LISSEN

SERVICE MANUAL FOR ALL WAVE SUPERHETERODYNE RECEIVER MODEL 8114

TECHNICAL SPECIFICATION

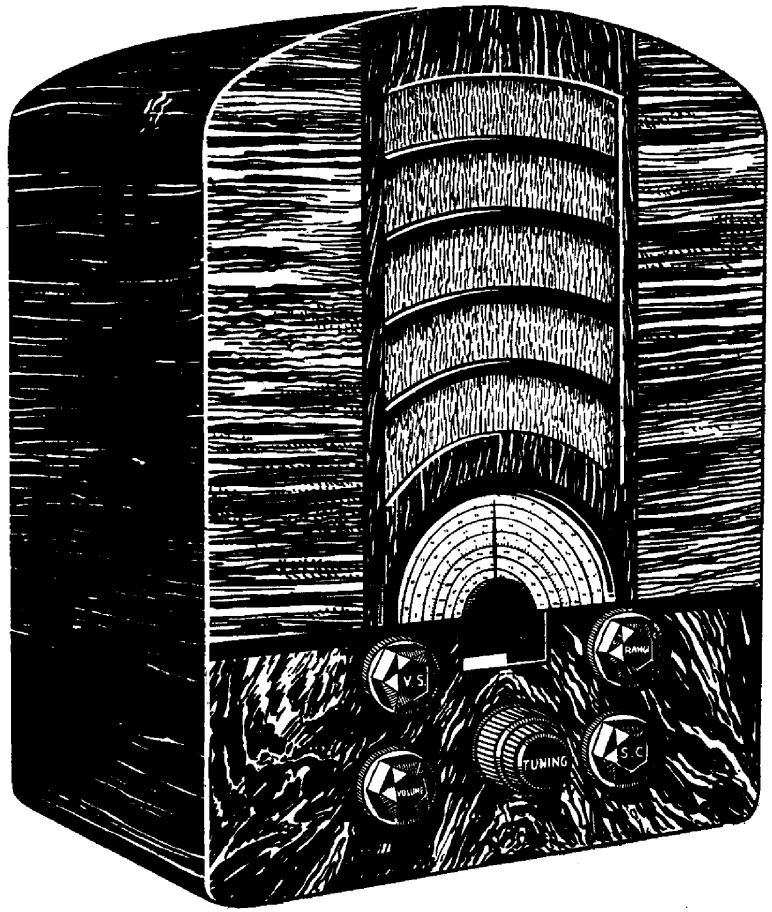
THE model 8114 all wave superheterodyne is for use with an external elevated aerial, and is for A.C. mains operation. The wavebands covered are 13-33 metres, 30–82 metres, 198–556 metres and 900–2,000 metres.

Six valves (including rectifier) are employed. Refinements such as variable selectivity, variable sensitivity and visual tuning indicator are incorporated.

On the medium and long wavebands a tuned band pass circuit precedes the Frequency changer valve (V2). The band pass circuits being inductively coupled. On these wavebands valve V1 is inoperative.

On the short and ultra short wavebands, a tuned aerial circuit precedes the valve V1 a variable Mu R.F. pentode which functions as a R.F. amplifier, and this is coupled to the Frequency changer valve (V2) by a choke fed, tuned grid circuit.

This valve, a variable Mu Octode which functions as a true electron coupled frequency changer is transformer coupled to the I.F. amplifier valve (V3) a variable Mu R.F. pentode, which in turn is coupled by another I.F. transformer to the signal rectifier. Both I.F. transformers are tuned to a frequency of 465 Kcs. (645 metres), whilst a mechanical adjustment of the coupling between the primary and secondary windings of both transformers provides variable selectivity.



The signal rectifier is a diode incorporated in a duo-diode triode valve (V4), a small bias being applied to this diode for inter-station quieting. The other diode provides delayed automatic volume control whilst the triode is an A.F. amplifier. This stage is resistance capacity coupled to the output valve, an A.F. pentode which is transformer coupled to the energised moving coil speaker.

A full wave valve rectifier is employed for power rectification, the speaker field winding being used in the smoothing circuit.

GENERAL REMARKS

In the event of trouble check the following details :

1. Power supply ; if the pilot lamps light it is certain that the power supply is not at fault, otherwise check : (*a*) Pilot bulbs. (*b*) Mains leads, plugs and sockets. (*c*) Mains switch. (*d*) Receiver correctly adjusted for power supply.
2. Valves : (*a*) Check characteristics, or (*b*) Substitute known good valves.
3. Locate trouble to a particular stage : (*a*) Check valve operating conditions, or (*b*) Stage by stage test with a signal generator, A.F., I.F., and R.F. stages.
4. Locate faulty component by testing with voltmeter, ammeter, ohmmeter, etc., or by substitution, as the case may be.
5. Check the alignment of the tuned circuits with a signal generator.

The charts are given in the order they will usually be required. Measurements made should be within + or − 10 per cent. of the readings given, providing the mains input voltage stated below is applied to the particular tap on the mains transformer.

Input 100 volts to the 100 volts tap.
" 110 " " " 110 " "
" 125 " " " 115-135 " "
" 143 " " " 136-150 " "
" 200 " " " 200 " "
" 210 " " " 210 " "
" 225 " " " 215-235 " "
" 243 " " " 236-250 " "

It follows that a lower or higher mains input voltage will give readings in proportion.

All voltages should be measured from the chassis with a 1,000 ohm per volt meter Voltages and currents of the R.F. valve (V1) are measured with the range switch set for short waves; all remaining voltages and currents, i.e., V2, V3, V4 and V5 are measured with the range switch set for medium waves.

POWER SUPPLY CIRCUIT

Mains Transformer	Output Volts
Heater winding V1, V2, V3, V4, V5	4.2 r.m.s. (4 r.m.s. at output valve heater)
Heater winding V6	4 r.m.s.
Dial light winding	2.2 r.m.s.
H.T. winding	328-0-328 r.m.s.
Rectifier	Smoothed D.C. output 261 volts 55 m.a.

OPERATING CONDITIONS OF THE VALVES

All readings are with the sensitivity control at maximum, and with no signal being received.

Valve	Circuit	Operating Conditions
R.F. valve (V1), Ever Ready A50N (Metallized).	Anode voltage Anode current Screen voltage Screen current	261 volts 1.6 m.a. 56 volts 1.2 m.a.
F.C. and Osc. valve (V2) Ever Ready A80A (Metallized)	F.C. anode voltage F.C. anode current F.C. screen voltage F.C. screen current Oscillator anode voltage Oscillator anode current	261 volts 1.3 m.a. 53 volts 0.2 m.a. 98 volts 2.1 m.a.
I.F. valve (V3), Ever Ready A50N (Metallized).	Anode voltage Anode current Screen voltage Screen current	152 volts 4.3 m.a. 74 volts 1.9 m.a.
Duo-diode-triode valve (V4), Ever Ready A23A (Metallized).	Anode voltage Anode current	106 volts 2.1 m.a.
A.F. pentode valve (V5), Ever Ready A70C.	Anode voltage Anode current Screen voltage Screen current	234 volts 35 m.a. 261 volts 4.0 m.a.

If a particular reading should vary considerably from the above table, a systematic check of the circuits associated with the particular valve should be made. The following table will facilitate the testing of the components concerned.

CIRCUIT ANALYSIS

Valve	Circuit	Associated Components
R.F. valve, (V1).	Anode circuit Screen circuit Grid circuit Cathode circuit	L10. S3. C29, C23. R1, R12. C21. S2 aerial coil unit and associated condensers. R2, R3. C20, C22.
F.C. valve, (V2).	Anode circuit Screen circuit Control grid circuit Oscillator anode circuit Oscillator grid circuit Cathode circuit	Screened cable. T1. C12. R9, R10. C32, C38. C31. R4. C28. A.V.C. circuit. S4. Grid coil unit and associated condensers. R11. C36, C38. S6. Oscillator coil unit and associated condensers. C34. R8. S5, S7. Oscillator coil unit and associated condensers. R5, R6, R7. C24, C36.
I.F. valve (V3).	Anode circuit Screen circuit Grid circuit Cathode circuit	Screened cable. T2. C18, C26. R14, R15, R17, R18, R20. Tuning indicator. R12, R13. C25. T1. C13, C28. A.V.C. circuit. R16. C27.
Duo-diode-triode valve (V4).	Anode circuit Grid circuit Rectifier diode circuit A.V.C. diode circuit Cathode circuit	R27, R28. C44, C45. Screened cable. R24. C41. T2. C19. R21, R22, R23. C39, C40, C41. S9, S10. Screened cable to S9 and pick-up socket. C28, C42, C46. R19, R20, R29. R25. C43. S10.
A.F. Pentode valve (V5).	Anode and screen circuit Grid circuit Cathode circuit	T3. C48, C50. R32. R30, R31. C45, C47. R33. C49.

INDUCTANCES AND TRANSFORMERS

Circuit Indication	Specification	Location	Component Number
L1	Ultra short wave coupling coil	Fig. 6	78,013
L2	Short wave coupling coil	Fig. 6	78,013
L3	Short wave aerial coil	Fig. 6	78,013
L4	Ultra-short wave aerial coil	Fig. 6	78,013
L5	Long wave coupling coil, 168 ohms	Fig. 7	78,016
L6	Long wave aerial coil, 17.9 ohms	Fig. 7	78,016
L7	Long wave grid coil, 17.9 ohms	Fig. 7	78,016
L8	Medium wave aerial coil, 2.3 ohms	Fig. 7	78,015
L9	Medium wave grid coil, 2.3 ohms	Fig. 7	78,015
L10	R.F. anode choke, 6.2 ohms	Fig. 6	77,030
L11	Short wave grid coil	Fig. 6	77,030
L12	Ultra-short wave grid coil	Fig. 6	77,030
L13	Ultra-short wave osc. grid coil	Fig. 6	78,012
L14	Short wave osc. grid coil	Fig. 6	78,012
L15	Ultra-short wave osc. anode coil	Fig. 6	78,012
L16	Short wave osc. anode coil	Fig. 6	78,012
L17	Medium wave osc. grid coil, 1.7 ohms	Fig. 6	78,014
L18	Long wave osc. grid coil, 2.7 ohms	Fig. 6	78,014
L19	Long and medium wave osc. anode coil, 30.4 ohms	Fig. 6	78,014
L20 L21	Speaker voice coil Speaker hum balancing coil, 1.4 ohms	Fig. 11	85,014

INDUCTANCES AND TRANSFORMERS—*Contd.*

Circuit Indication	Specification	Location	Component Number
L22	Speaker field coil, 2,250 ohms	Fig. 11	85,014
T1	First I.F. transformer: primary 6 ohms; secondary, 6 ohms	Fig. 6	77,028
T2	Second I.F. transformer: primary 6 ohms; secondary, 6 ohms	Fig. 6	77,029
T3	Output transformer: primary, 700 ohms; secondary, 0.3 ohms	Fig. 7	77,515
T4	Mains transformer, primary tappings 100 v., 10.3 ohms; 110v., 11.1 ohms; 115-135v., 12.4 ohms; 136-150 v., 13.8 ohms; 200 v., 41 ohms; 210 v., 41.7 ohms; 215-235 v., 43 ohms; 236-250 v., 44.5 ohms	Fig. 8	77,017
	Mains transformer, secondaries A-B, 0.1 ohms; rectifier heater, 0.2 ohms; rectifier anodes, 498 ohms		

No resistance values are given for the short and ultra-short wave coils, as they are very low and can only be measured with laboratory apparatus. For normal fault checking, the resistance may be considered as a fraction of an ohm.

CONDENSERS

Circuit Indication	Specification	Location	Component Number
C1	Aerial circuit tuning condenser	Fig. 6	80,012
C2	F.C. grid circuit tuning condenser	Fig. 6	80,012
C3	Oscillator circuit tuning condenser	Fig. 6	80,012
C4	Long wave aerial coil trimmer	Fig. 6	80,000
C5	Medium wave aerial coil trimmer	Fig. 6	80,000
C6	Short wave aerial coil trimmer	Fig. 6	80,000
C7	Ultra-short wave aerial coil trimmer	Fig. 6	80,001
C8	Long wave grid coil trimmer	Fig. 6	80,000
C9	Medium wave grid coil trimmer	Fig. 6	80,000
C10	Short wave grid coil trimmer	Fig. 6	80,000
C11	Ultra-short wave grid coil trimmer	Fig. 6	80,000
C12	First I.F. transformer primary tuning condenser	Fig. 6	80,001
C13	First I.F. transformer secondary tuning condenser	Fig. 6	80,001
C14	Ultra-short wave osc. grid coil trimmer	Fig. 6	80,000
C15	Short wave osc. grid coil trimmer	Fig. 6	80,000
C16	Medium wave osc. padding condenser	Fig. 9	80,021
C17	Long wave osc. padding condenser	Fig. 9	80,001
C18	Second I.F. transformer primary tuning condenser	Fig. 6	80,001
C19	Second I.F. transformer secondary tuning condenser	Fig. 6	80,001
C20	0.1 mfd. tubular (double sealed) 450 v. D.C.	Fig. 9	68,060
C21	.04 mfd. tubular (double sealed) 450 v. D.C.	Fig. 9	68,061
C22 C23 C24 C25 C26 C27 C28	0.1 mfd. 0.1 mfd. 0.1 mfd. 0.1 mfd. 0.1 mfd. 0.1 mfd. 0.025 mfd.	condenser block 450 v. D.C.	Fig. 7	68,052
C29	.0001 mfd. flat type	Fig. 9	66,001
C30	Neutralizing condenser	Fig. 6	80,022
C31	.0001 mfd. flat type	Fig. 9	66,001
C32	.04 mfd. tubular (double sealed) 450 v. D.C.	Fig. 9	68,061
C33	2 mfd. electrolytic (tropical type) 350 v. D.C.	Fig. 7	67,020
C34	.0001 mfd. mica type	Fig. 9	66,966
C35	.0005 mfd. mica type	Fig. 9	66,976
C36	.04 mfd. tubular (double sealed) 450 v. D.C.	Fig. 9	68,061

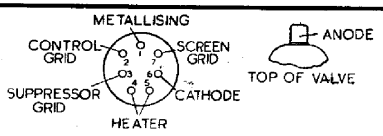
CONDENSERS—*Contd.*

Circuit Indication	Specification	Location	Component Number
C37	.0002 mfd. mica type	Fig. 9	66,975
C38	2 mfd. electrolytic (tropical type) 350 v. D.C.	Fig. 7	67,020
C39	.0001 mfd. mica type	Fig. 7	66,966
C40	.0001 mfd. mica type	Fig. 7	66,966
C41	.05 mfd. tubular (double sealed) 450 v. D.C.	Fig. 7	68,062
C42	.04 mfd. tubular (double sealed) 450 v. D.C.	Fig. 7	68,061
C43	10 mfd. electrolytic (tropical type) 20 v. D.C.	Fig. 7	67,021
C44	2 mfd. electrolytic (tropical type) 350 v. D.C.	Fig. 7	67,020
C45	.05 mfd. tubular (double sealed) 450 v. D.C.	Fig. 7	68,062
C46	.0001 mfd. mica type	Fig. 7	66,966
C47	.001 mfd. tubular (double sealed) 450 v. D.C.	Fig. 7	68,064
C48	.01 mfd. tubular (double sealed) 450 v. D.C.	Fig. 7	68,063
C49	50 mfd. electrolytic (tropical type) 12 v. D.C.	Fig. 7	67,022
C50	.01 mfd. tubular (double sealed) 450 v. D.C.	Fig. 7	68,063
C51 C52	8 mfd. 16 mfd.	dry electrolytic block type 450 v. D.C.	Fig. 8	67,016
C53	Medium wave osc. coil trimmer	Fig. 6	88,000
C54	Long wave osc. coil trimmer	Fig. 6	88,001

RESISTANCES

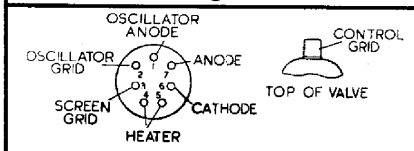
Circuit Indication	Specification	Colour Code: Body	Tip	Dot	Location	Component Number
R1	5,000 ohms ½ watt	Grn.	Blk.	Red	Fig. 9	71,922
R2	200 ohms ½ watt	Red	Blk.	Brn.	Fig. 9	71,943
R3	5,000 ohms ½ watt	Grn.	Blk.	Red	Fig. 9	71,922
R4	510,000 ohms ½ watt	Grn.	Brn.	Yel.	Fig. 9	71,944
R5	150 ohms ½ watt	Brn.	Grn.	Brn.	Fig. 7	71,969
R6	2,000 ohms sensitivity control (variable)	—	—	—	Fig. 7	82,007
R7	2,100 ohms ½ watt	Red	Brn.	Red	Fig. 7	71,982
R8	51,000 ohms ½ watt	Grn.	Brn.	Org.	Fig. 9	71,968
R9	40,000 ohms ½ watt	Yel.	Blk.	Org.	Fig. 7	71,918
R10	65,000 ohms 1 watt	Blue	Grn.	Org.	Fig. 7	71,983
R11	80,000 ohms ½ watt	Grey	Blk.	Org.	Fig. 7	71,939
R12	65,000 ohms 1 watt	Blue	Grn.	Org.	Fig. 7	71,983
R13	100,000 ohms ½ watt	Brn.	Blk.	Yel.	Fig. 7	71,910
R14	510,000 ohms ½ watt	Grn.	Brn.	Yel.	Fig. 7	71,944
R15	50,000 ohms ½ watt	Grn.	Blk.	Org.	Fig. 7	71,909
R16	200 ohms ½ watt	Red	Blk.	Brn.	Fig. 7	71,943
R17*	15,000 ohms ½ watt	Brn.	Grn.	Org.	Fig. 7	71,917
R18	14,500 ohms tuning indicator adjuster	—	—	—	Fig. 7	89,001
R19	510,000 ohms ½ watt	Grn.	Brn.	Yel.	Fig. 7	71,944
R20	2 megohms ½ watt	Red	Blk.	Grn.	Fig. 7	71,905
R21	110,000 ohms ½ watt	Brn.	Brn.	Yel.	Fig. 7	71,962
R22	110,000 ohms ½ watt	Brn.	Brn.	Yel.	Fig. 7	71,962
R23	11,000 ohms ½ watt	Brn.	Brn.	Org.	Fig. 7	71,963
R24	250,000 ohms volume control (variable)	—	—	—	Fig. 7	81,011

*12,000 ohms in some receivers.



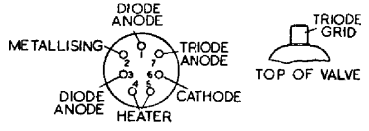
V1 & 3
TOP SIDE OF VALVE HOLDER
1H. R.F. PENTODE

Fig. 1



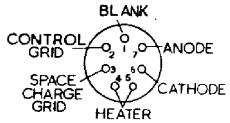
V2
TOP SIDE OF VALVE HOLDER
1H. OCTODE

Fig. 2



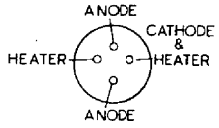
V4
TOP SIDE OF VALVE HOLDER
1H. DUO-DIODE-TRIODE

Fig. 3



V5
TOP SIDE OF VALVE HOLDER
1H. OUTPUT PENTODE

Fig. 4



V6
TOP SIDE OF VALVE HOLDER
RECTIFIER

Fig. 5

RESISTANCES—*Contd.*

Circuit Indication	Specification	Colour Code			Location	Component Number
		Body	Tip	Dot		
R25	1,000 ohms ½ watt ..	Brn.	Blk.	Red	Fig. 7	71,914
R26	510,000 ohms ½ watt ..	Grn.	Brn.	Yel.	Fig. 7	71,944
R27	25,000 ohms ½ watt ..	Red	Grn.	Org.	Fig. 7	71,908
R28	50,000 ohms ½ watt ..	Grn.	Blk.	Org.	Fig. 7	71,909
R29	510,000 ohms ½ watt ..	Grn.	Brn.	Yel.	Fig. 7	71,944
R30	260,000 ohms ½ watt ..	Red	Blue	Yel.	Fig. 7	71,945
R31	26,000 ohms ½ watt ..	Red	Blue	Org.	Fig. 7	71,974
R32	11,000 ohms ½ watt ..	Brn.	Brn.	Org.	Fig. 7	71,963
R33	150 ohms ½ watt ..	Brn.	Grn.	Brn.	Fig. 7	71,976

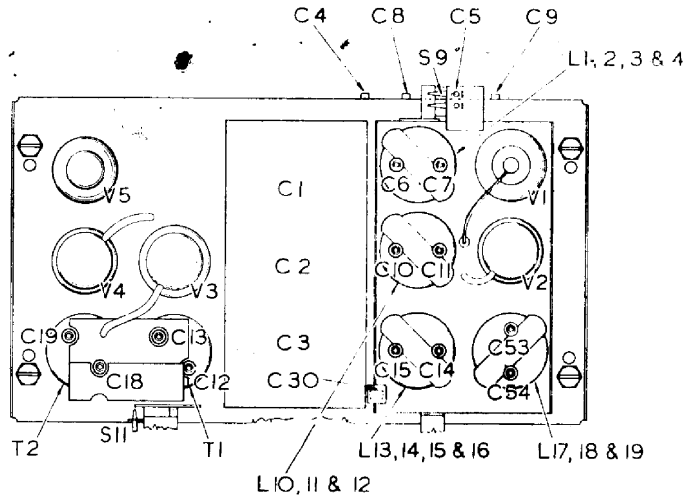


Fig. 6

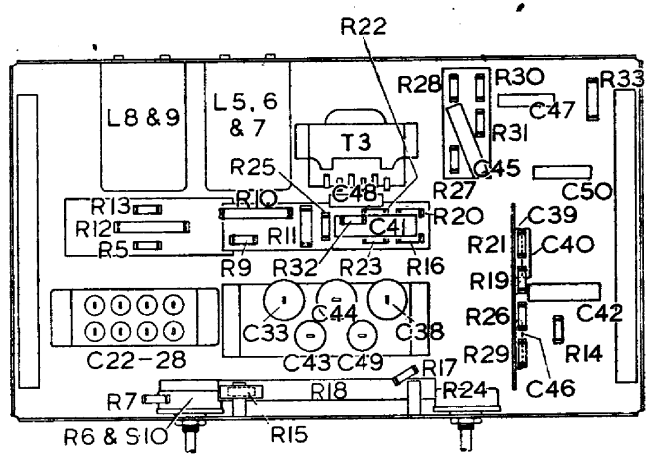
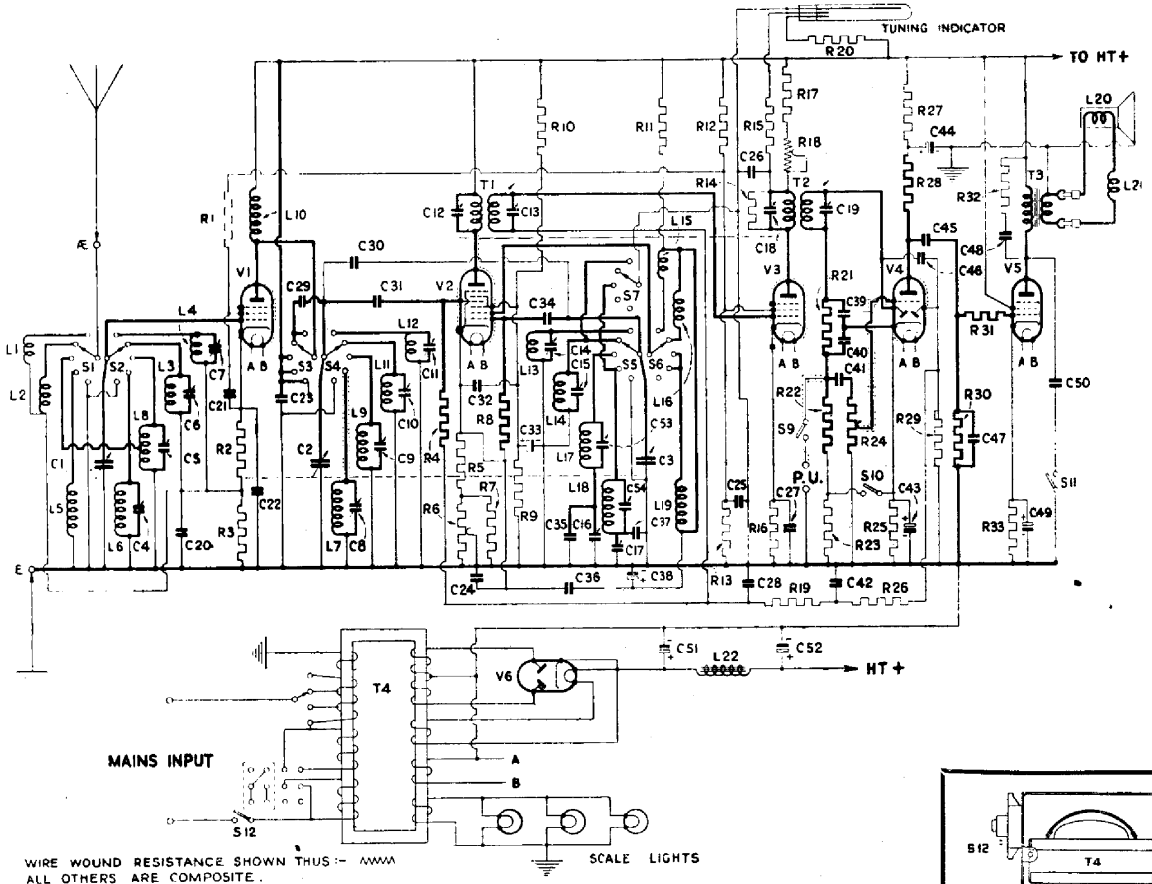


Fig. 7



WIRE WOUND RESISTANCE SHOWN THUS :- ∧∧∧∧
ALL OTHERS ARE COMPOSITE.
VALVE METALISING AND ALL SCREENED LEADS ARE EARTHED TO CHASSIS, EXCEPT V2 (TO CATHODE)

CIRCUIT DIAGRAM

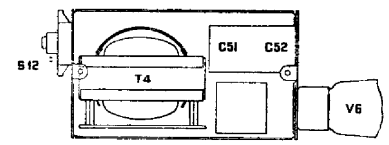


Fig. 8

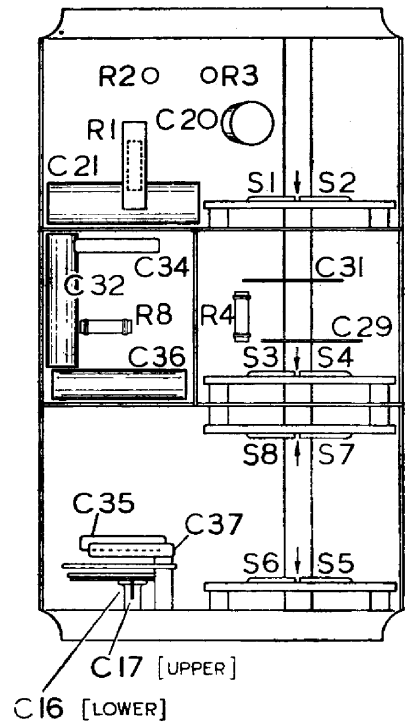
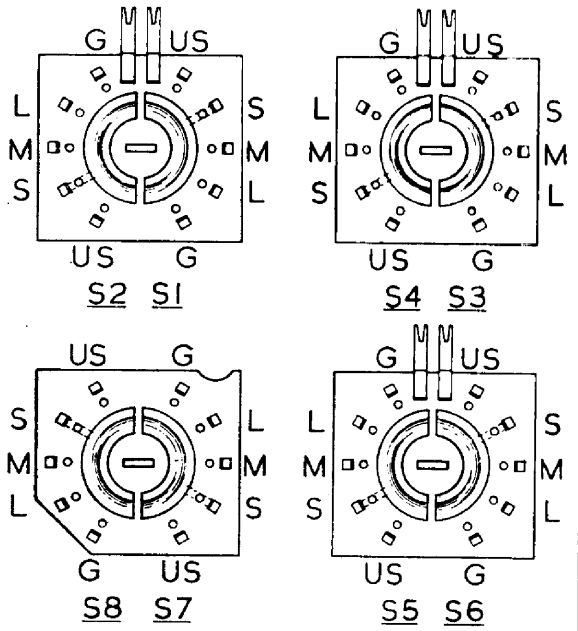


Fig. 9



VIEWS OF SWITCH SECTIONS LOOKING IN DIRECTION OF ARROWS (SEE FIG. 9)

Fig. 10

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REMOVING THE CHASSIS FROM THE CABINET

The knobs must first be removed by a direct forward pull. In the case of the tuning knobs, the larger one should be gripped firmly and the two pulled off together. Next the speaker plugs are pulled from their sockets, the plug is pulled out from the underside of the power pack and the cleats holding the wires to the plug loosened, and the field leads disconnected at the speaker end.

The four fixing bolts (A in fig. 11) accessible from the underside of the cabinet should now be removed, and the chassis partially withdrawn from the cabinet. It will be found easier to engage the screwdriver with the centre of the screws A, if the card base plate of the receiver is first removed, thus making the screws easily visible. The tuning indicator bulb holder will now be accessible and should be released from the cabinet by unscrewing the knurled headed fixing nut. The chassis may now be removed completely.

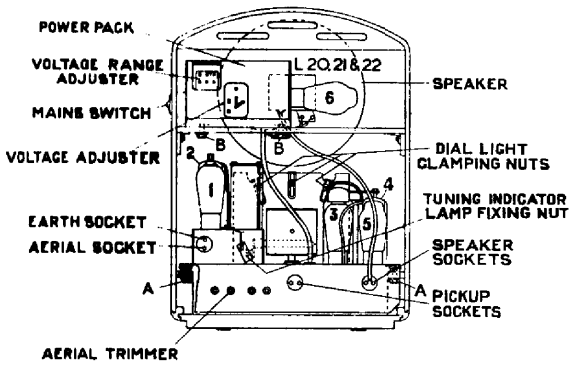

Fig. 11

The power pack may be removed by taking out the two fixing screws (B in fig. 11). Care should be taken not to damage the mains switch when withdrawing the power pack.

The loudspeaker may also be removed by taking out its four fixing bolts, and withdrawing it under the shelf supporting the power pack

It should be noted that to get access to the underside of the chassis it is only necessary to remove the card base plate of the cabinet, which is held in place by four wood screws.

REPLACING THE TUNING INDICATOR BULB

The chassis must first be partially withdrawn from the cabinet (see "Removing the chassis from the cabinet). It will not be necessary to undo the speaker field coil leads, as these are long enough to allow the chassis to be withdrawn sufficiently.

The tuning indicator bulb and holder can be released by unscrewing the knurled headed fixing nut.

The bulb is now taken from the holder, a replacement fitted and the bulb and holder replaced in position. The replacement should be a G.E.C. Tuneon indicator bulb (Part No. 71423). Now replace the chassis in the cabinet.

When a new bulb is fitted it will be necessary to readjust the slider on resistance R18 (see fig. 7). To do this, disconnect the aerial, lay the cabinet on its side and remove the base plate, if it has not already been removed.

Loosen the screw which fixes the position of the slider, and move the slider along the resistance till it is at the end nearer the sensitivity control R6. The glow in the tube should now be a minimum.

Now slowly move the slider back along the resistance towards the volume control R24, at the same time watching the indicator. The glow will move very slowly at first along the tube until a point is reached when it starts to move more quickly for a corresponding movement of the slider. This is the point at which the slider should be clamped, by tightening the fixing screw.

ADJUSTING THE TUNED CIRCUITS

Tuned circuits: (*a*) Tuned primary and secondary of I.F. transformers T1 and T2. (*b*) Tuned oscillator circuit. (*c*) Band pass input (two tuned stages) on medium and long waves. Tuned grid circuit of V1 and tuned grid circuit of V2 on short and ultra short waves.

All adjustments should be made with:

1. Volume control turned fully clockwise.
2. Selectivity control (V.S. knob) turned fully clockwise for long and medium wavebands, and fully anti-clockwise for short and ultra short wavebands.
3. Sensitivity control turned fully clockwise.

The applied signal must always be adjusted so that it is below the point at which the A.V.C. system commences to operate, as indicated by the tuning indicator.

I.F. CIRCUITS (V.S. Knob at Maximum).

The I.F. transformers should first be adjusted.

A modulated signal of 465 kcs. (645 metres) is applied between the frequency changer control grid and chassis via a .002 mfd. condenser. The lead to the control grid is removed and a ½ megohm resistance is connected between this valve terminal and the chassis. To stop the valve from oscillating a 0.25 mfd. condenser is connected between the oscillator anode and chassis.

An output meter is connected across the primary of the output transformer.

Adjust the trimmers in this order for a maximum reading on the output meter:

(*a*) T2 secondary trimmer C19. (*b*) T2 primary trimmer C18. (*c*) T1 secondary trimmer C13. (*d*) T1 primary trimmer C12.

R.F. AND OSCILLATOR CIRCUITS

The design of the receiver is such that any one waveband may be readjusted individually, so that it is only necessary to retrim the circuits connected with the waveband that is below standard.

THE LONG WAVEBAND (V.S. Knob at Maximum).

Apply a modulated signal of 876 metres (342.5 kcs.) to the aerial terminal, and switch the receiver to the long waveband, the gang being set at minimum capacity.

Adjust the following trimmers, in the stated order, for a maximum reading on the output meter:

(*a*) C54 (*b*) C8 (*c*) C4

Now set the dial pointer to 1,950 metres and apply a modulated signal of 1,950 metres (168 kcs.) and adjust the long wave padding condenser C17 for maximum output.

THE MEDIUM WAVEBAND (V.S. Knob at Maximum).

Apply a modulated signal of 198 metres (1,515 kcs.) to the aerial terminal, and switch the receiver to the medium waveband, the gang being set at minimum capacity.

Adjust the following trimmers, in the stated order, for a maximum reading on the output meter:

(*a*) C53 (*b*) C9 (*c*) C5

Now set the dial pointer to 520 metres and apply a modulated signal of 520 metres (168 kcs.) and adjust the medium wave padding condenser C16 for maximum output.

THE SHORT WAVEBAND (V.S. Knob at Minimum).

Apply a modulated signal of 30 metres (10 megacycles) to the aerial terminal, and switch the receiver to the short waveband, the indicating pointer being adjusted to 30 metres.

Adjust the following trimmers, in the stated order, for a maximum reading on the output meter.

(*a*) C15 (*b*) C10 (*c*) C6

Finally check the adjustment of these three trimmers.

THE ULTRA-SHORT WAVEBAND (V.S Knob at Minimum).

Apply a modulated signal of 14.3 metres (21 megacycles) to the aerial terminal, and switch the receiver to the ultra short waveband, the indicating pointer being adjusted to 14.3 metres.

Adjust the following trimmers, in the stated order, for a maximum reading on the output meter.

(*a*) C14. (*b*) C11. (*c*) C7.

Finally check the adjustment of these three trimmers.

NOTE:—When adjusting the oscillator trimmer on any waveband (C54 on L.W., C53 on M.W., C15 on S.W., or C14 on U.S.W.) more than one peak may be found. In this case the trimmer should always be adjusted to the peak nearer to minimum capacity.

If when checking any waveband at the higher end of the scale the tuning is low, it is probable that the oscillator trimming condenser has been adjusted to the wrong peak. In this case the particular waveband should be retrimmed.