signal heard clearly	i Set sounds weak	Internal fault	*As for 13A above Pay particular attention to checking of C16B, R23B and C21B for open circuits*
				ii Set is unstable (*i.e.*, howls)	Internal fault	*As for 13A above Pay particular attention to checking of R6G for open circuit*
				iii Signals are very noisy	(*a*) Loose connexions (*b*) Internal fault	Check aerial and all aerial connexions Check for faulty joints and microphonic noise due to mechanical vibration of V1D or V7A
				iv No signal heard but set sounds "alive"	Aerial disconnected	Check "B" pigtail

TABLE XII. TESTS FOR LOCALIZING FAULTS ON "B" SET SENDER

Part tested (*a*)	*No.* (*b*)	*Test* (*c*)	*Correct result* (*d*)	*Incorrect result* (*e*)	*Probable cause* (*f*)	*Action to be taken* (*g*)
"B" set sender.	14	Switch on "B" set. Press pressel switch and speak into microphone.	Hiss is no longer heard in headphones. Sidetone is heard. Signals from set can be heard in another set near-by.	i. Hiss is still heard in phones. No side-tone is heard.	(*a*) Pressel switch circuit faulty. (*b*) Control system faulty. (*c*) Internal fault.	Inspect microphone and adjust if necessary. Inspect microphone leads and snatch plugs. If this fails to cure fault, replace headset. *Try test control box.* Check line 8 in 12-pt. leads. *Check relay connexions up to pin 8 of 12-pt. socket.*
				ii. Hiss no longer heard, but no side-tone heard.	(*a*) Headset connexions faulty. (*b*) Internal fault.	*Try test control box.* Check line 2 in 12-pt. connectors. *Check T4A for open circuit.* Check lead from pin 2 of 12-pt. socket. *Check relay contacts.*
				iii. Side-tone is heard but signals not received by set near-by.	Internal fault.	*Check sender secondary of T5A for open circuit. Check relay contacts.*

TABLE XIII TESTS FOR LOCALIZING MISCELLANEOUS FAULTS

Part tested (*a*)	*No.* (*b*)	*Test* (*c*)	*Correct result* (*d*)	*Incorrect result* (*e*)	*Probable cause* (*f*)	*Action to be taken* (*g*)
"A" unattended warning lamp.	15	Switch on all sets. Switch both control units to B.	Lamp on operator's control box lights.	Lamp does not light.	(*a*) Bulb burnt out. (*b*) Fuse blown. (*c*) Connexions faulty.	Replace bulb. Replace fuse in commander's control unit. Check line 10 in 12-pt. connectors.
"A" and "B" sets as background to "I-C."	16	Switch on all sets and switch both control units to "I-C." Tune "A" and "B" sets to incoming signals and turn up GAINS.	"A" and "B" sets are heard as a background in headphones.	i. "A" set is not heard.	Faulty connexions.	Check line 11 of 12-pt. connector between control units. (Not applicable to sets fitted with Control units, No. 3).
				ii. "B" set is not heard.	Faulty connexions.	Check line 12 of 12-pt. connector between control units. (Not applicable to sets fitted with Control units, No. 3).
Retransmission (only on sets fitted with Mk. II control units).	17	Switch in turn to: A → B B → A A and B	Signals are retransmitted in each case.	Retransmission fails.	Faulty switches or resistors in control unit.	First check normal operation of sets again. Then check switches and resistors in control unit.

CHAPTER V
PERFORMANCE AND ADJUSTMENTS

Note.—The adjustments and measurements dealt with in this chapter should not be made except by those suitably qualified and in possession of the necessary facilities and test equipment.

30. The "A" set receiver.

1. *Sensitivity of I.F. amplifier.*—The I.F. sensitivity should be measured as follows:—

i. Connect the output of a signal generator between the frequency changer grid and the chassis with a 100$\mu\mu$F condenser in series with the grid connexion. Connect a 0·5 megohm resistance as a leak between the grid and the chassis. The frequency of the signal generator should be adjusted to 465 kc/s, with the output modulated 30% at 400 c/s.

ii. The output should be measured at the telephone connexions in the commander's telephone jack by means of an A.C. voltmeter (*e.g.* an Avominor) shunted by a 100 ohm resistance.

iii. The frequency of the signal generator is adjusted for maximum output on the voltmeter, after which the attenuator is adjusted to reduce the reading to 2·25 volts. This corresponds to an output of 50 milliwatts in a 100 ohm load.

iv. Read the value of the input from the signal generator and the frequency at which the signal generator is set.

v. If, *either* (*a*) the input is greater than 120μV

or (*b*) the frequency is outside the limits 462·5–467·5 kc/s

the I.F. amplifier needs adjustment, or valves need replacement. The method of adjusting it is described below.

2. *Adjustment of I.F. amplifier.*—i. With the apparatus connected as in para. 1, set the signal generator to *exactly* 465 kc/s.

ii. Adjust each of the six I.F. trimmers in turn for a maximum reading on the voltmeter, starting with the secondary of the third I.F. transformer and working back to the primary of the first I.F. transformer.

iii. The signal generator must remain set at 465 kc/s during this adjustment. The input should be adjusted, by means of the attenuator, so that it just gives a convenient reading on the voltmeter, with the latter switched to its lowest range. The input should be reduced as the adjustment proceeds.

iv. The I.F. amplifier is of the single peak type.

3. *Beat frequency oscillator.*—i. With the system switch set to R/T and the apparatus connected as for I.F. alignment, adjust the frequency of the signal generator carefully for maximum receiver output. Input must not be great enough to work A.V.C.

ii. Switch off the signal generator modulation and press the NET button. Adjust L5A, if necessary, for zero beat.

iii. Switch to C.W. and vary the heterodyne beat control throughout its range. The note heard should vary approximately from 600 to 2000 c.p.s.

4. *Calibration.*—i. This should normally be correct within ± 25 kc/s. If correction is necessary, adjustment of the local oscillator is made as described below.

ii. *Mark I sets.*—(*a*) Switch to R/T. Set a wavemeter to 6 Mc/s and set the FREQUENCY MC/S dial to 6 Mc/s.

Connect a signal generator between the grid of V1A and earth. Tune the signal generator to zero beat with the wavemeter and adjust the modulation to 30% at 400 c.p.s. Switch off the wavemeter and adjust the L.O. trimmer, C35A, for maximum output as measured by an output meter connected as for I.F. alignment or, using an unmodulated input, switch the meter to A.V.C. and adjust C35A for maximum dip in the meter. Alternatively, if no signal generator is available, use the wavemeter only and adjust C35A to give zero beat in the headphones with the NET button pressed.

(*b*) Tune to 2·5 Mc/s and adjust C11A using the same procedure as in (*a*).

(*c*) Check the calibration at 3, 4, 5 and 6 Mc/s and, if necessary, readjust C35A and C11A for the best compromise.

iii. *Mark II sets.*—(*a*) Switch to 4·5–8 Mc/s range and using the same procedure as for Mark I sets, adjust C35A at 8 Mc/s.

(*b*) Switch to 2–4·5 Mc/s range and adjust C35B at 4·5 Mc/s and C11A at 2·5 Mc/s.

There is no adjustment at 4·5 Mc/s on the 4·5–8 Mc/s range.

Note.—Care should be taken when adjusting C35A or C35B to ensure that the local oscillator is adjusted to signal frequency *plus* I.F. It may be possible to obtain a spurious result at signal frequency *minus* I.F. If two maxima are found, the correct one is that in which the trimmer is further anti-clockwise, *i.e.* of lesser capacity.

5. *R.F. amplifier trimming.*—i. *Mk. I sets.*—Inject a 6 Mc/s signal between the grid of V1A and the chassis. Tune the signal

generator carefully for maximum output and adjust C10A for maximum output. The frequency for maximum output should coincide with zero beat when the NET button is pressed, with the set switched to R/T. If the B.F.O. has already been adjusted, either method may be used for obtaining the correct signal generator frequency.

ii. *Mk. II sets.*—(*a*) Switch to the 4·5–8 Mc/s range. Inject a signal of 8·0 Mc/s and adjust C10A for maximum output, as in i. above.

(*b*) Switch to the 2–4·5 Mc/s range. Inject a signal of 4·5 Mc/s and adjust C10D for maximum output as in i. above.

6. *R.F. sensitivity.*—The method of testing the R.F. sensitivity is the same as that described in para. 1 for the I.F. sensitivity. Table XIV below gives the sensitivity which should be expected.

TABLE XIV. R.F. SENSITIVITY FOR 50mW OUTPUT INTO 100Ω LOAD

	Average injected signal at			
Frequency (*a*)	*Control grid of V2A hexode* (*b*)	*Control grid of V1A* (*c*)	*Æ. socket on panel* (*d*)	*Æ. Tag on Variometer (through 15μμF dummy aerial)* (*e*)
Mc/s.	μV	μV	μV	μV
8·0	50	4·5	<1	<1
6·0	65	5·5	<1	<1
5·0	80	6·7	<1	<1
4·5	50	3·5	<1	<1
3·0	50	4·0	<1	<1
2·4	—	—	<1	
2·0	70	7·0	<1	Variometer and P.A. circuits cannot be tuned.

31. The "A" set sender.

1. *Adjustment of drive.*—i. The drive voltage may vary on individual sets between 4 and 7 volts on the 15V scale. This reading should remain steady as the frequency is varied. Should the variation exceed 3 small divisions (1·5V), V2A and/or V2B should be replaced. If no improvement, the drive should be adjusted as explained below.

ii. *Mk. I sets.*—Tune the set to 6 Mc/s. Adjust the trimmers C10B and C10C to give a maximum drive voltage. Check the variation of the drive voltage throughout the frequency range and, if the variation is excessive, readjust the trimmers.

iii. *Mk. II sets.*—(*a*) Switch to the 4·5–8 Mc/s range and tune the set to 8 Mc/s. Adjust the trimmers C10B and C10C for a maximum drive voltage, as in ii. above.

(*b*) Switch to the 2–4·5 Mc/s range and tune the set to 4 Mc/s. Adjust the trimmers C10E and C10F for a maximum drive voltage as in ii. above.

(*c*) Check the variation of drive voltage throughout the frequency range, as in ii. above, and readjust the trimmers if necessary.

Note.—Care should be taken to ensure that the circuits are adjusted to the signal frequency and not to the local oscillator frequency, at which a spurious maximum will be obtained. Wrong adjustment will be indicated by a falling off of the drive reading over the remainder of the range.

2. *Aerial current.*—Table XV, below, gives the aerial current which may be expected under various conditions.

TABLE XV. AERIAL CURRENT WITH 15μμF DUMMY AERIAL

Frequency (*a*)	*R/T (Zero mod.)* (*b*)	*R/T (100% mod.)* (*c*)	*M.C.W.* (*d*)	*C.W.* (*e*)
Mc/s.	mA	mA	mA	mA
8	170	210	245	400
7	220	245	300	440
6	227	250	310	454
5	212	237	290	420
4·5	140	176	210	316
3	135	170	205	300
				262

32. The "B" set.

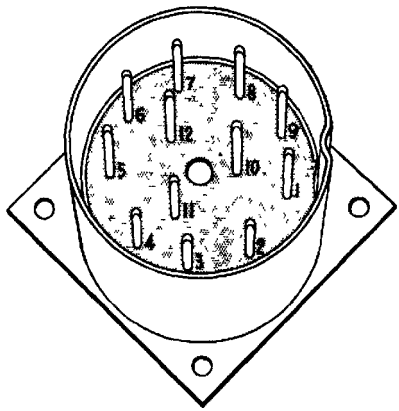
The only adjustment that can be made to the "B" set is to alter the inductance of L11A, by opening and closing the turns, to correct calibration. This can only be done by workshops in possession of a calibrated wavemeter.

APPENDIX I

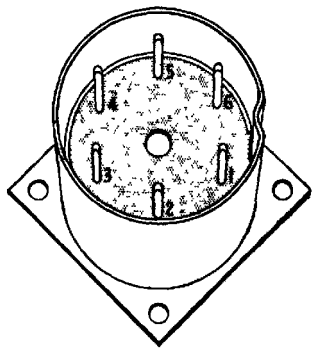
NUMBER AND COLOUR CODING OF CONTROL HARNESS

Lead function (*a*)	*Lead colour* (*b*)	*Sleeve colour* (*c*)	*Wire number*		
			12-*pt. connector* (*d*)	*Power input* 6-*pt. connector* (*e*)	*Unit-Set* 6-*pt. connector* (*f*)
Microphone "A"	White	Mauve	1	–	–
„ "B"	„	Grey	2	–	–
„ I–C	„	Orange	3	–	–
Headphones "A" ..	Green	Mauve	4	–	–
„ "B" ..	„	Grey	5	–	–
„ "I–C" ..	„	Orange	6	2	2
Relay "A"	Blue	Mauve	7	–	–
„ "B"	„	Grey	8	–	–
Driver's signal	Green	White	9	5	5
Lamp "A" unattended ..	Brown	Brown	10	–	–
Headphone stand by, "A"	Green	Red	11	–	–
Headphone stand by, "B"	„	Brown	12	–	–
Heaters 12v–	Black	Black	–	1	1
„ 12v+	Red	Red	–	3	3
Rotary Transformer 12v+	„	„	–	4	–
„ „ 12v–	Black	Black	–	6	–
275v+	Red	Yellow	–	–	6
500v+	„	Green	–	–	4

12 pt. plug



6 pt. plug



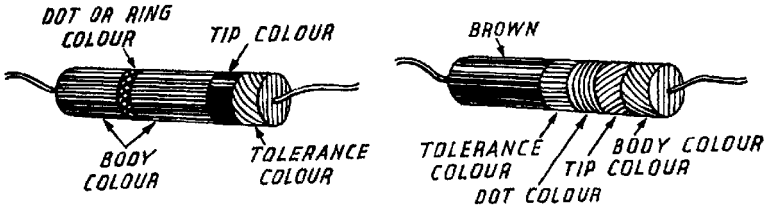
Connections as shown in above table

APPENDIX II

AMERICAN AND ENGLISH RESISTOR COLOUR CODING

Colour (*a*)	*Body* (*b*)	*Tip* (*c*)	*Dot* (*d*)
Black ..	0	0	None
Brown ..	1	1	0
Red	2	2	00
Orange	3	3	000
Yellow ..	4	4	0,000
Green ..	5	5	00,000
Blue ..	6	6	000,000
Mauve ..	7	7	
Grey ..	8	8	
White ..	9	9	

EXAMPLE :—



ENGLISH CODING AMERICAN CODING

% Tolerance colour coding

Colour	*% Tolerance*
Gold	5
(No extra colour) Body colour	10
Silver	20

APPENDIX III

LIST OF MODIFICATIONS TO MARK I SETS

1. R43A, 82,000 Ω resistance deleted and 100,000 Ω variable resistance introduced.

   Reason. Permits delay volts on V6A to be adjusted to exactly 50 volts. (Introduced at set No. 251 approx.)

2. L2C R.F. choke 17·3 Ω removed from tank coil mounting bracket and mounted on four-gang condenser. *N.B.*—A.V.C. lead must be removed also.

   Reason. To cure R.F. instability. (Introduced at set No. 401 but many earlier sets have this modification.)

3. C33B, T.C.C. mica condenser ·004μF 2000V. replaced by 0·1μF Hunts 1500V.

   Reason. Increased capacity for decoupling purposes, also enables P.A. circuit to tune to 2·5 Mc/s. (Introduced at set No. 151 approx.)

4. C36A, T.C.C. mica condenser ·004μF removed from its mounting on tank coil bracket and replaced by ·004μF Lemco.

   Reason. Reduction of capacity thrown across L3A with a view to improving calibration alignment of P.A. tuning dial with respect to frequency dial. (Introduced at set No. 151 approx.)

5. Cathode of V6A, No. 8 pin, disconnected from earth and connected to cathode of V4A. This wiring change puts bias on diode and renders it inoperative in "receive" condition.

   Reason. To cure overall instability which manifested itself by a L.F. howl or grunting noise, also general instability when frequency dial was mis-tuned slightly. (Introduced at set No. 601 approx.)

6. Wiring modified so that keying takes place in H.T. feed to V2B and V5A anodes and screens and to R18A in addition to screen of V4A. This shuts down drive when morse key is raised. (Originally only the screen of V4A was keyed.)

   Reason. To ensure "clean" keying and improve C.W. operation generally at short range. (Introduced at set No. 401 approx.)

7. R44A increased to 39,000 Ω from 22,000 Ω, and R19B increased to 82,000 Ω from 47,000 Ω.

   Reason. To prevent screens of 6K7Gs being over-run in any condition. (Introduced at set No. 1000 approx.)

8. R15A deleted and R16A reduced from 4 Ω to ·5 Ω.

   Reason. To reduce minimum hetrodyne note to 600 c/s approx. (Introduced at set No. 401 approx.)

9. R10A, 470 Ω becomes R9E, 1000 Ω.

   Reason. This supplies bias to 6B8G, and increase of resistance increases undistorted output which was liable to be barely sufficient. (Introduced at set No. 1451 approx.)

10. 3300 Ω resistance fitted in variometer in circuit of T1A. This resistance is wired in path of D.C. only, *i.e.*, inserted at junction of L2A and C24A in series with L2A but not in series with lead connected to concentric plug on variometer. *N.B.*—In some cases the value of resistance quoted above has been varied to suit changing conditions.

    Reason. To accommodate varying efficiency of Westector W1A, the resistance being necessary in some cases to restrict excessive feedback current which causes full scale deflection on panel meter. (Introduced at set No. 1500 approx. but in some cases the sets have not been so modified.)

11. 22,000 Ω resistance connected from screen of V2B to earth. Designation becomes R4D.

    Reason. To reduce volts on screen of V2B and V2A to accommodate Raytheon 6K8Gs. Brimar 6K8Gs appear to work well with a wide latitude of screen volts, but Raytheons sometimes lose their efficiency with a screen voltage of 150 approx. (Introduced from set No. 2,100 approx.)

12. 22,000 Ω resistance fitted from screen of V2A to earth. Designation becomes R4A.

    Reason. Same reason as for modification No. 11. (Introduced at set No. 2100 approx.)

13. V7A—Grid leak R1G 470,000 Ω changed to 270,000 Ω and becomes R18C.

    Reason. Ensures better detector action. (Introduced at set No. 151 approx.)

14. R8C, one megohm screen feed resistance to V1E, and R8E screen feed resistance to V1F changed to 470,000 Ω. R8C becomes R1A and R8E becomes R1F.

    Reason. Introduced as a precautionary measure against overloading (*e.g.*, by stray U.H.F.). (Introduced at set No. 476 approx.)

15. Braid pigtail on screened lead to grid of V1F to be earthed to shakeproof tag on V1F valveholder instead of to three-way tag plate near T4B. Also grid lead of V1F to microphone transformer T4B was screened and position altered so as to lie over top of three-way tag plate already mentioned.

    Reason. To remove U.H.F. interference on inter-communication which occurred on a few sets. (Introduced at set No. 476 approx.)

16. Quench frequency altered from 250–350 kc/s to new coverage of from 160–220 kc/s. C15F, 500$\mu\mu$F $\pm$ 20% moulded mica becomes C37A, 500$\mu\mu$F $\pm$ 2% Lemco.

Reason. To accommodate the changing characteristics of the VR135 oscillator-detector. (Introduced at set No. 601 approx.)

17. Heater shunt resistance R38A value 39 Ω across valve V7A changed to 55 Ω.

Reason. V7A heater is in series with V1D and must have between six and seven volts, otherwise cathode becomes stripped. *N.B.*—All sets have this modification.

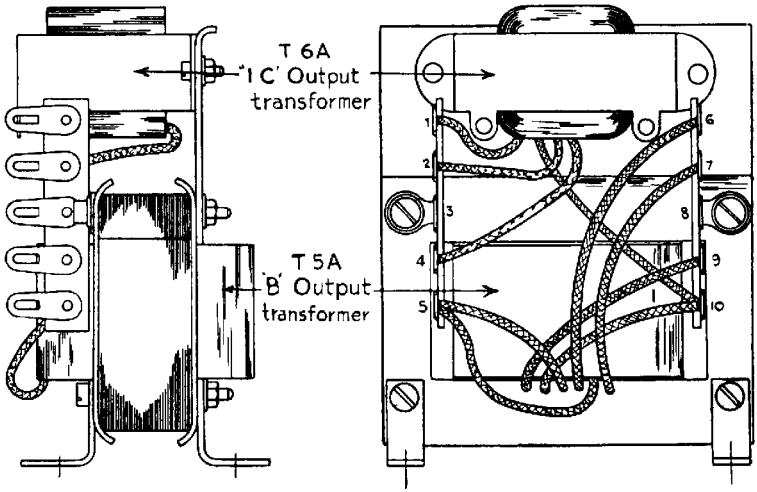
18. R33A, 10,000 Ω changed to 27,000 Ω; R5F, 2200 Ω changed to 1000 Ω and becomes R9D. R34A, formerly connected to H.T.+ through relay, is now connected to junction of R33A and R11B.

Reason. The lower quench frequency now in use reduces the detector audio output (equivalent to reducing A.V.C. delay voltage on ordinary set).
These resistance changes increase A.F. gain of receiver, thus restoring maximum output to required level.
R34A connection changed to prevent quench valve failing to start oscillating on switching. (Introduced at set No. 601 approx.)

19. L13A cathode choke in circuit of U.H.F. oscillator-detector reduced from 18 turns to 14 turns.

Reason. To cure dead spots in tuning when operating receiver, which occurred in some sets when in use with feeder and aerial connected. The dead spots manifested themselves by the absence of quench mush or noise at the tuning point in question. (Introduced at set No. 2000 approx.)

FIG. 5 "B" SET AND "IC" OUTPUT TRANSFORMER CONNECTIONS



Primary of "I C" O P Trans	2	Finish	Green	V8B anode
	4	Start	Blue or mauve	V8B screen
Secondary of "I C" O P Trans	1	Finish	Orange	Pin 6, 12pt plug
	10	Start	Black	Earth
"B" O P Transformer	9	Finish Sec 2	Black	Pin 5 12pt plug
	10	Start	Black	Earth
	5	Finish Sec 1	Red	H T
	6	Start	Yellow	"B" modulation (relay)
	5	Finish Pri	Red	H T
	7	Start Pri	Red	V8A anode

ERRATA FIG. 6

Diag H T + 275 to valves

H T to V1A, V1B, V1C screens switched off on Send. Anodes receive H T continuously

H T to V2B triode only on Receive.

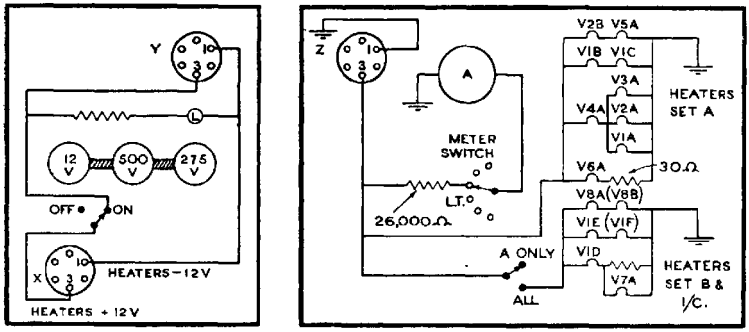
H T to V1D Screen switched off on Send. Anode switched to H.T.

Diag + 275 to valves and diag. + 500 to valves

1 Ω in meter switch circuit should read 1 2 MΩ

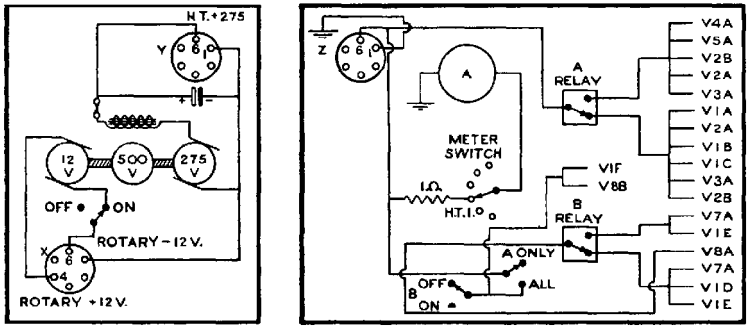
FIG. 6. VALVE HEATERS AND H.T. SCHEMATIC

L.T. TO VALVE HEATERS



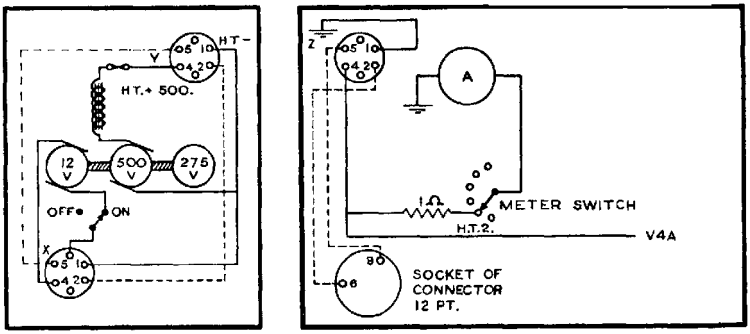
NOTE: I/C Valve Heaters shown in brackets thus (V8B).

H.T. + 275 TO VALVES



NOTE: (1) Relays shown in Rec. position.
(2) Valves V2A, V2B and V3A in Set A and V7A and V1E in Set B duplicated for clarity.

H.T. + 500 TO VALVES



NOTE: (1) H.T. + 500 continuously applied to Anode of V4A. Valve not operative, however, until A switched to Send and H.T. from H.T. + 275 line applied to screen.
(2) Sp. line from Power Mics. . . . taken direct to No. 6 Pin on Connector 12 pt. and thence to Comd. Phones when switched to I/C on Control Unit.
(3) Signal line from Dr.'s buzzer . . . taken direct to Pin No. 9 on Connector 12 pt. and thence to Comd. Phones irrespective of position of Selector Sw. on Control Unit.

FIG. 7. R./T. C.W. M.C.W. SWITCH DIAGRAM

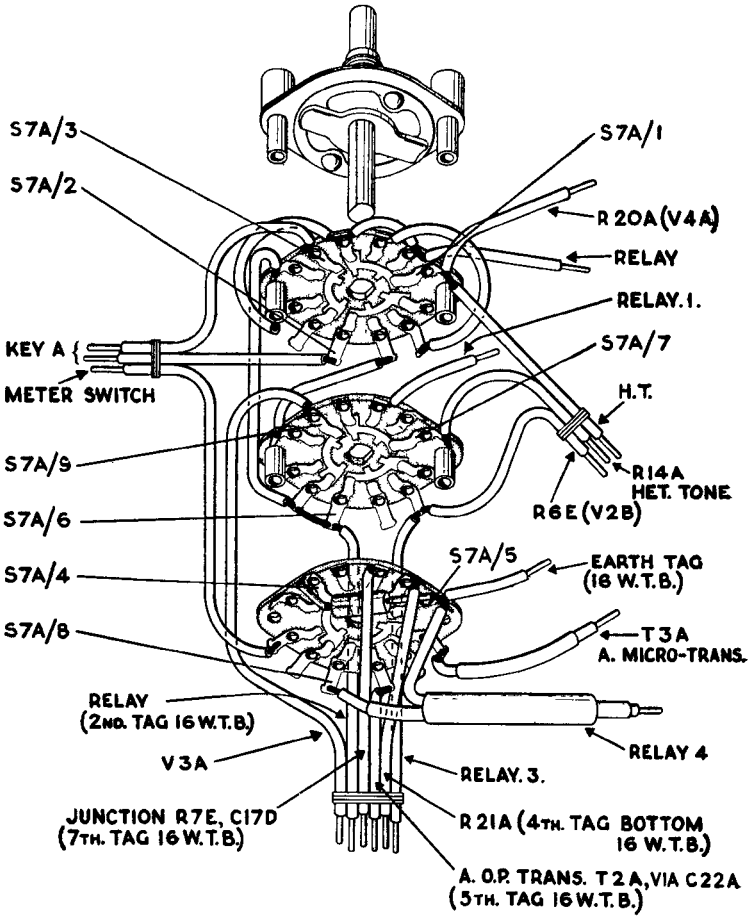


FIG. 8. R.F. COILS AND SWITCHING DIAGRAM

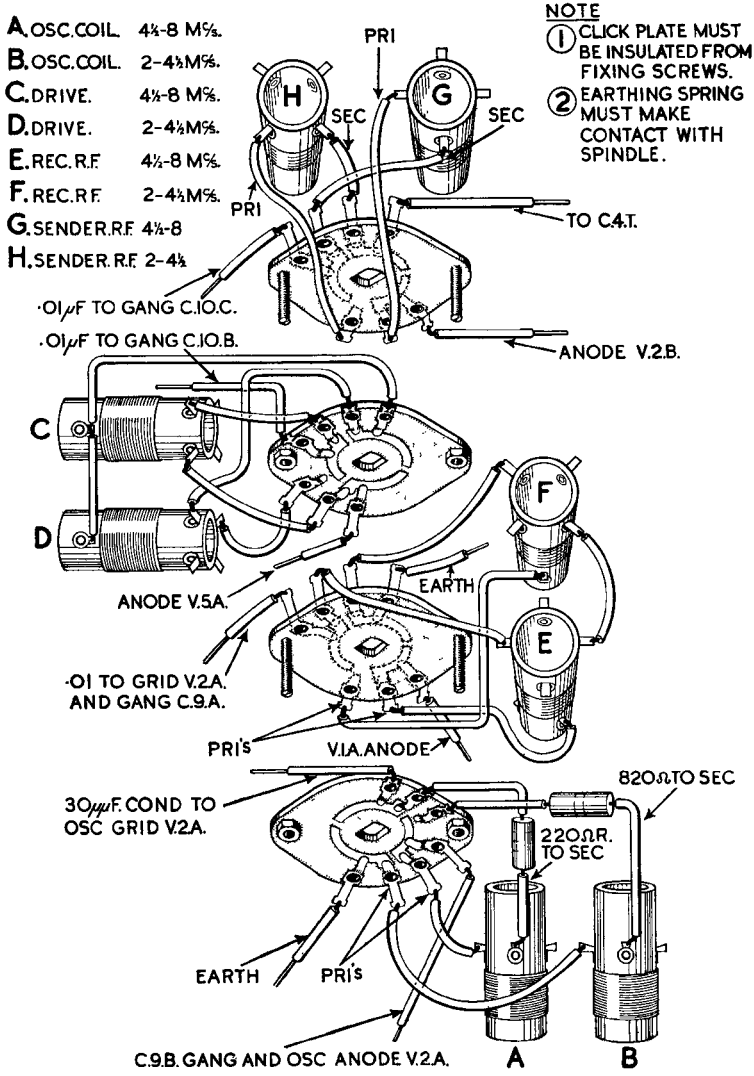


FIG. 9. "A" SET AND "B" SET RELAYS

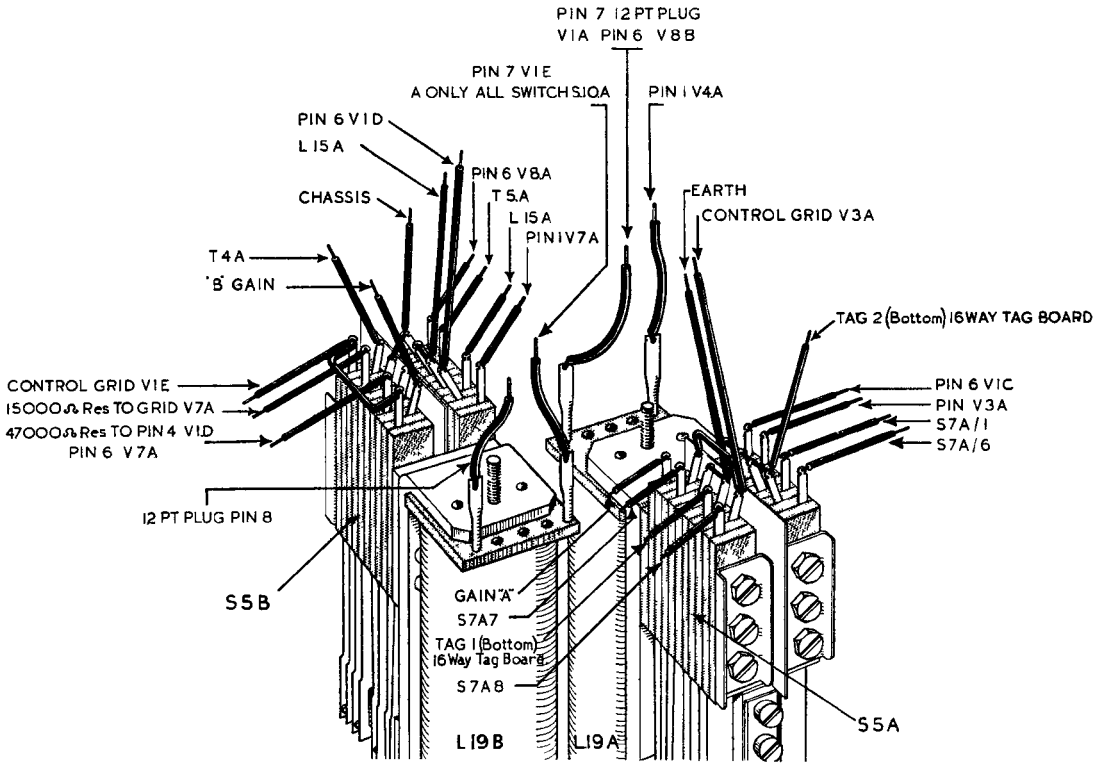


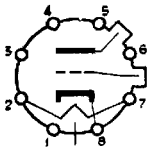
TABLE XVI—VOLTAGE AND CURRENT ANALYSIS AND POINT TO POINT CHECK

Wireless Set No. 19 Mark II

V1A 6K7G						V2A 6K8G					V1B 6K7G					V1C 6K7G					
				Resistance					Resistance					Resistance					Resistance		
Pin		Volts	MA	To	Ohms		Volts	MA	To	Ohms		Volts	MA	To	Ohms		Volts	MA	To	Ohms	Pin
1	—	—	—	CH.	38,000	—	—	—	—	—	—	—	—	CH. H.T.+	130,000 175,000	—	—	—	—	—	1
2	H	5·9	290	CH. L.T.+	1·2 1·2	H	5·8	290	CH. L.T.+	1·2 1·2	H	6	293	CH. L.T.+	3 3	H	11·6	290	CH. L.T.+	1 3 S.C.	2
3	A	240	10	H.T.+	2,200	A	256	1·4	CH. H.T.+	46,000 2,200	A	260	4·8	CH. H.T.+	44,000 17	A	248	7·9	CH. H.T.+	46,000 2,200	3
4	GS	130	2·3	H.T.+	39,000	GS	81	3·8	CH. H.T.+	22,000 22,000	GS	130	1·1	H.T.+	39,000	GS	87	1·8	CH. H.T.+	126,000 82,000	4
5	SU	—	—	CH.	S.C.	Go	—	—	CH. H.T.+	47,000 90,000	SU	—	—	CH.	S.C.	SU	—	—	CH.	S.C.	5
6	—	—	—	CH. H.T.+	41,000 83,000	Ao	88·5	3·9	CH. H.T.+	9,000 47,000	—	—	—	CH. H.T.+	110,000 150,000	—	—	—	—	—	6
7	H	—	—	CH.	S.C.	H	—	—	CH.	S.C.	H	—	—	CH.	S.C.	H	5·8	290	CH. L.T.+	3 3	7
8	K	2·8	12·3	CH.	220	K	2·4	9·0	CH.	270	K	5·9	5·9	CH.	1,000	K	2·4	9·7	CH.	270	8
9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	9
T.C.	G	—	—	A.V.C.	28	G	—	—	—	—	G	—	—	A.V.C.	—	G	—	—	A.V.C.	—	T.C.

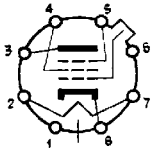
For Notes see page 56.

V7A — CV6



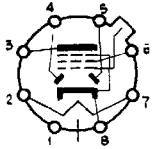
Pin		Volts	MA	Resistance To	Resistance Ohms Rec'r	Resistance Ohms Send
1	—	—	—	CH.	37,000	O.C.
				H.T.+	S.C.	O.C.
2	H	6	200	CH.	1·2	1·2
				L.T.+	1·2	1·2
3	—	—	—	—	—	—
4	—	—	—	—	—	—
5	—	—	—	CH.	65,000	35,000
				H.T.+	30,000	35,000
6	—	—	—	CH.	24,000	50,000
				H.T.+	3,800	200,000
7	H	—	—	CH.	S.C.	S.C.
8	K	—	R 1·8 / S 16·6	CH.	S.C.	S.C.
T.C.1	G	—	—	CH.	285,000	15,000
T.C.2	A	210	16·6	CH.	76,000	47,000
				H.T.+	32,500	3,000

V1D — 6K7G



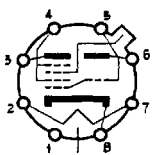
	Volts	MA	Resistance To	Resistance Ohms Rec'r	Resistance Ohms Send	Pin
—	—	—	CH.	50,000	50,000	1
			H.T.+	100,000	100,000	
H	11·6	290	CH.	1·2	1·2	2
			L.T.+	S.C.	S.C.	
A	75	4·5	CH.	74,000	44,000	3
			H.T.+	30,300	800	
GS	108	2·4	CH.	85,000	O.C.	4
			H.T.+	47,000	O.C.	
SU	—	—	CH.	S.C.	S.C.	5
—	—	—	—	—	—	6
H	5·8	290	CH.	3	3	7
K	—	6·9	CH.	S.C.	S.C.	8
G	—	—	CH.	47,000	47,000	T.C.1
—	—	—	—	—	—	T.C.2

V3A — 6B8G



	Volts	MA	Resistance To	Resistance Ohms	Pin
—	—	—	CH.	35,000	1
			H.T.+	S.C.	
H	5·8	290	CH.	1·3	2
			L.T.+	1·3	
A	263	5·5	CH.	35,000	3
			H.T.+	900	
D1	—	—	CH.	250,000	4
			H.T.+	380,000	
D2	—	—	CH.	1 m.	5
			H.T.+	1 m.	
GS	150	1·4	CH.	100,000	6
			H.T.+	68,000	
H	—	—	CH.	S.C.	7
K	30	6·9	CH.	4,300	8
			CH.	3,300	
G	—	—	Volume control at minimum		T.C.1
—	—	—	—	—	T.C.2

V2B — 6K8G



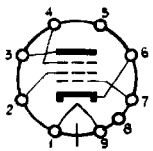
	Volts	MA	Resistance To	Resistance Ohms	Pin
—	—	—	—	—	1
H	6	293	CH.	2	2
			L.T.+	2	
A	260	1·8	CH.	46,000	3
			H.T.+	2,200	
GS	82	4·3	CH.	22,000	4
			H.T.+	22,000	
Go	—	—	CH.	47,000	5
			H.T.+	90,000	
Ao	101	3·8	CH.	90,000	6
			H.T.+	47,000	
H	—	—	CH.	S.C.	7
K	2·3	9·9	CH.	220	8
G	—	—	CH.	100,000	T.C.1
—	—	—	—	—	T.C.2

For Notes see page 56.

V1E 6K7G						V8A 6V6G					V1F 6K7G					V8B 6V6G					
				Resistance					Resistance					Resistance					Resistance		
Pin		Volts	MA	To	Ohms		Volts	MA	To	Ohms		Volts	MA	To	Ohms		Volts	MA	To	Ohms	Pin
1	—	—	—	CH.	55,000	—	—	—	CH.	S.C.	—	—	—	CH.	60,000	—	—	—	—	—	1
				H.T.+	22,000									H.T.+	22,000						
2	H	6	293	CH.	2	H	6	435	CH.	2	H	—	—	CH.	S.C.	H	—	—	CH.	S.C.	2
				L.T.+	2				L.T.+	2											
3	A	50	1·5	CH.	160,000	A S	253	33·2	CH.	44,000	A	60	1·5	CH.	160,000	A	262	12·7	CH.	44,000	3
				H.T.+	122,000	R	265	14·5	H.T.+	170				H.T.+	122,000				H.T.+	360	
4	GS	37	0·44	CH.	470,000	Gs S	260	2·1	CH.	44,000	GS	39	·5	CH.	510,000	GS	265	11·2	CH.	44,000	4
				H.T.+	470,000	R	265	·71	H.T.+	S.C.				H.T.+	470,000				H.T.+	S.C.	
5	SU	—	—	CH.	S.C.	G	—	—	CH.	1,000,000	SU	—	—	CH.	S.C.	G	—	—	CH.	1,000,000	5
6	—	—	—	CH.	30,000	—	—	—	CH. R	1,000	—	—	—	CH.	38,000	—	—	—	CH.	100	6
				H.T.+	S.C.				S	S.C.				H.T.+	S.C.				L.T.+	100	
7	H	—	—	CH.	S.C.	H	12	435	CH.	1	H	5·9	290	CH.	2·1	H	6	430	CH.	1·3	7
									L.T.+	S.C.				L.T.+	2·1				L.T.+	1·3	
8	K	1·8	2	CH.	1,000	K S	14·6	35·3	CH. S	390	K	1·7	2	CH.	1,000	K	18·2	23·9	CH.	820	8
						R	21·6	15·2	R	1,390											
T.C.	G	—	—	CH.	22,000	—	—	—	—	—	G	—	—	CH.	23,000	—	—	—	—	—	T.C.

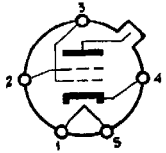
For Notes see page 56.

V5A — ARP35(EF50)



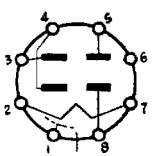
Pin		Volts	MA	Resistance To	Resistance Ohms
1	H	12	294	CH. / L.T.+	1 / S.C.
2	GS	249	3·2	CH. / H.T.+	47,900 / 3,900
3	A	242	10·2	CH. / H.T.+	46,000 / 2,200
4	SU	—	—	CH.	S.C.
5	SC	—	—	CH.	S.C.
6	K	1·3	13	CH.	100
7	G	—	—	Pin 6 V6A	470,000
8	SC	—	—	CH.	S.C.
9	H	6	294	CH.	2·5
T.C.	—	—	—	—	—

V4A — 807



Pin		Volts	MA	Resistance To	Resistance Ohms
1	H	12	895	CH. / L.T.+	1·2 / S.C.
2	GS	261	1·3	CH. / H.T.+	44,000 / 100
3	G	—	—	CH.	300,000
4	K	—	26·9	CH.	S.C.
5	H	5·9	895	CH. / L.T.+	1·2 / 1·2
1	—	—	—	—	—
7	—	—	—	—	—
8	—	—	—	—	—
T.C.1	A	450	25·6	H.T.+	47
T.C.2	—	—	—	—	—

V6A — EB34



Pin		Volts	MA	Resistance To	Resistance Ohms
1	—	—	—	CH.	S.C.
2	H	12	—	CH. / L.T.+	3 / S.C.
3	D1	—	—	CH.	470,000
4	K1	40	—	CH. / H.T.+	0–100,000 / 270,000
5	D2	Drive	—	CH.	100,000
6	—	—	—	—	—
7	H	6	—	CH. / L.T.+	7 / 7
8	K2	—	—	CH.	S.C.
T.C.	—	—	—	—	—

NOTE.—(1) Voltage values liable to variation due to batteries, etc. (2) Current measurements are not to be made as a routine test. Intended as valve data only. (3) All measurements taken on R/T send or receive. (4) Valve pins viewed from under chassis.

CONTROL SWITCHING CHART No. 1.

CONTROL UNITS No. 1 MK. I and II. No. 1A, MK. I and II with Control No. 2. No. 3, 3A, 3B.

Commander		*Operator*		*I.C. and By-pass or Watching Circuits*	*General Remarks*
Switch		*Switch*			The crew can converse with each other on the I.C. without interfering with the operation of the sets.
		A.	Send or Receive on A. (Operator and Commander can converse on the side tone their conversation being broadcast.)	Tel. output from B fed into I.C. Tel. circuit.	
A.	Send or Receive on A.	I.C.	Can talk with crew on I.C.		The driver and/or co-driver are generally connected to the I.C. circuit, using Junction Distribution No. 1 or 2 and Headgear No. 2. or Junction Distribution No. 3 and headgear No. 1.
		B.	Send or Receive on B.		
		A.	Send or Receive on A.	Output from B fed into I.C.	
I.C.	Can talk with crew on I.C.	I.C.	Can talk with crew on I.C.	Output from A and B fed into I.C.	
		B.	Send or Receive on B.	Output from A fed into I.C.	
		A.	Send or Receive on A.		The driver's buzzer signal is heard by the Commander and also on any circuit the Commander is switched to.
B.	Send or Receive on B.	I.C.	Can talk with crew on I.C.	Output from A fed into I.C.	
		B.	Send or Receive on B. (Operator and Commander can converse on the side tone their conversation being broadcast.) WARNING LAMP Lights indicating that A set is unattended except on I.C.		

CONTROL UNIT No. 1 MK. I AND MK. II WITH CONTROL UNIT No. 2.	One drop lead on Control 1 is permanently connected to I.C.
CONTROL UNIT No. 1A MK. I AND MK. II WITH CONTROL UNIT No. 2.	Both drop leads on Control 1A are switched in parallel.
CONTROL UNIT No. 3.	Commander and Operator drop leads only on Control 3.
CONTROL UNIT No. 3A.	One drop lead on Control 3A is permanently connected to I.C.
CONTROL UNIT No. 3B.	Both drop leads on Commander's half of Control 3B are switched in parallel.
CONTROL UNIT No. 3C.	One drop lead on Control 3C is permanently connected to I.C. The Commander's drop lead is extended and terminates in a Junction Distribution No. 3. The buzzer signal from the Junction Distribution No. 3 is applied to the *Operator's* phones and is used by the Commander to indicate to the operator the required circuit, the switching being controlled by the Operator. The crew can converse with each other on the I.C. without interfering with the operations of the sets. The driver and/or co-drivers are generally connected to the I.C. circuit using Junction Distribution No. 3 and Headgear No. 1.

CONTROL SWITCHING CHART No.2.

CONTROL UNITS No. 1, 1 MK. II, 1A, 1A MK. II, No. 8.

Control	*1st Drop Lead*		*2nd Drop Lead*	*I.C. and By-pass or Watching Circuit*	*General Remarks*
	Switch.				When the Control 1 or 1A Mk. I or II are used without the Control No. 2, the by-pass or watching circuits are incomplete and therefore one of the sets will always be unattended.
No. 1, Mk. I or II.	A. I.C. B.	Send or Receive on A. Converse on I.C. Send or Receive on B.	Permanently connected to I.C.	No By-pass Circuits.	
No. 1A Mk. I or Mk. II.	A. I.C. B.	Send or Receive on A. Converse on I.C. Send or Receive on B.	Switched in parallel with 1st drop lead. Operator and Commander can converse with each other over the sidetone of A and B, their conversation being transmitted.	No By-pass Circuits.	The fuse should be removed from Control 1 or 1A, Mk. I or II, when they are connected direct to the set. The Control 1 and 1A, Mk. II, have the addition of a 4-way terminal strip for making connections to the I.C. circuit.
No. 8.	A. I C B.	Send or Receive on A. Converse on I.C. Send or Receive on B.	Permanently connected to I.C. Note*.	Tel. output from B is fed into the tel. circuit of I.C. Output from A and B is fed into I.C. Output from A is fed into I.C.	The No. 1 or 1A was connected direct to the set in some early installation, but has now been superseded by Control 3. On Control No. 8 the 1st drop lead is normal, the I.C. drop lead being 15 ft. long. *On one special installation, however, the telephone circuit of the I.C. drop lead is connected in parallel with the switched drop lead, the mic. circuit being left on I.C.

CONTROL SWITCHING CHART No. 3.

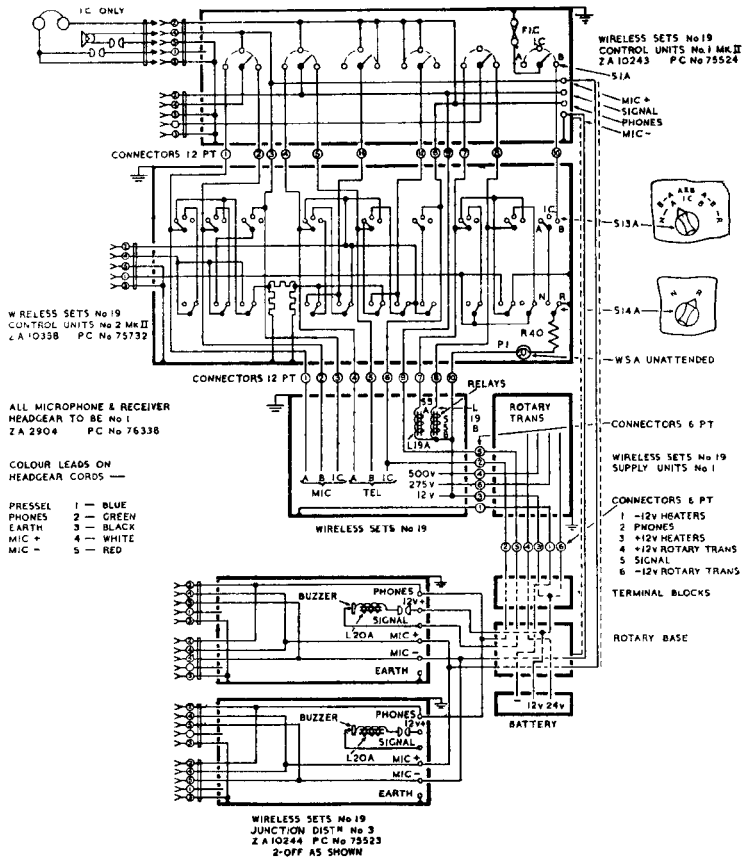
MK. II CONTROL UNITS Nos. 2, 3, 3A, 3B, 3C. R/B (Re-Broadcast) Control Units.

Operator			*Commander* *		
Switches			*Switches*		
N.	A. I.C. B.	Normal switching facilities as described on Switching Chart No. 1.	A I.C. B.	Normal switching facilities as described on Switching Chart No. 1.
R.	BA.	Output from B modulating A which is automatically switched to send. Operator can hear A side tone. Operator's mic. out of circuit. *Note.*—Modulation level of R/B is controlled by "B" gain control.	A. I.C B.	Hears A side tone (R/B side tone) and can add his speech to the R/B. Can converse with crew on I.C. (except Operator). Hears B tel. (incoming signal) and can send on B, his conversation being R/B.
R.	A. & B.	A. & B. in parallel. Send or Receive on A. & B. simultaneously.	A. B. I.C.	Send or Receive on A & B simultaneously. " Can converse with crew on I.C. (except Operator).
R.	AB.	Output from A modulating B which is automatically switched to send. Operator can hear B side tone Operator's mic. out of circuit. *Note.*—Modulation level of R, B is controlled by "A" gain control.	B. I.C. A.	Hears B side tone (R/B side tone) and can add his speech to the R/B. Can converse with the crew on I.C. (except Operator). Hears A tel. (incoming signal) and can send on A, his conversation being R/B.

Note.—See Switching Chart No. 1 for other details.

* In some units there are two drop leads switched in parallel.

FIG. 10. WIRING PLATE LAYOUT NO. 14 MK. II



WIRING PLATE LAYOUT No 14 Mk. II OF CONTROL & INTER COMMUNICATION WIRING — COMPLETE STATIONS No. 19

FIG. 11. CONTROL UNIT NO. 1

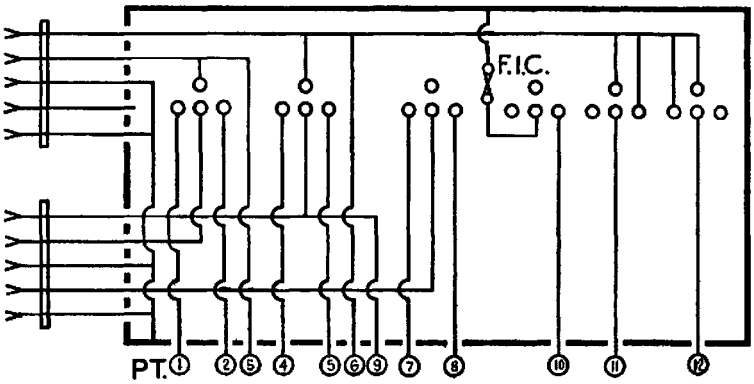


FIG. 12. CONTROL UNIT NO. 1A

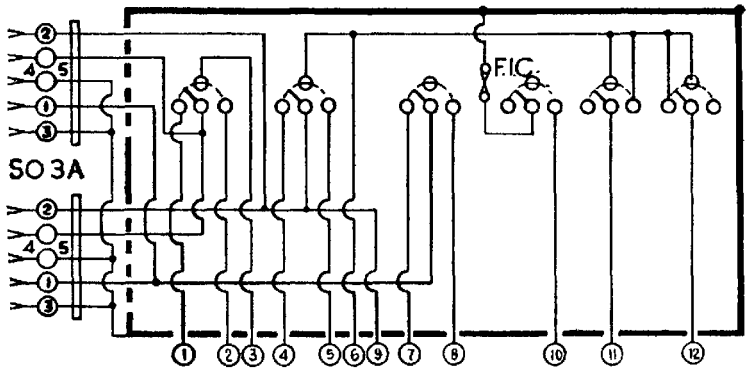


FIG. 13. CONTROL UNIT NO. 1A MK. II

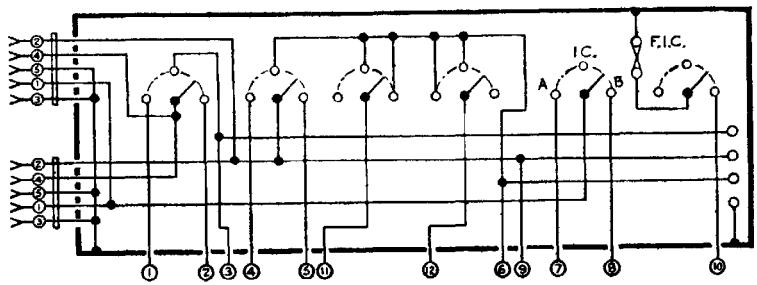


FIG. 14. CONTROL UNIT NO. 2

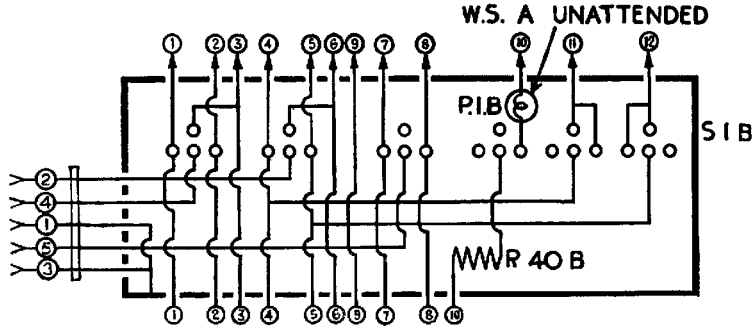


FIG. 15. CONTROL UNIT NO. 3

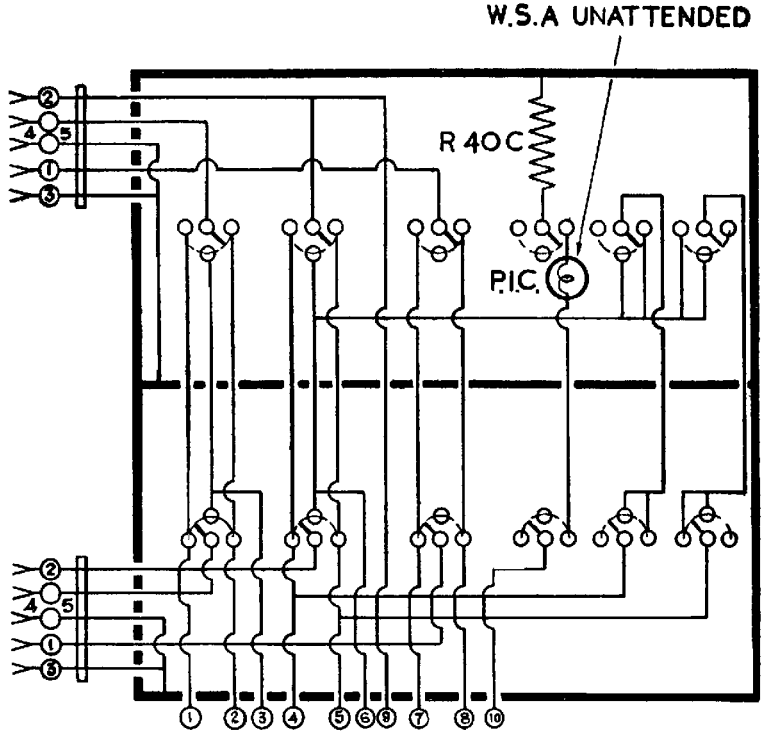
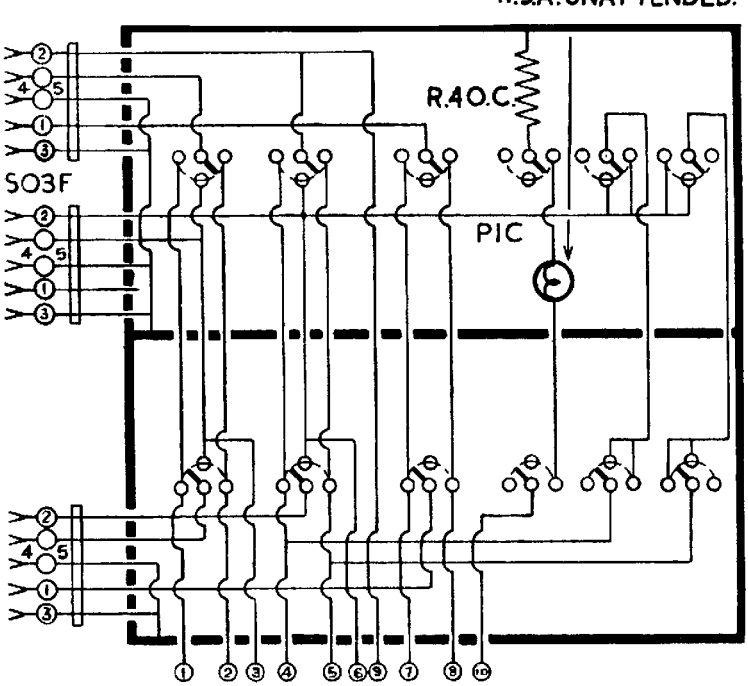


FIG. 16. CONTROL UNIT NO. 3A



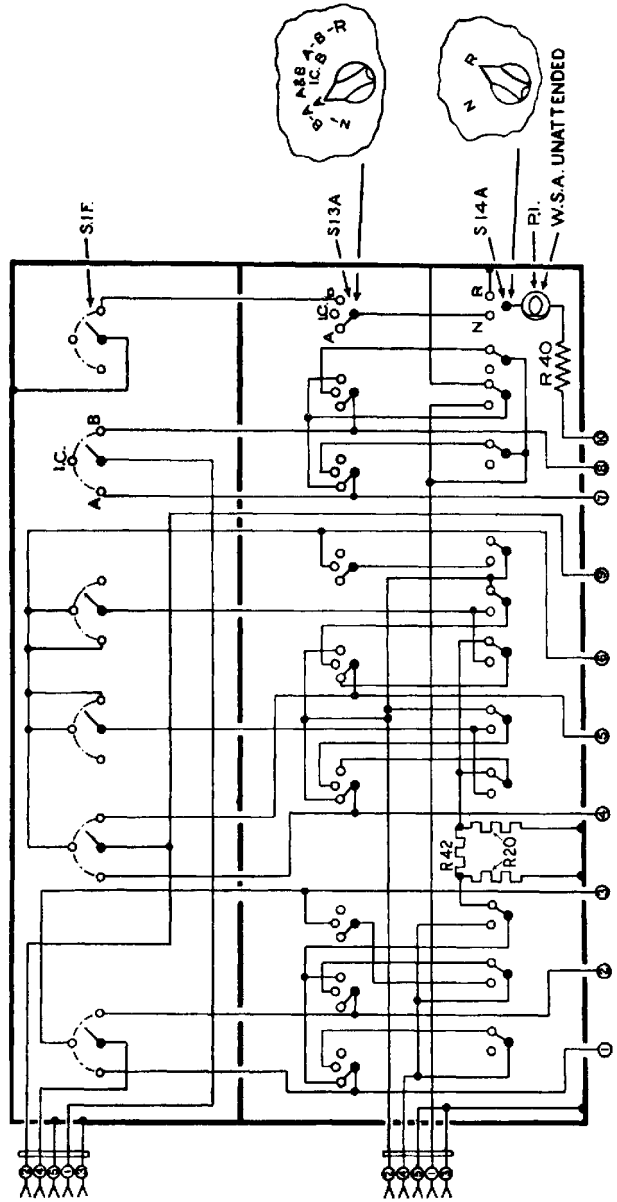


FIG. 17. CONTROL UNIT NO. 3 MK. II

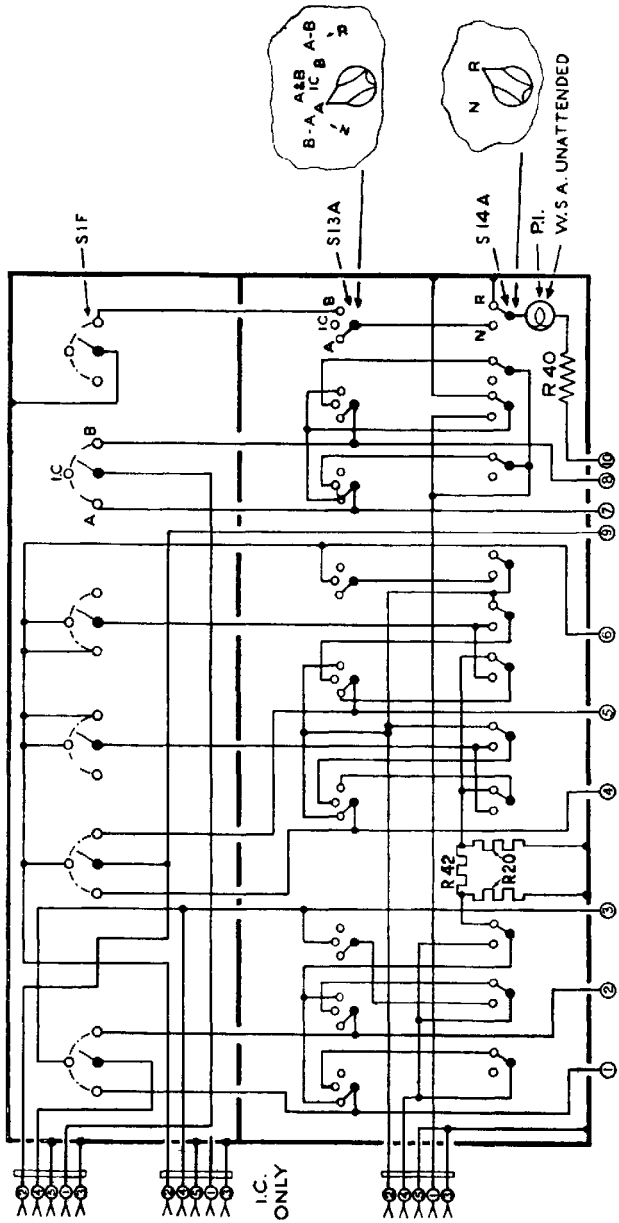


FIG. 18. CONTROL UNIT NO. 3A MK. II

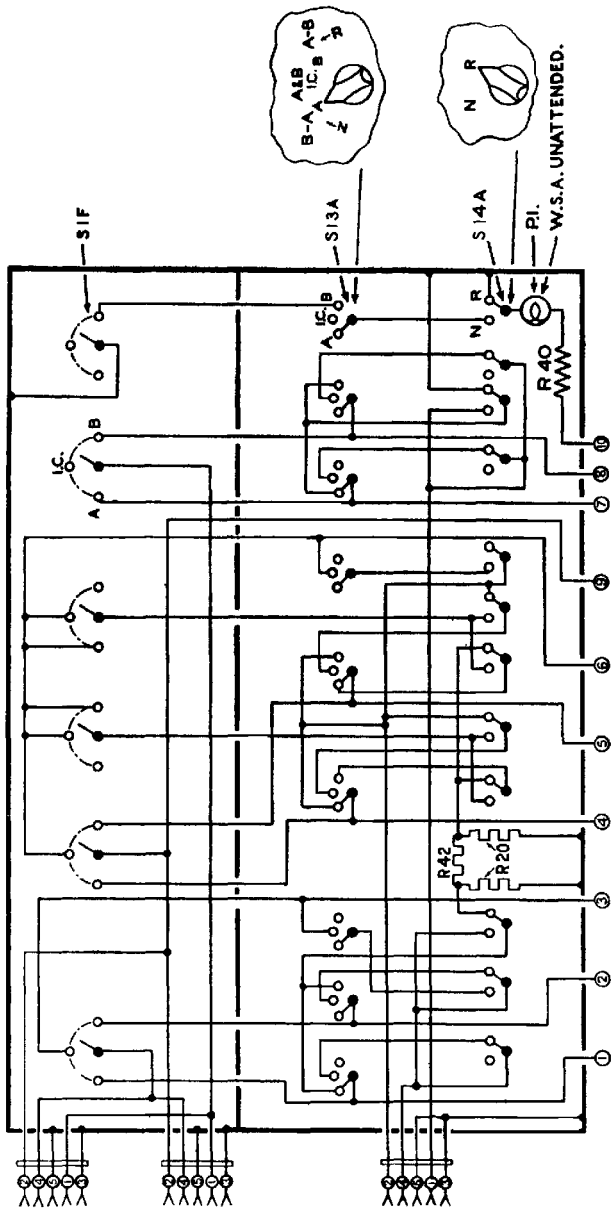
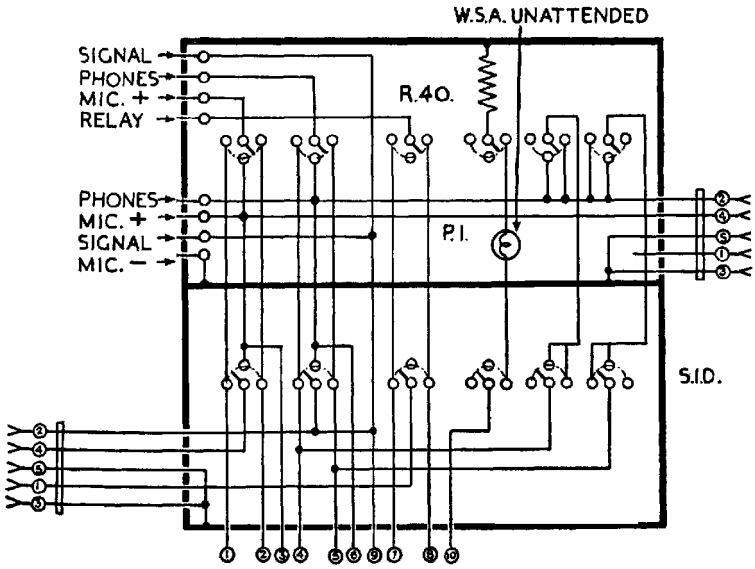


FIG. 19. CONTROL UNIT NO. 3B MK. II

FIG. 20. CONTROL UNIT NO. 3C



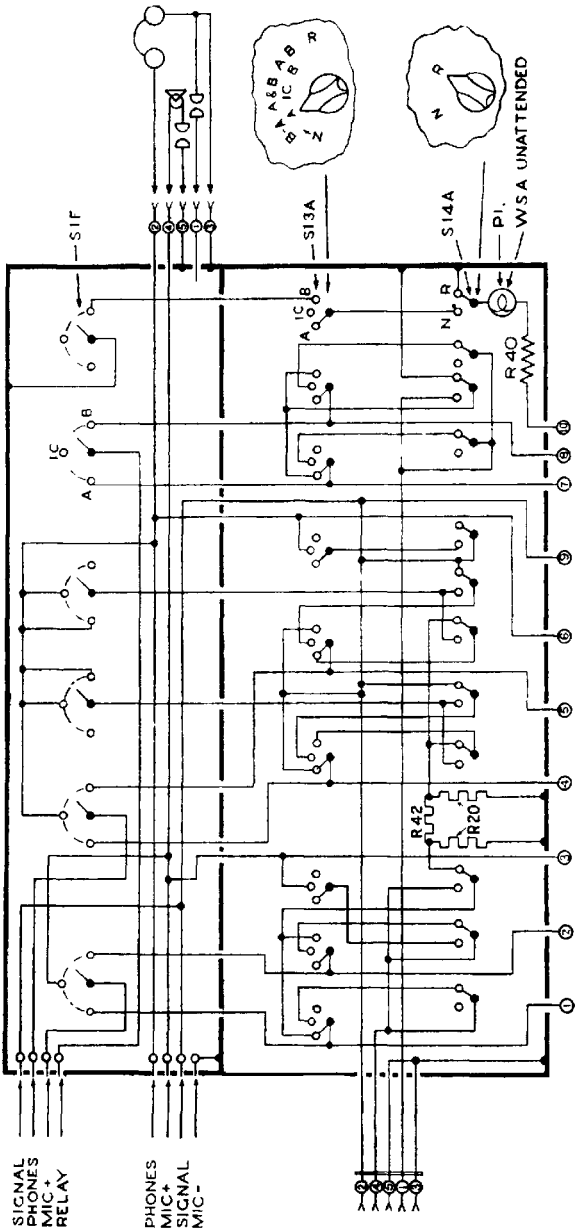


FIG. 21. CONTROL UNIT NO. 3C MK. II

FIG. 22. JUNCTION DISTRIBUTION NO. 1

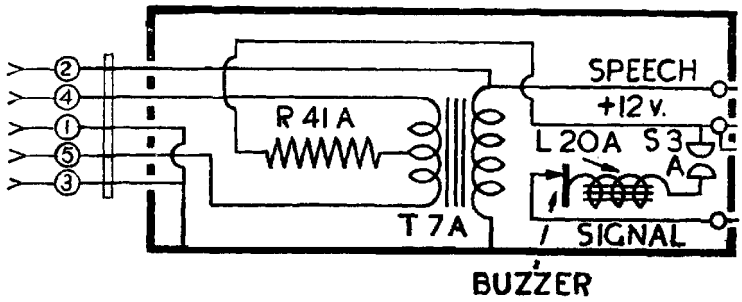


FIG. 23. JUNCTION DISTRIBUTION NO. 2.

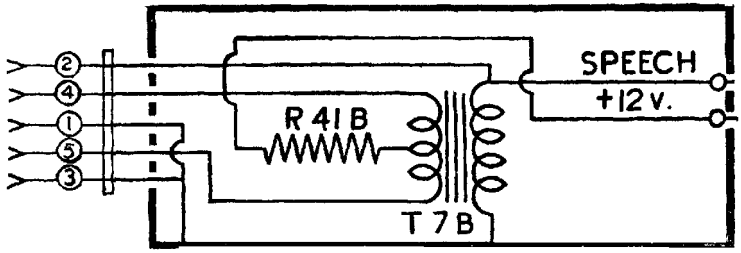
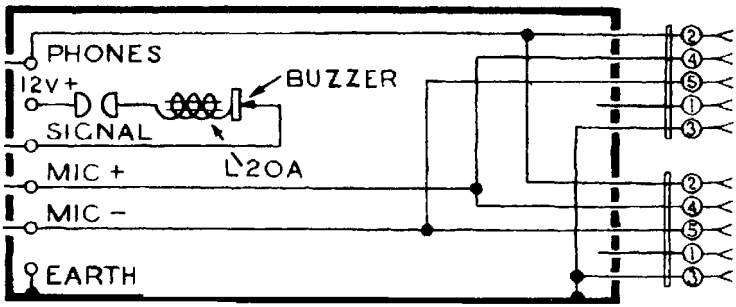
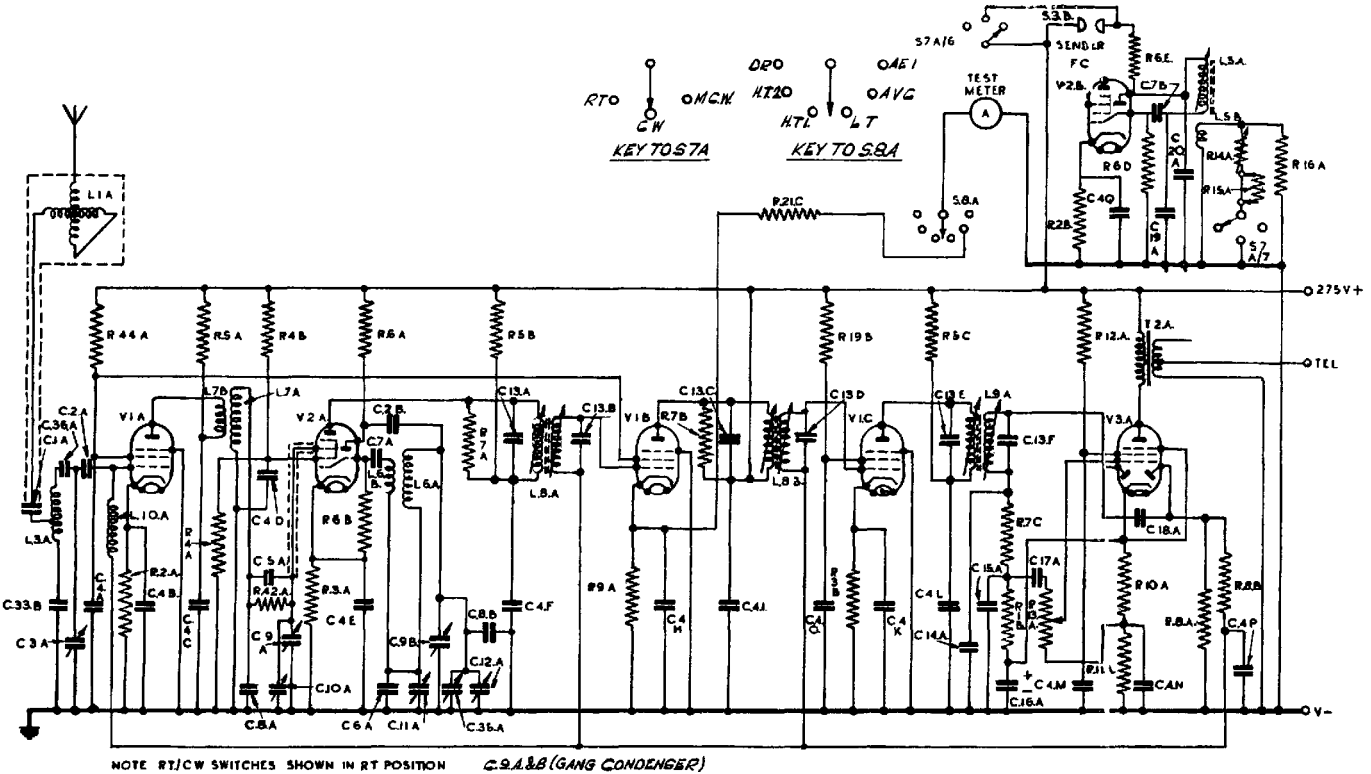


FIG. 24. JUNCTION DISTRIBUTION NO. 3





NOTE RT/CW SWITCHES SHOWN IN RT POSITION C.9.A.&B (GANG CONDENSER)

FIG 25 WIRELESS SETS No 19, MK. I
SIMPLIFIED CIRCUIT OF SET 'A' AS RECEIVER

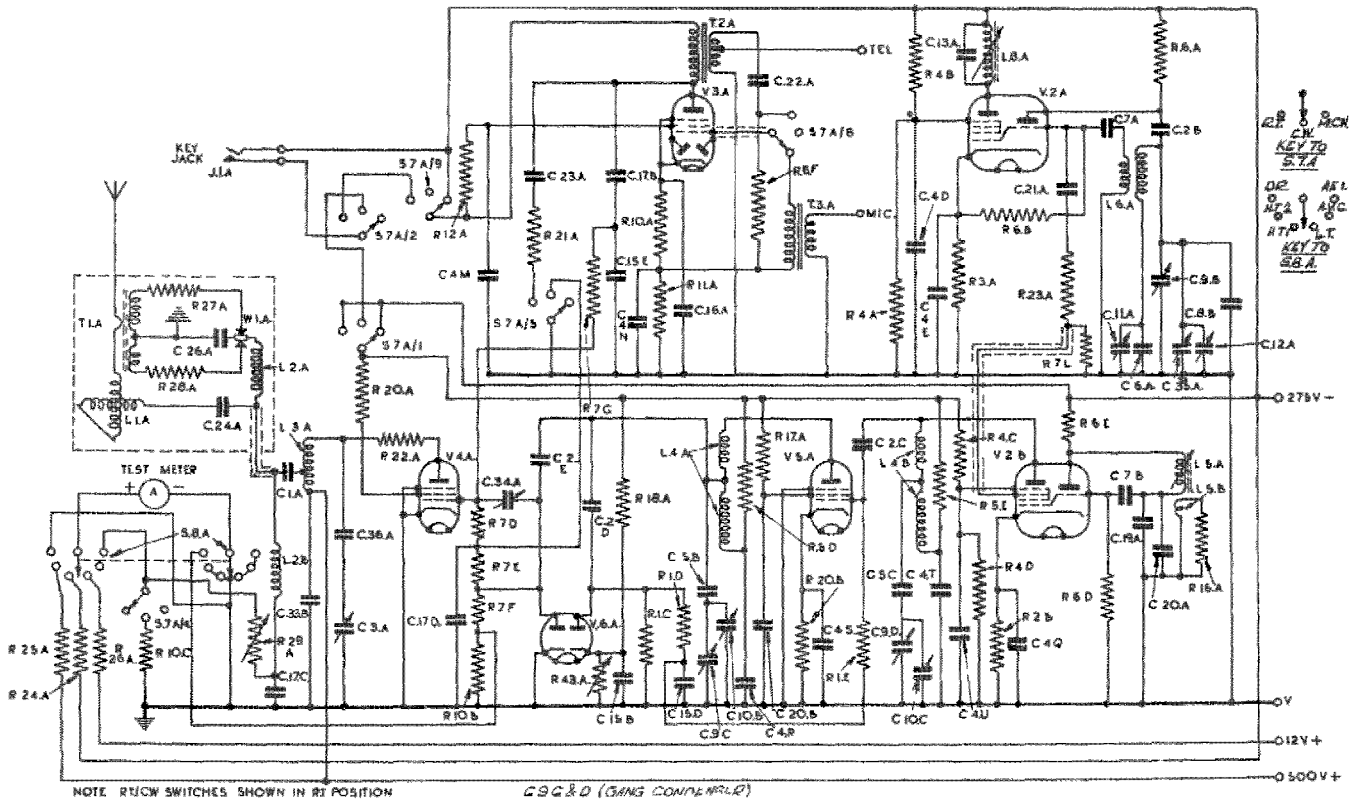


FIG 26 WIRELESS SETS No 19, MK. I
SIMPLIFIED CIRCUIT OF SET 'A' AS SENDER

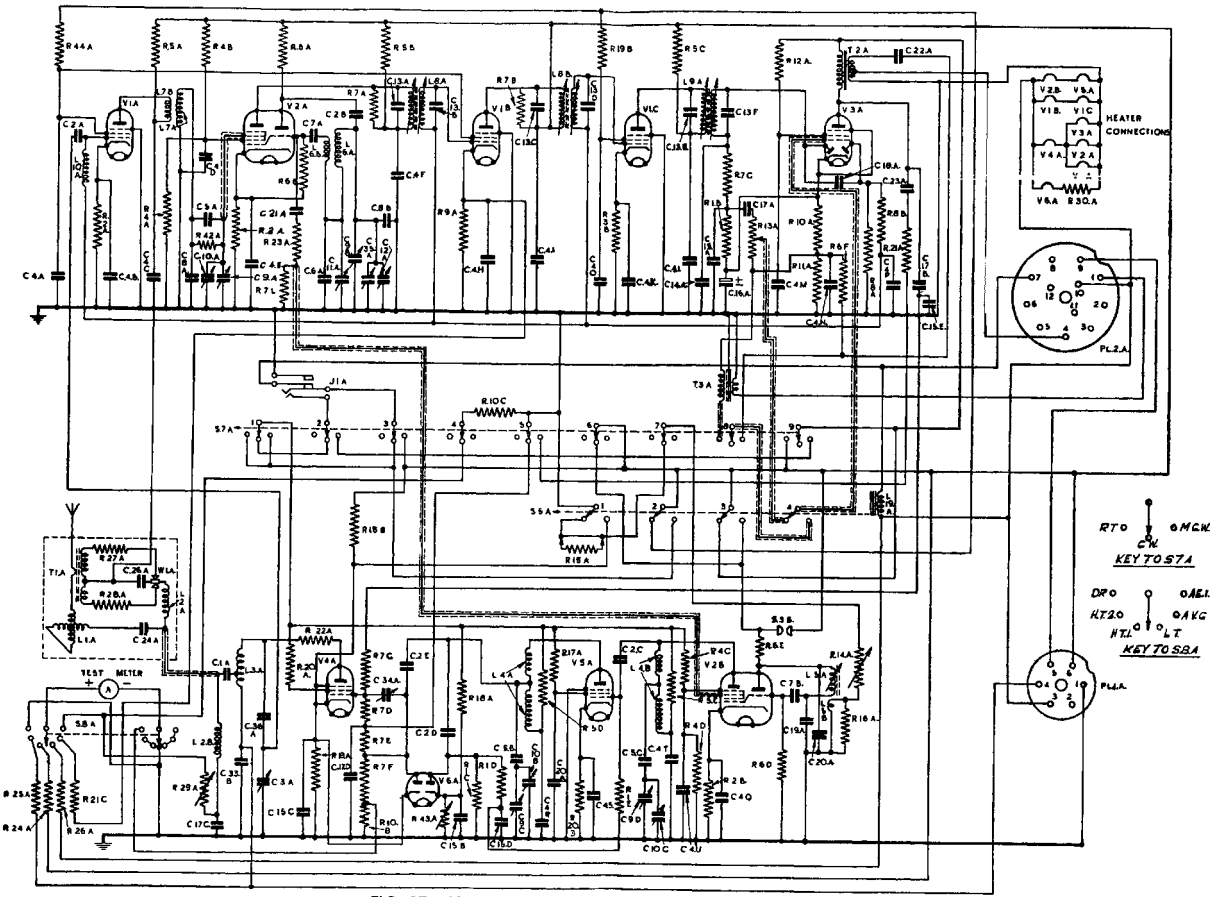


FIG 27 WIRELESS SETS No 19, MK. I.
COMPLETE SENDER AND RECEIVER CIRCUIT DIAGRAM

NOTE – RT/CW SWITCH SHOWN IN CW POSITION S/R RELAY SHOWN IN RECEIVE POSITION

C.9 A,B,C,D (GANG CONDENSER)

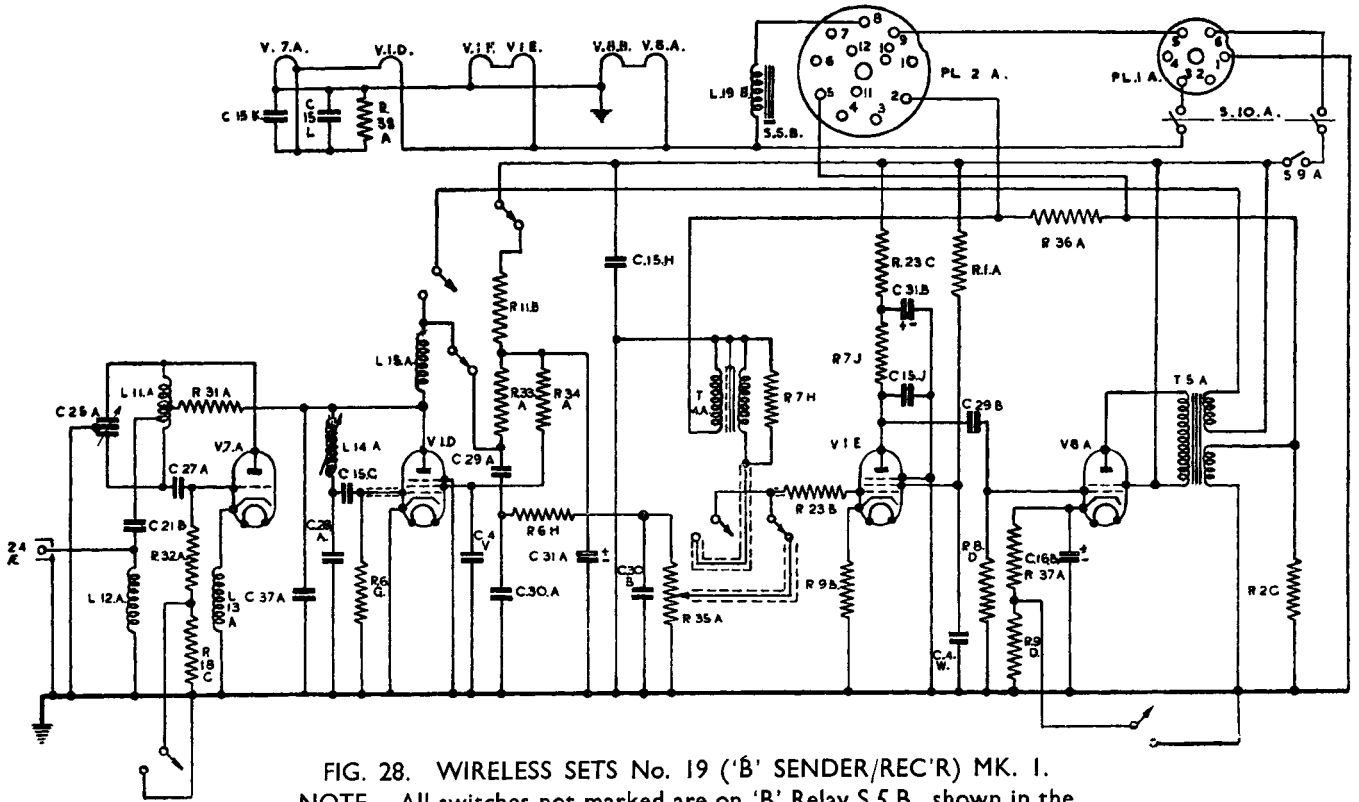


FIG. 28. WIRELESS SETS No. 19 ('B' SENDER/REC'R) MK. 1.
NOTE.—All switches not marked are on 'B' Relay S.5.B., shown in the 'Receive' position.

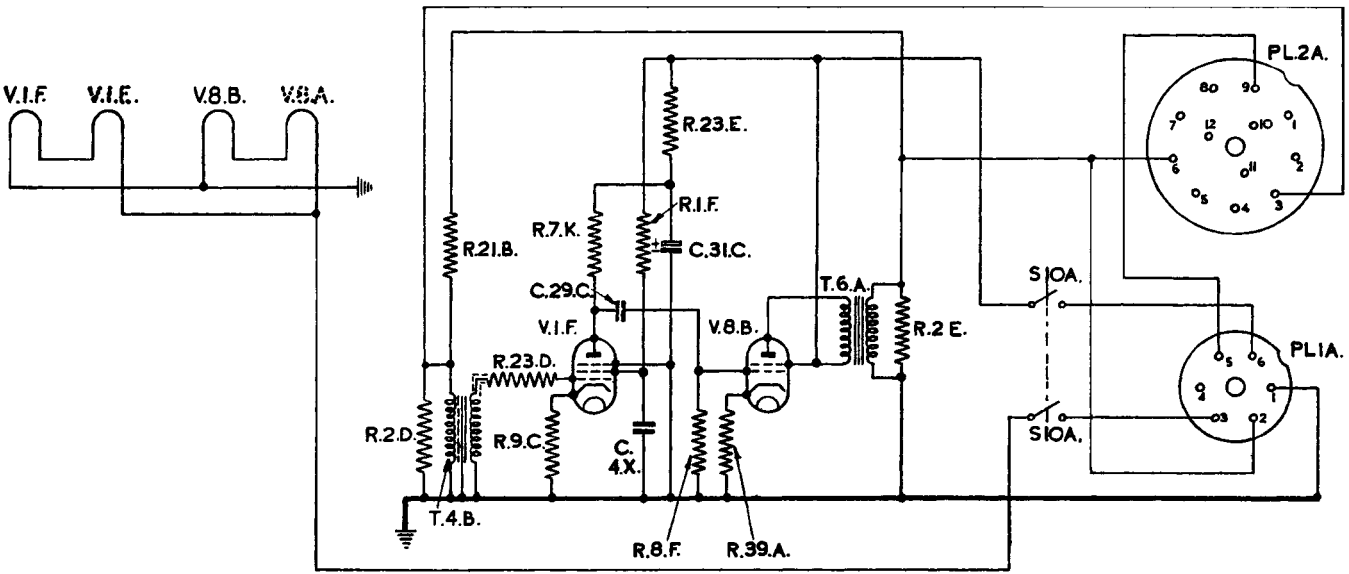


FIG. 29. WIRELESS SETS No. 19, MK. 1.
INTER-COMMUNICATION AMPLIFIER.

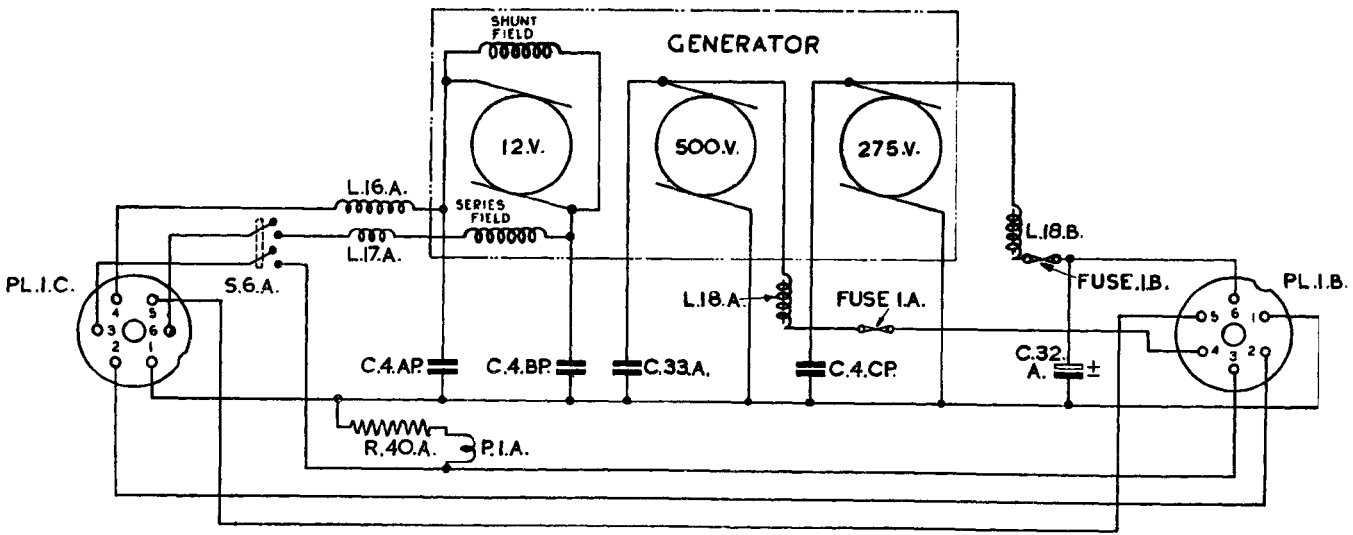


FIG. 30. WIRELESS SETS No. 19, MK. 1.
SUPPLY UNITS No. 1.

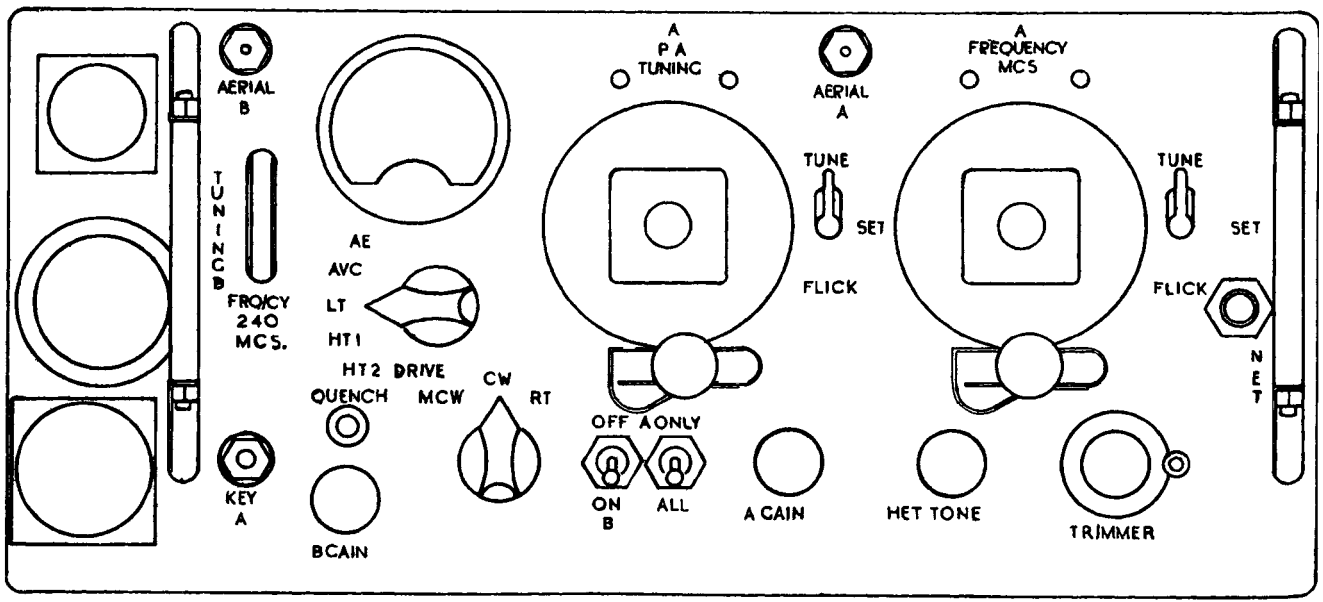


FIG. 31. WIRELESS SETS No. 19, MK. 1.
FRONT VIEW OF PANEL.

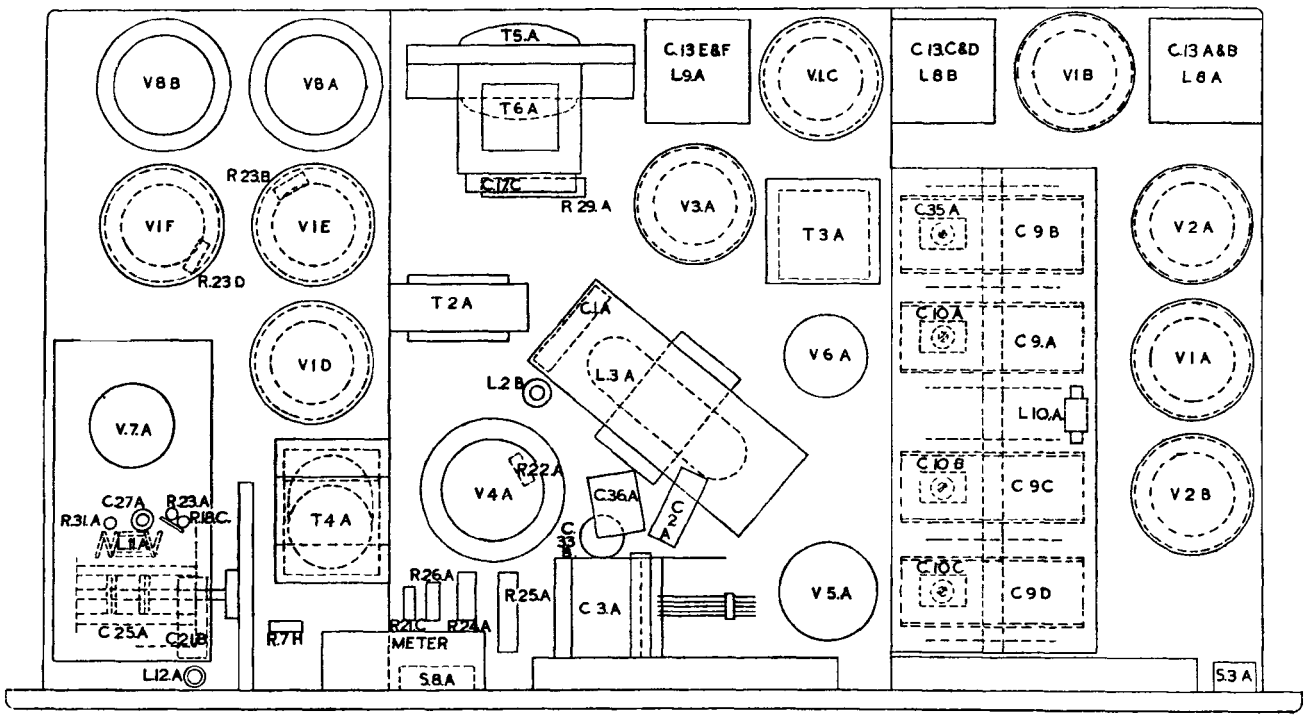


FIG. 32. WIRELESS SETS No. 19, MK. 1.
TOP PLAN OF CHASSIS.

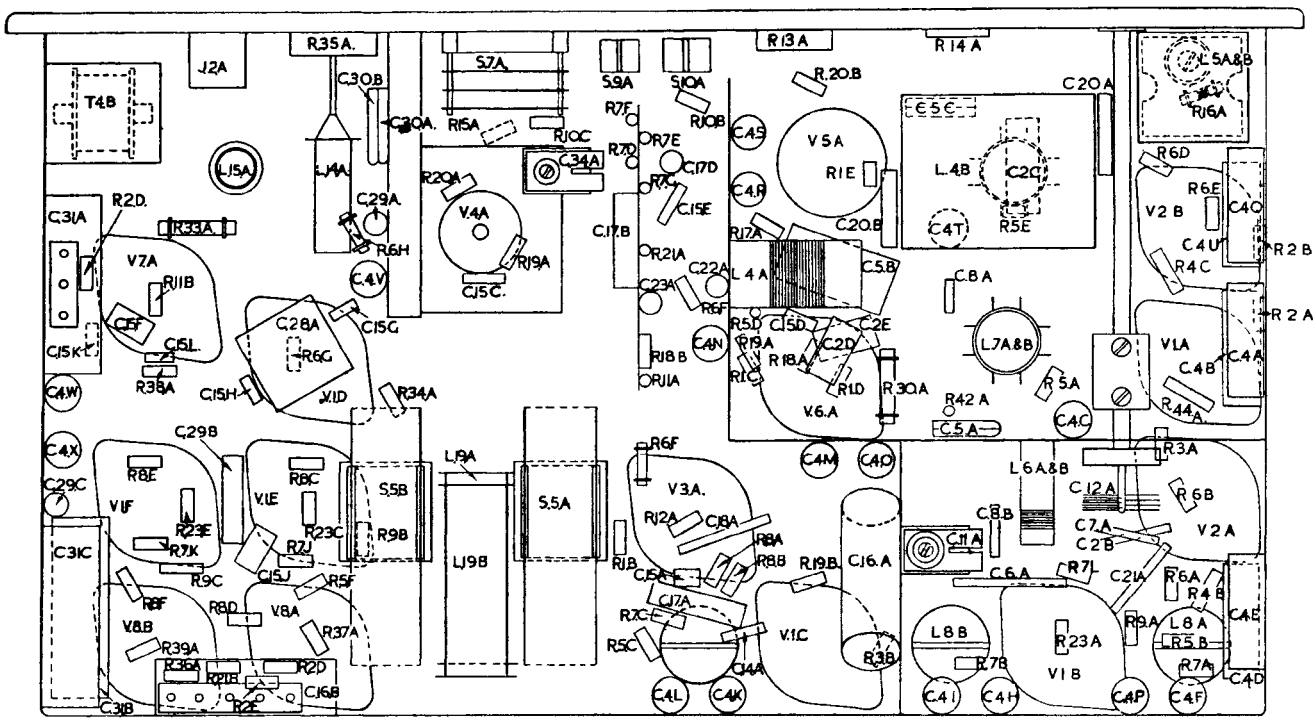


FIG. 33. WIRELESS SETS No. 19, MK. I.
UNDERNEATH PLAN OF CHASSIS.

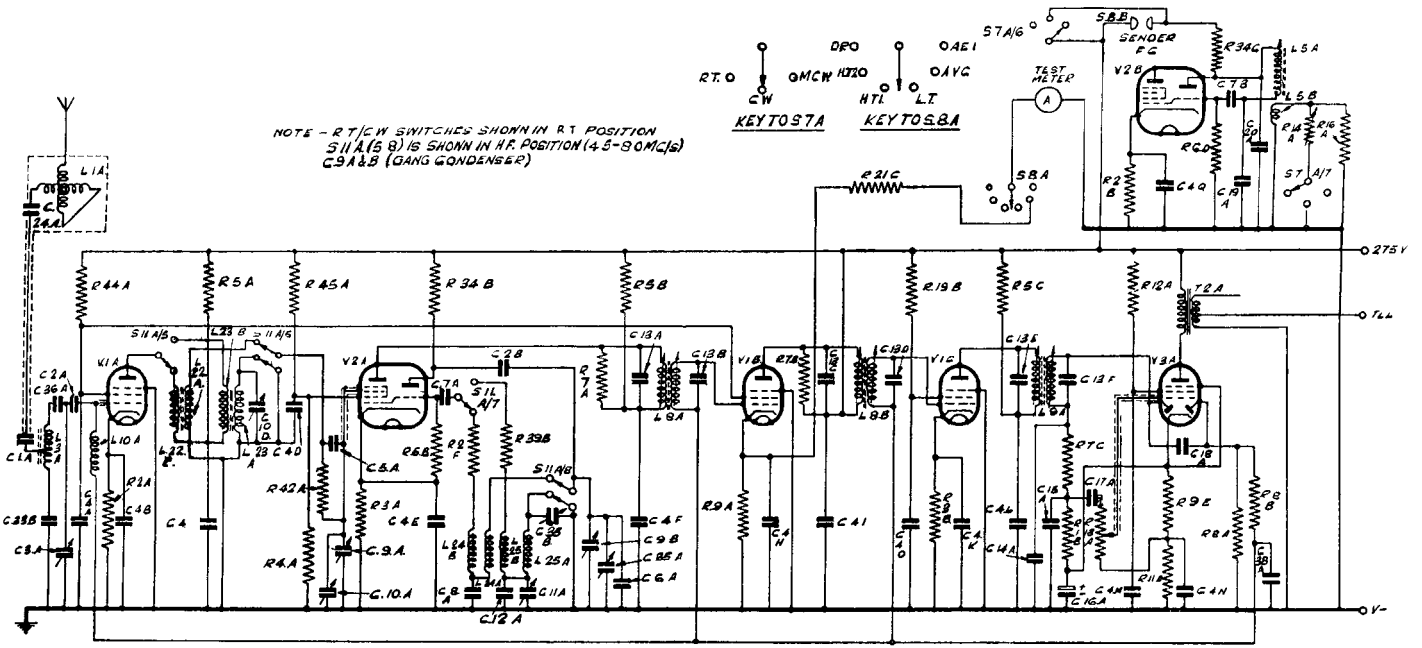


FIG. 34. WIRELESS SETS No. 19, MK. II.
SIMPLIFIED CIRCUIT OF SET 'A' AS RECEIVER.

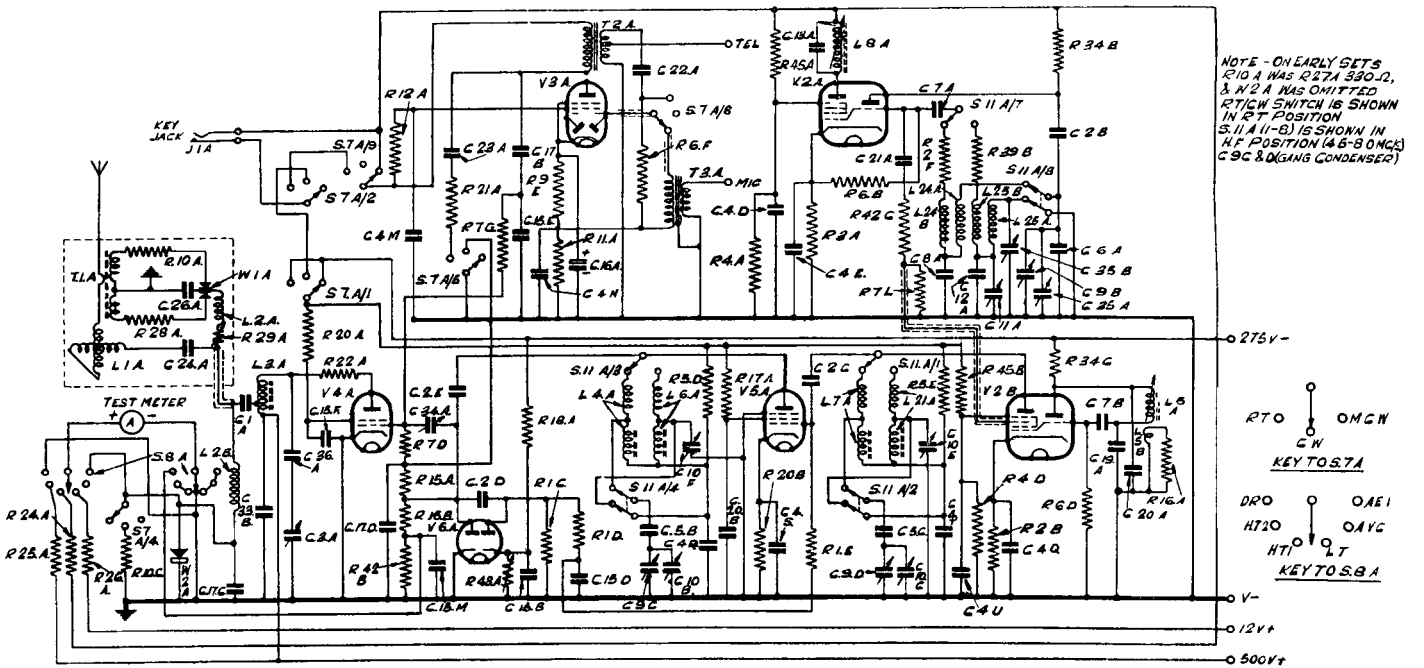


FIG. 35. WIRELESS SETS No. 19, MK. II.
SIMPLIFIED CIRCUIT OF SET 'A' AS SENDER.

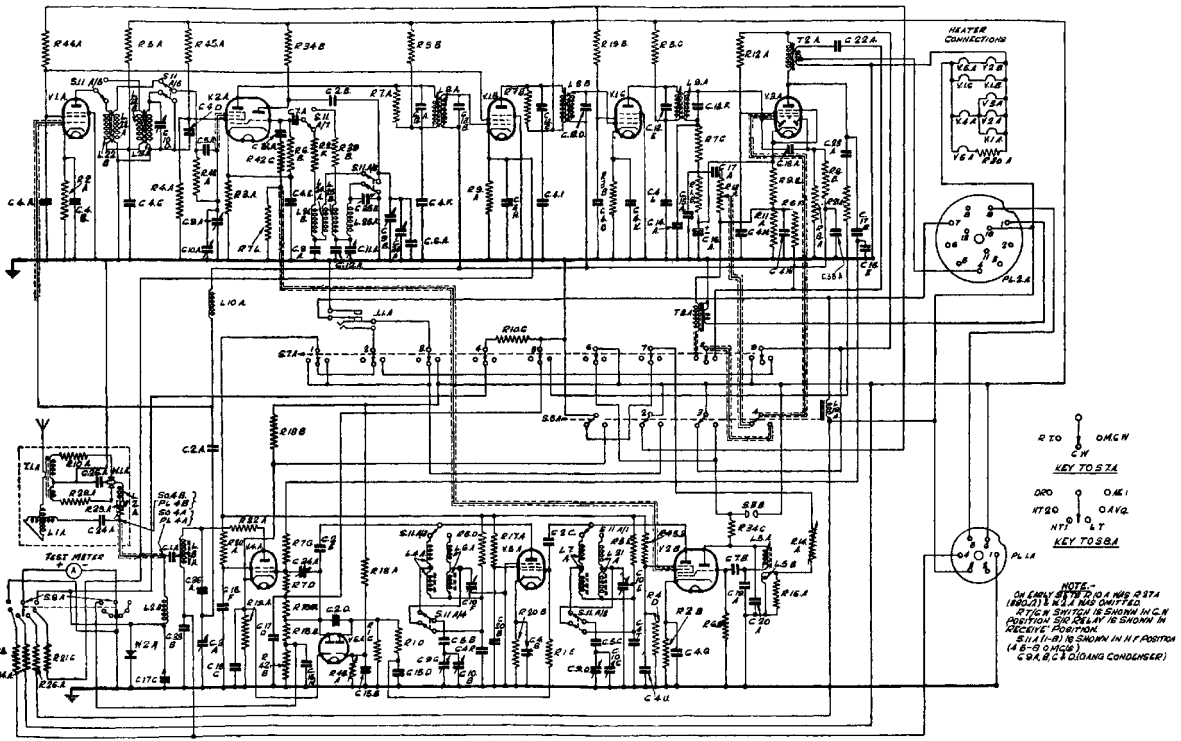


FIG. 36. WIRELESS SETS No. 19, MK. II.
COMPLETE SENDER AND RECEIVER CIRCUIT DIAGRAM, 'A' SET.

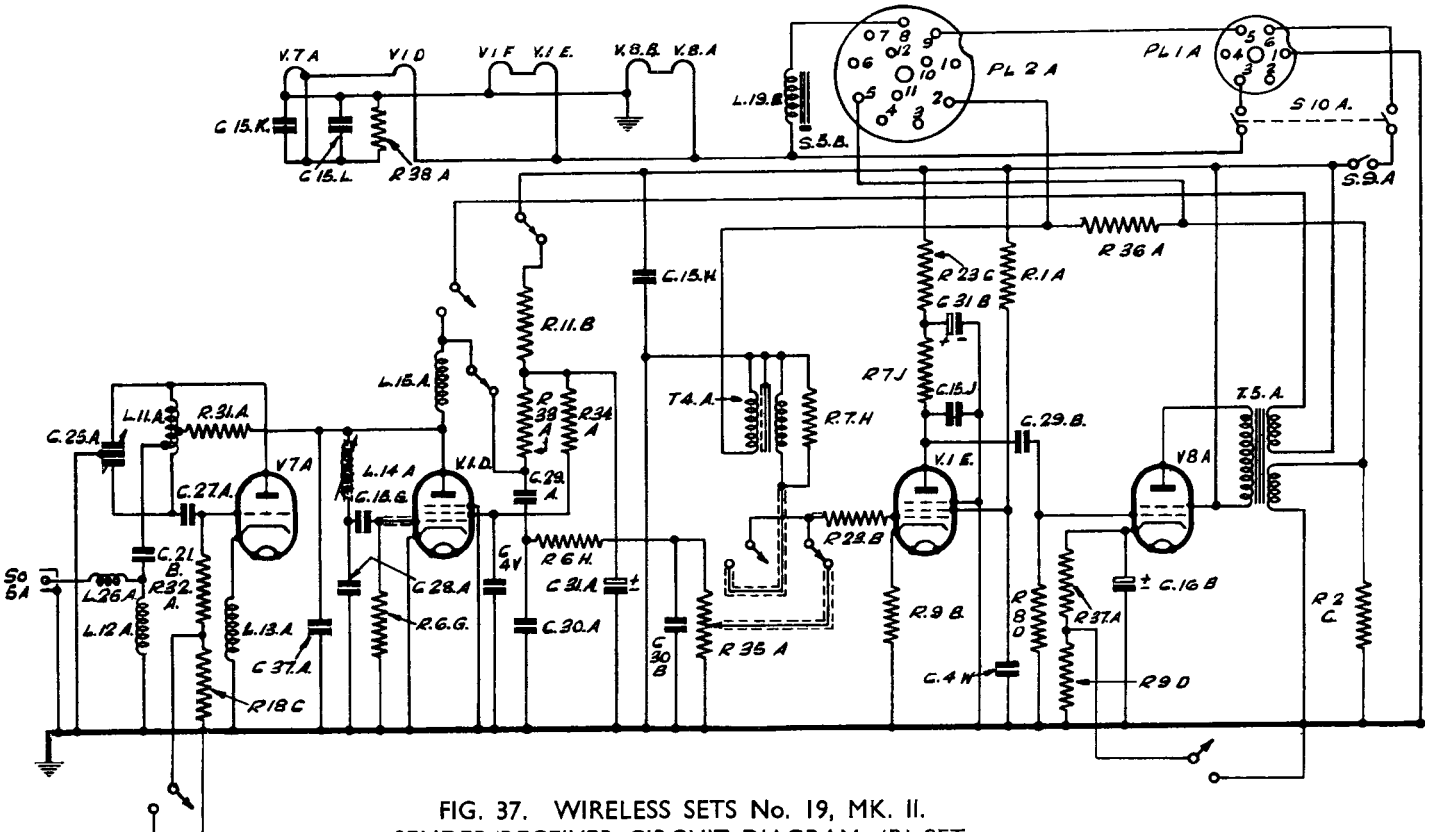


FIG. 37. WIRELESS SETS No. 19, MK. II.
SENDER/RECEIVER CIRCUIT DIAGRAM, 'B' SET.
NOTE —All switches not marked are on 'B' relay S.5.B., shown in the 'Receive' position.

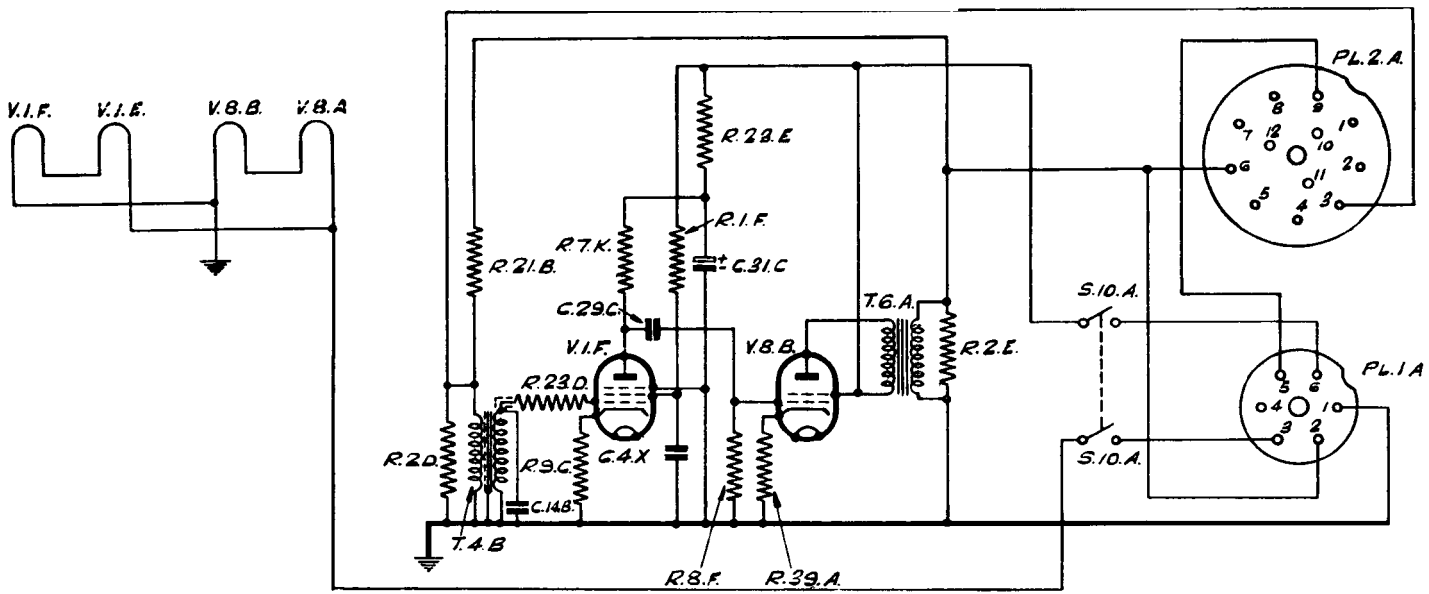


FIG. 38. WIRELESS SETS No. 19, MK. II.
INTER-COMMUNICATION AMPLIFIER.

(For code list see opposite)

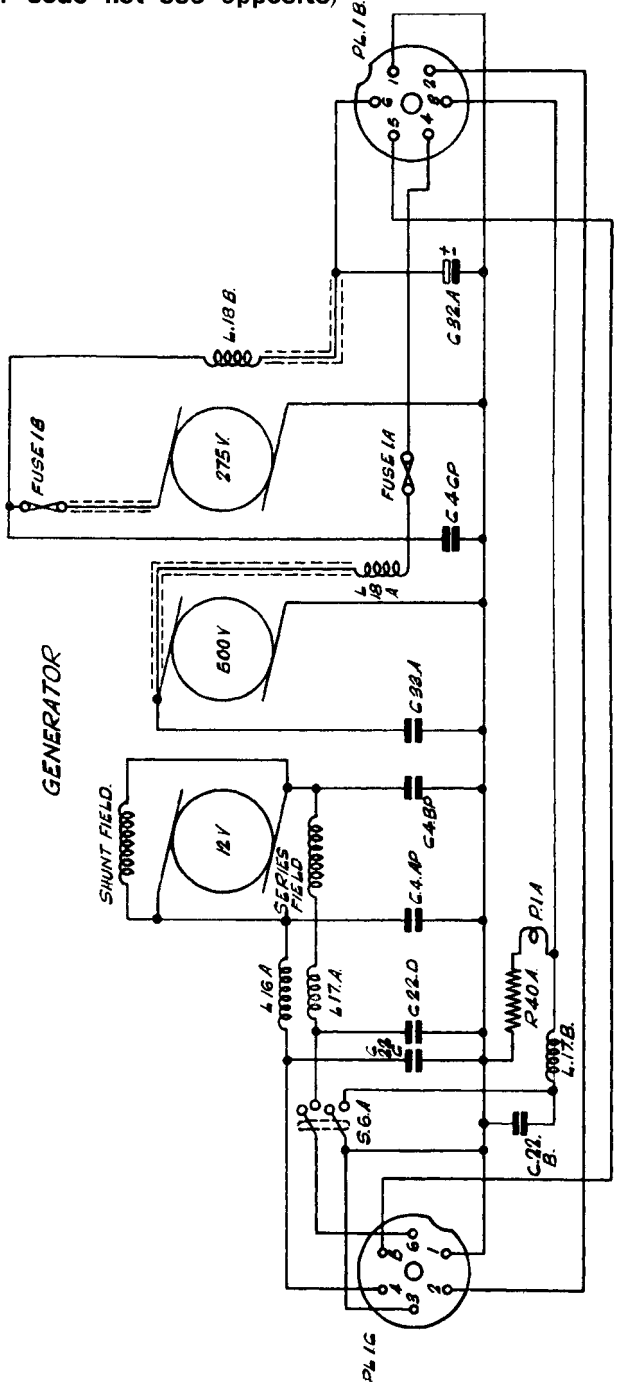


FIG. 39. WIRELESS SETS No. 19, MK. II.
SUPPLY UNITS No. 1, MK. 1.*

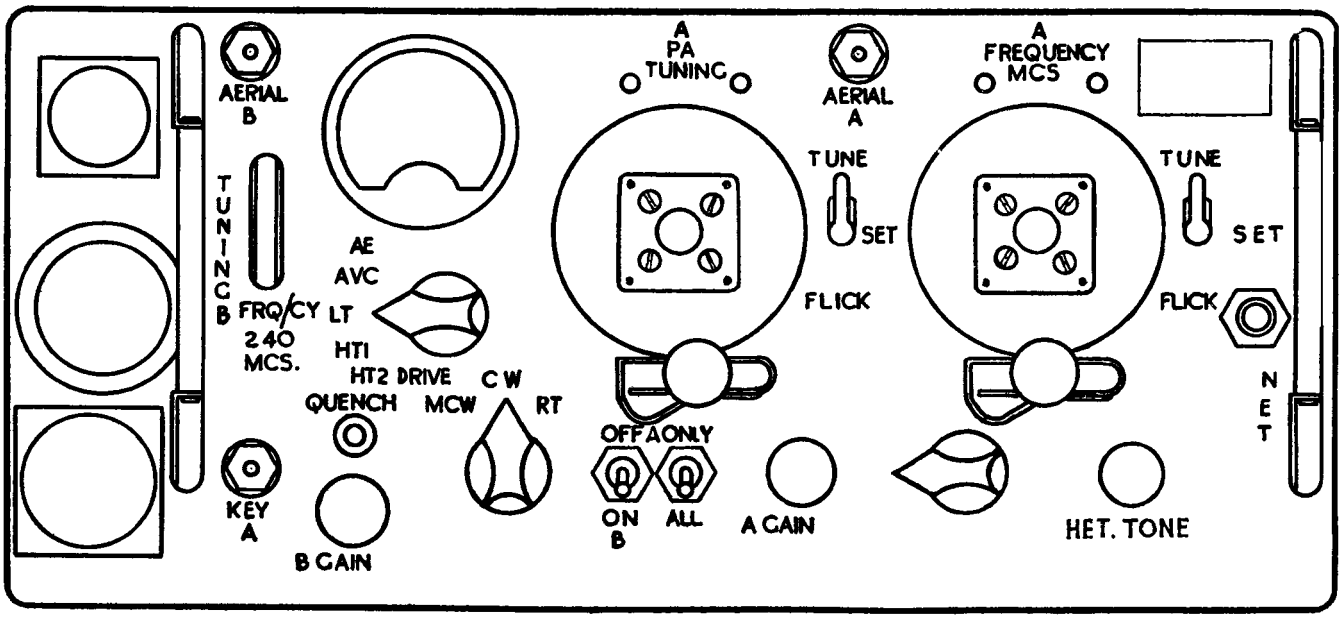


FIG. 40. WIRELESS SETS No. 19, MK. II.
FRONT VIEW OF PANEL.

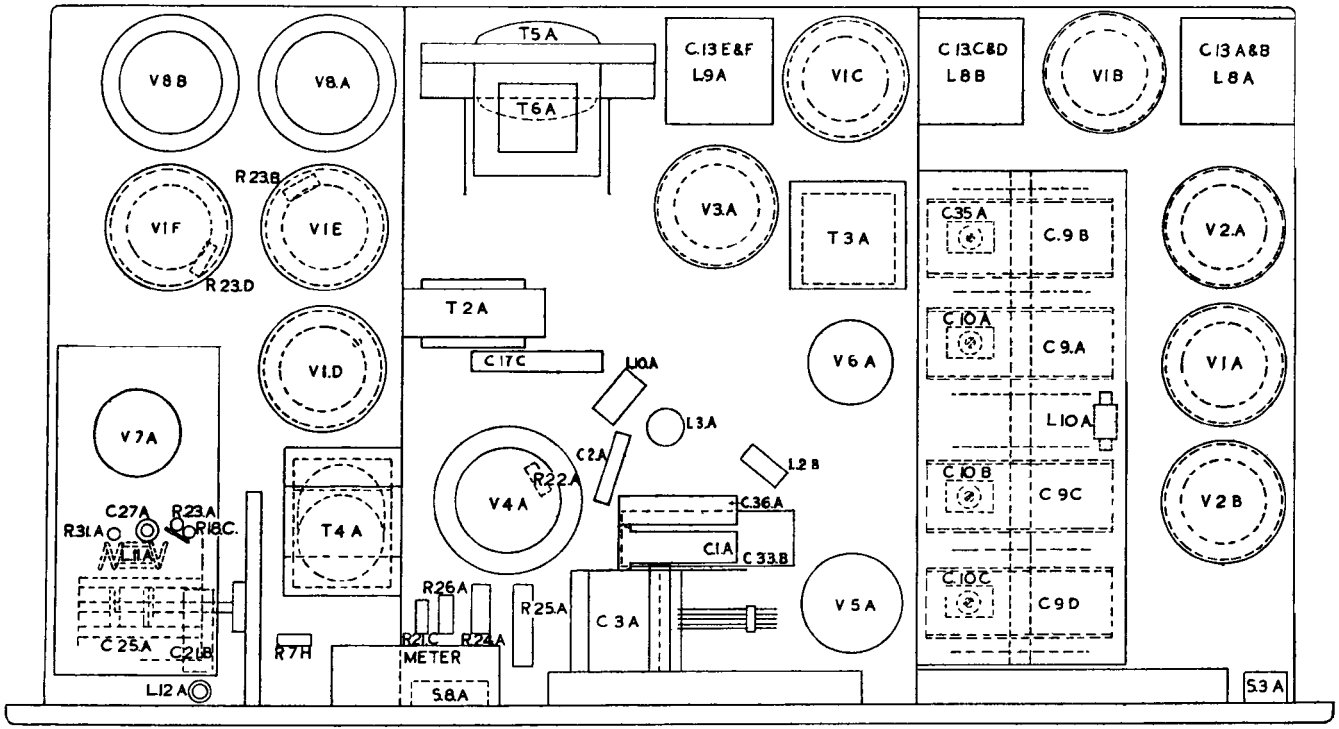


FIG. 41. WIRELESS SETS No. 19, MK. II.
TOP PLAN OF CHASSIS.

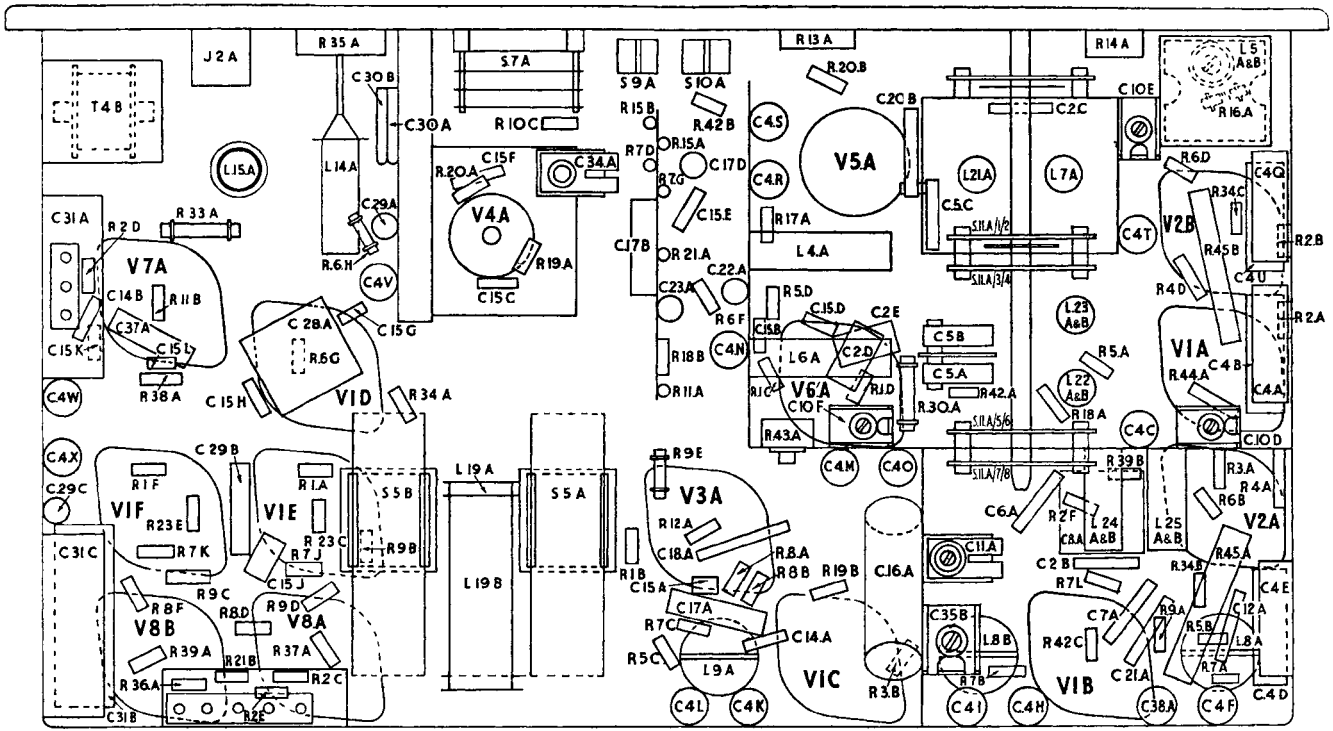


FIG. 42. WIRELESS SETS No. 19, MK. II.
UNDERNEATH PLAN OF CHASSIS.

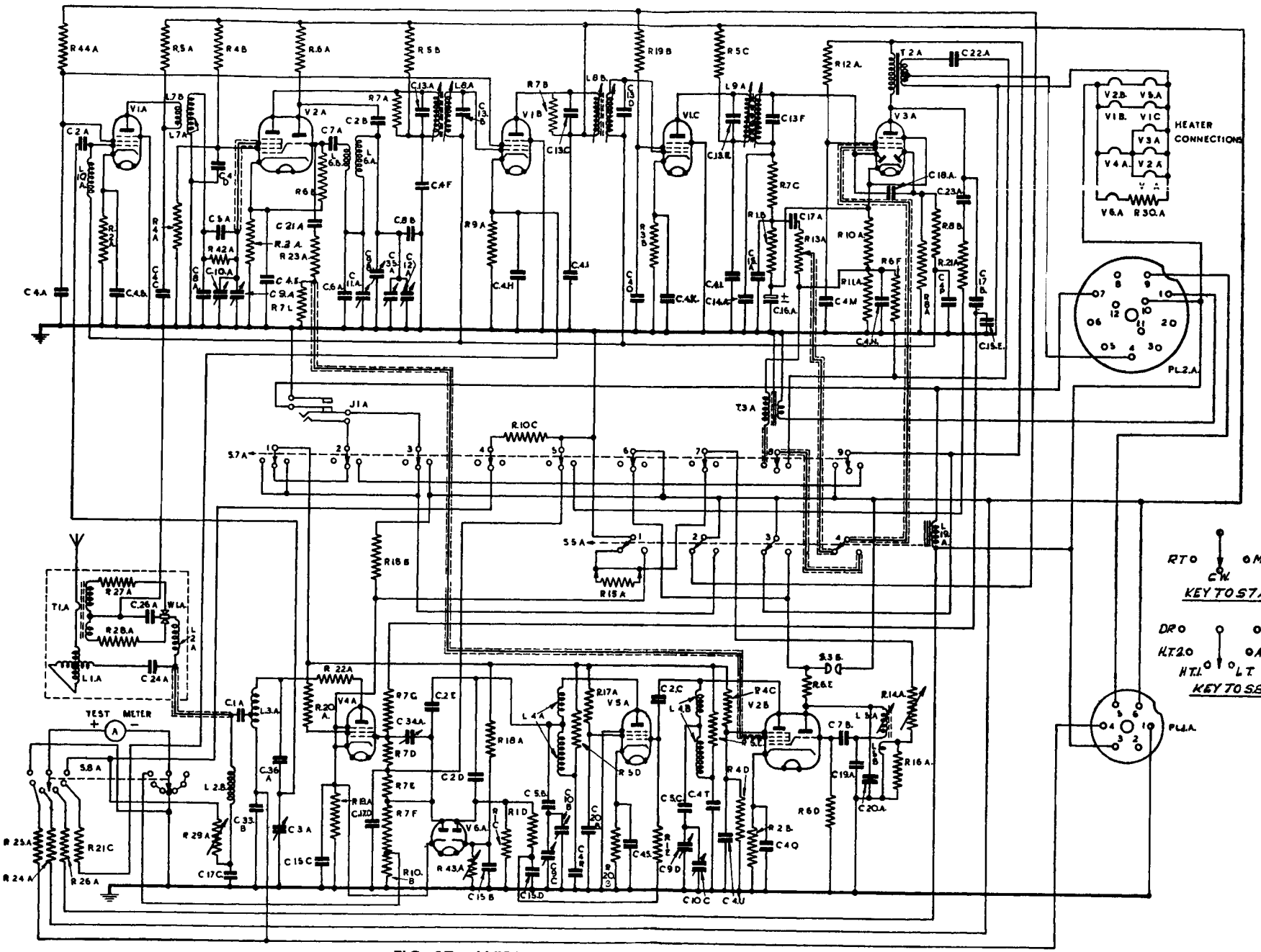


FIG 27 WIRELESS SETS No 19, MK. 1.
COMPLETE SENDER AND RECEIVER CIRCUIT DIAGRAM

NOTE - RT/CW SWITCH SHOWN IN CW POSITION S/R RELAY SHOWN IN RECEIVE POSITION

C.9A,B,C,D (GANG CONDENSER)

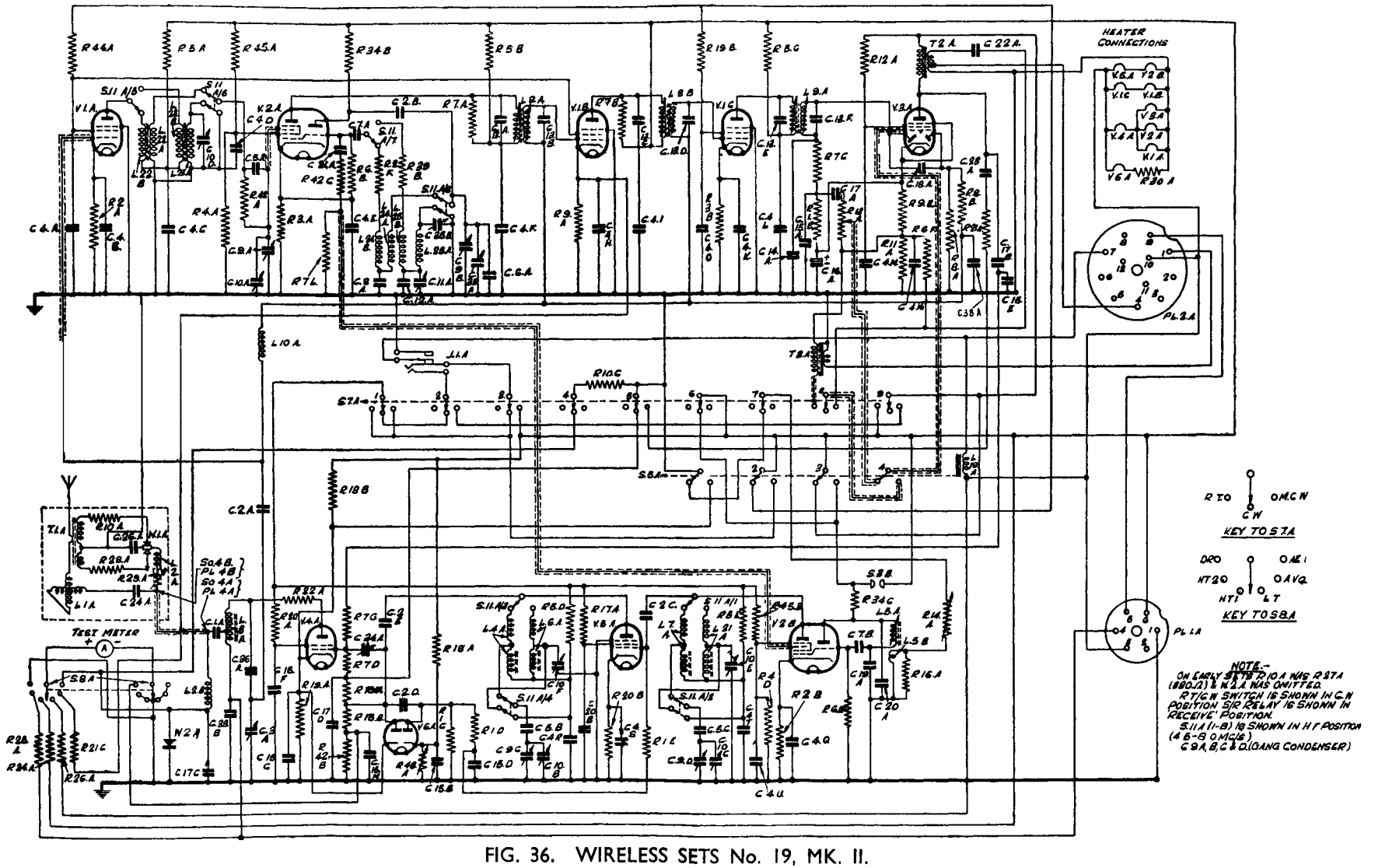


FIG. 36. WIRELESS SETS No. 19, MK. II.
COMPLETE SENDER AND RECEIVER CIRCUIT DIAGRAM, 'A' SET.