LISSEN

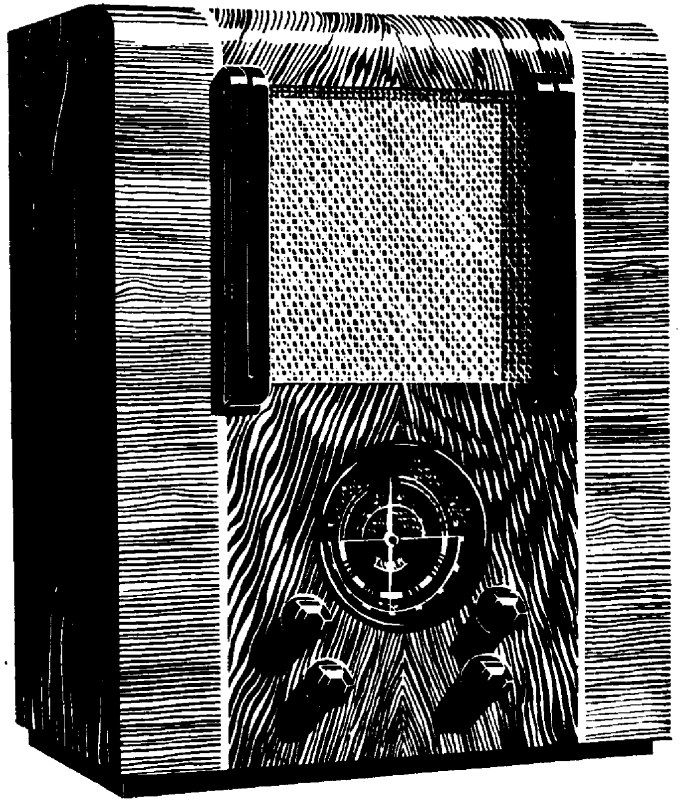
SERVICE MANUAL FOR THREE WAVE-BAND BATTERY OPERATED RECEIVER MODEL 8165

TECHNICAL SPECIFICATION

THE model 8165 three wave-band receiver is for use with an external elevated aerial, and is for battery operation. The wavebands covered are 18-54 metres, 202-560 metres and 900-2,000 metres. Three valves are employed. The first valve (V1) is a variable-mu R.F. pentode which functions as a R.F. amplifier on all wavebands. It is preceded by a tuned grid circuit which is inductively coupled to the aerial coils.

Volume control is effected by varying the bias on the grid of the variable-mu pentode, thus changing its amplification.

The detector valve (V2) is a triode which functions as a grid rectifier, and is coupled to the first valve by a tuned grid circuit.



Reaction is provided by the coil L8 on short waves and by L9 on the medium and long waves. It is controlled on the short waves by the condenser C6, and on the medium and long waves by C7. These two condensers are both operated by the same spindle.

The detector stage is coupled by a transformer to the output valve (V3), a high slope A.F. pentode, which in turn is transformer coupled to the permanent magnet moving coil speaker.

A tone correcting network is employed and is so arranged that the high frequency response can be varied by the two point tone control switch S8.

SERVICE DATA FOR THREE WAVE-BAND BATTERY OPERATED RECEIVER MODEL 8165

GENERAL REMARKS

In the event of trouble check the following details :—

(1) Batteries : L.T. and H.T., and confirm that the leads are correctly connected.

(2) Valves : (*a*) Check characteristics, or (*b*) substitute valves known to be good.

(3) Locate trouble to a particular stage by : (*a*) Checking valve operating conditions, or (*b*) Stage by stage test with an oscillator, *i.e.*, output stage, detector stage and R.F. stage.

(4) Locate faulty components by testing with a suitable meter or by substitution, as the case may be.

The following charts are given in the order they will usually be required.

Those readings given in columns X and Y are obtained with new (136.5 volts including G.B.) and partially discharged (110 volts including G.B.) H.T. batteries respectively.

The battery plugs should be placed in the sockets indicated below :—

Battery Leads	Battery Sockets
Red lead (H.T. +)	136.5 volts
Yellow lead (H.T. +) ..	See notes below
Black lead (H.T. —) ..	12 volts
Brown lead (G.B. —) ..	0 volts

POSITION OF YELLOW BATTERY PLUG

The anode current of a pentode is controlled by the auxilliary grid voltage, which is applied in this case through the yellow battery lead. The auxilliary grid voltage required for the correct anode current will vary with individual valves. For this reason the A.F. pentode valve is marked with a letter, either A, B, C or D, and this letter represents a certain H.T.+ tapping.

The letter A indicates 135 volts.

" " B " 127½ "

" " C " 120 "

" " D " 112½ "

The yellow battery lead should be connected into the appropriate socket as indicated by the above table.

If at any time it is necessary to replace the output valve by one that is not lettered, the correct position for the yellow battery plug may be found as follows : remove the first two valves from their sockets and insert a milliammeter in the Red H.T. lead. Now switch on the set and adjust the position of the yellow plug until the milliammeter measures as nearly as possible to 4.5 milliamps. A new H.T. battery of 136½ volts (including G.B.) should be used for this adjustment.

CIRCUIT ANALYSIS

Valve	Circuit	Associated Components
R.F. valve (V1) Ever Ready K50M (Metallized)	Anode circuit	L6, C12. Red H.T. lead and plug.
	Screen circuit	R5, C11. Red H.T. lead and plug.
	Grid circuit	L2, L4 and L5. C1, C3, C5 and C10. R2, R1, R7, R8. S2, S3, S9. Brown G.B. lead and plug.
Detector valve (V2) Ever Ready K30C (Metallized).	Anode circuit	L8, L9. R5. L12. T1 primary. R6. C15, C13, C6, C7. S5. Red H.T. lead and plug.
	Grid circuit	L7, L10, L11. C2, C4, C14. R4. S4, S6, S7.
Output valve (V3) Ever Ready K70D	Anode circuit	T2 primary. C16, R9. S8. Red H.T. lead & plug.
	Aux. grid circuit ..	Yellow H.T. lead and plug.
	Grid circuit	T1 secondary. R7, R1, R6. S9. Brown G.B. lead and plug.

OPERATING CONDITIONS OF THE VALVES

All readings are taken with volume control at maximum and with no reaction. (All voltages are measured from chassis.)

Valve	Circuit	Column X. (New H.T.)	Column Y. (Partially discharged H.T.)
R.F. valve, Ever Ready K50M (Metallized).	Anode voltage	123 volts	102 volts
	Anode current	1.2 m.a.	0.9 m.a.
	Screen voltage	80 volts	68 volts
	Screen current	0.4 m.a.	0.3 m.a.
Det. valve Ever Ready K30C (Metallized).	Anode voltage	64 volts	51 volts
	Anode current	3.1 m.a.	2.4 m.a.
Output valve Ever Ready K70D	Anode voltage	119 volts	100 volts
	Anode current	4.4 m.a.	3.5 m.a.
	Aux. grid voltage	Same as yellow battery plug	
	Aux. grid current	0.5 m.a. (approx.)	0.4 m.a. (approx.)
Total H.T. current consumption		9.6 m.a.	7.5 m.a.
Total L.T. current consumption		0.48 amps.	

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 tables will facilitate the testing of the components concerned.

NOTE.—All voltages are measured with a 1,000 ohm per volt meter.

INDUCTANCES AND TRANSFORMERS

Circuit Indication	Specification		Location	Component Number
L1 ..	Short wave aerial coupling coil 0.7 ohms... ..	Aerial coil unit	Fig. 4	78,029
L2 ..	Short wave aerial coil			
L3 ..	Medium and long wave aerial coupling coil 30.6 ohms			
L4 ..	Medium wave aerial coil 2.5 ohms			
L5 ..	Long wave aerial coil 11 ohms ..			
L6 ..	R.F. choke 560 ohms		Fig. 5	79,015
L7 ..	Short wave grid coil	Grid coil unit	Fig. 4	78,030
L8 ..	Short wave reaction coil 0.6 ohms			
L9 ..	Medium and long wave reaction coil 6.7 ohms ..			
L9 ..				
L10 ..	Medium wave grid coil 3.7 ohms			
L11 ..	Long wave grid coil 12.5 ohms ..			
L12 ..	Detector choke 550 ohms ..		Fig. 5	79,008
L13 ..	Speaker voice coil 1.2 ohms..		Fig. 6	85,004
T1 ..	Intervalve transformer, primary 1,300 ohms ; secondary 14,000 ohms		Fig. 5	77,011
T2 ..	Output transformer, primary, 830 ohms ; secondary 0.8 ohms		Fig. 5	77,032

No resistance values are given for the 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 to be zero.

CONDENSERS

Circuit Indication	Specification		Location	Component Number
C1 ..	Aerial tuning condenser	Two Gang condenser	Fig. 4	80,031
C2 ..	Grid tuning condenser			
C3 ..	Aerial tuning condenser trimmer ..			
C4 ..	Grid tuning condenser trimmer			
C5 ..	Short wave aerial coil trimmer		Fig. 4	80,000
C6 ..	Reaction condenser (short wave) ..	Dual reaction condenser	Fig. 5	80,027
C7 ..	Reaction condenser (Medium and long wave)			
C8 ..	Aerial series condenser (Twisted wires)		Fig. 5	
C9 ..	.0003 mfd. mica		Fig. 5	66,968
C10 ..	.1 mfd. tubular 350 volt D.C. working		Fig. 5	68,020
C11 ..	.1 mfd. tubular 350 volt D.C. working		Fig. 5	68,020
C12 ..	50 mmfd. mica		Fig. 5	66,036
C13 ..	.0002 mfd. mica		Fig. 5	66,967
C14 ..	50 mmfd. mica		Fig. 5	66,036
C15 ..	.5 mfd. tubular 350 volts D.C. working		Fig. 5	68,019
C16 ..	.01 mfd. tubular 450 volts D.C. working		Fig. 5	68,005

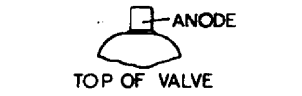
RESISTANCES

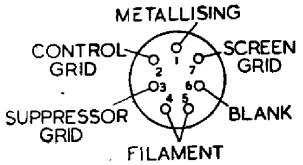
Circuit Indication	Specification	Colour Code			Location	Component Number
		Body	Tip	Dot		
R1	Volume control 3,000 ohms				Fig. 4	81,021
R2	110,000 ohms (½ watt) ..	Brn.	Brn.	Yel.	Fig. 5	71,962
R3	40,000 ohms (½ watt) ..	Yel.	Blk.	Org.	Fig. 5	71,918
R4	2.1 megohms (½ watt) ..	Red	Brn.	Grn.	Fig. 5	71,902
R5	5,000 ohms (½ watt) ..	Grn.	Blk.	Red	Fig. 5	71,922
R6	11,000 ohms (½ watt) ..	Brn.	Brn.	Org.	Fig. 5	71,963
R7	430 ohms (½ watt) ..	Yel.	Org.	Brn.	Fig. 5	71,992
R8	2,200 ohms (½ watt) ..	Red	Red	Red	Fig. 5	71,993
R9	31,000 ohms (½ watt) .. (on T.2.)	Org.	Brn.	Org.	Fig. 5	71,965

SWITCH POSITIONS

Short Wave	Medium Wave	Long Wave
S1, S2, S3, S4, S7. Closed.	S3, S5, S6, S7, Closed.	S5 and S6. Closed
S5, S6. Open	S1, S2 and S4. Open	S1, S2, S3, S4, S7. Open

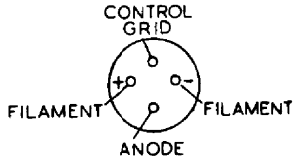
S9, S10, S11 are closed when set is "on."
S9, S10, S11 are open when set is "off."
S8 Tone control switch.





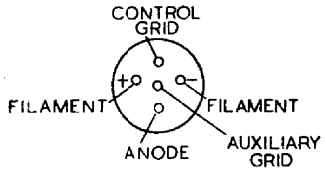
V1
TOP SIDE OF VALVE HOLDER
BATTERY R.F. PENTODE

Fig. 1



V2
TOP SIDE OF VALVE HOLDER
BATTERY TRIODE

Fig. 2



V3
TOP SIDE OF VALVE HOLDER
BATTERY OUTPUT PENTODE

Fig. 3

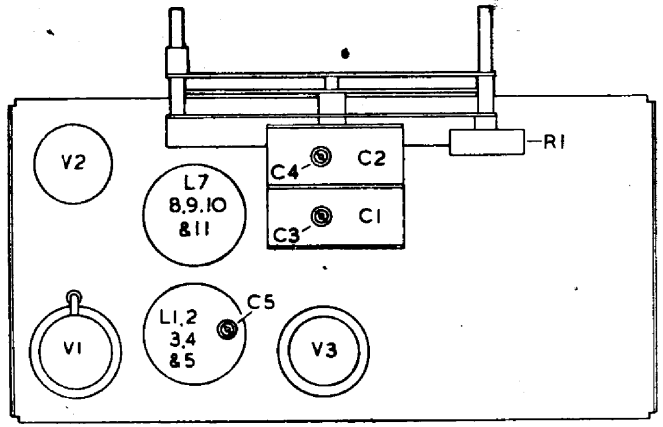


Fig. 4

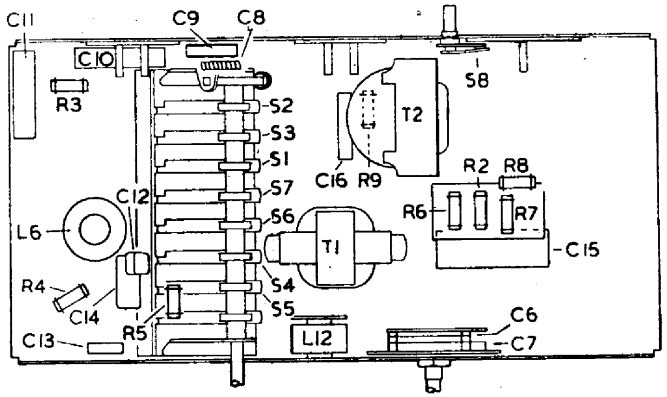
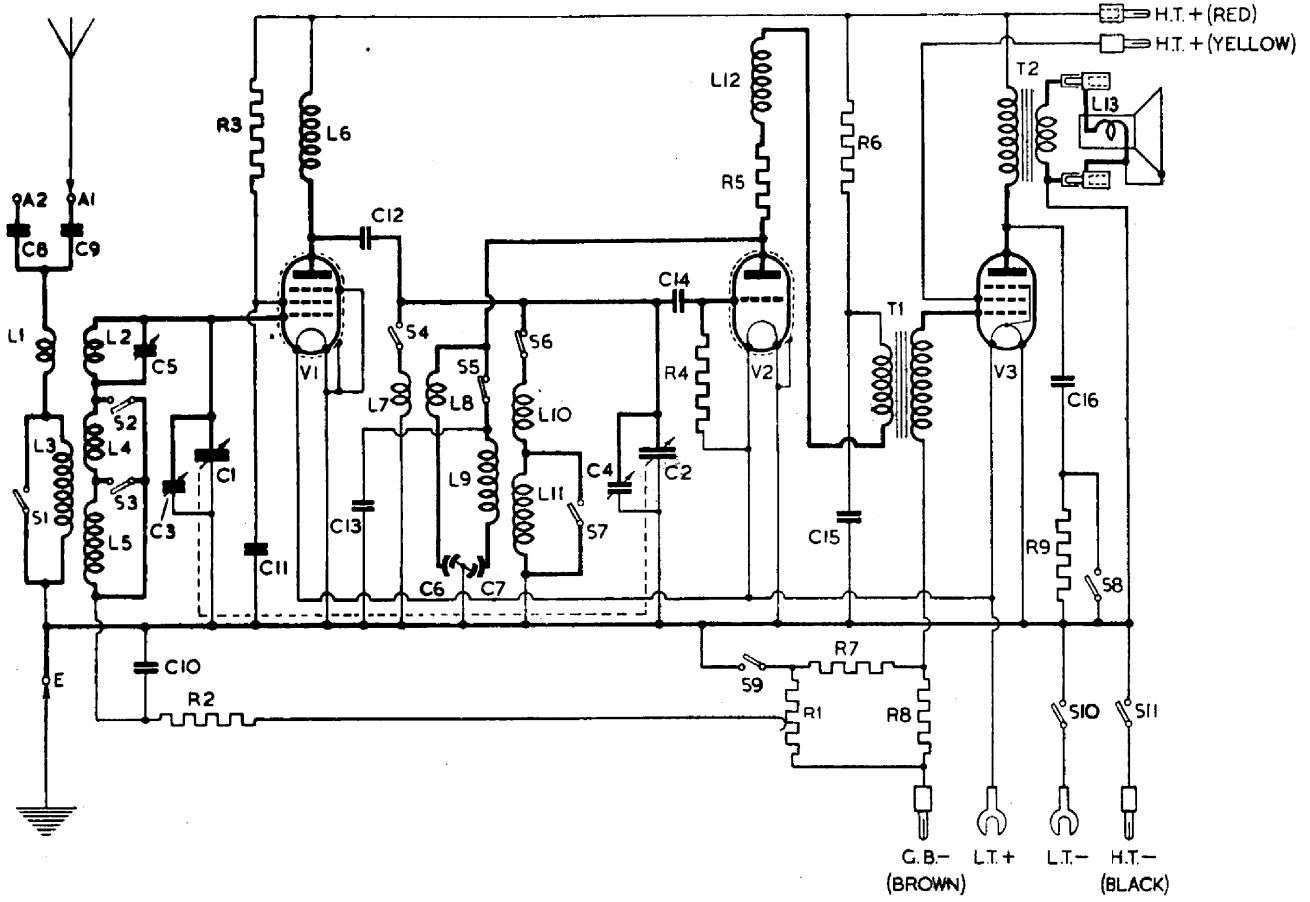


Fig. 5



CIRCUIT DIAGRAM

REMOVING THE CHASSIS FROM THE CABINET

The knobs must first be removed by a direct forward pull. Next the speaker plugs are pulled from their sockets, and all battery leads disconnected and the batteries removed. Now take out the two wood screws which hold the on-off switch in place, and loosen the cleat which holds the L.T. battery leads to the cabinet.

The four fixing bolts (A in Fig. 6), accessible from the underside of the cabinet should now be removed, and the chassis withdrawn from the cabinet.

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

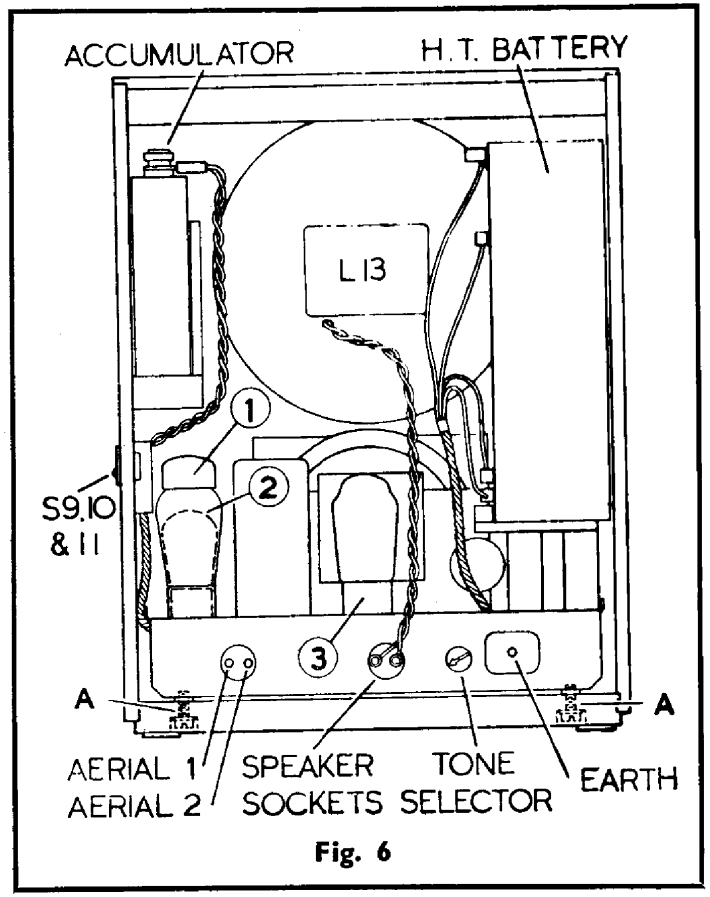


Fig. 6

ADJUSTING THE GANGED CONDENSER AND DIAL POINTER

Rotate the gang till the pointers are at the higher wavelength ends of the scales. Push a flat ended rod through the hole in the side of the gang cover and against the vanes. Now rock the vanes by means of the rotor drive until it is felt that the rotors are fully in mesh. If the pointers do not coincide with the horizontal line dividing the scale, release the centre fixing screw and adjust them to this position.

ADJUSTING THE RADIO FREQUENCY CIRCUITS

The "A1" aerial socket should be used for all these adjustments. Rotate the gang till the pointers are at the lower wavelength ends of the scales, and switch the receiver to the medium waveband. The volume control should be turned to "maximum" and the reaction control to "minimum." Apply a modulated signal of 202 metres to the aerial terminal "A1" and adjust the trimming condensers C3 and C4 in turn for maximum output.

Now switch the receiver to the short waveband and apply a modulated signal of 18.2 metres to the aerial terminal "A1."

Next adjust the reaction condenser until the receiver is just below the point of oscillation, still leaving the volume control at maximum. Finally adjust the short wave aerial circuit trimmer C5 for maximum output, and if necessary, re-adjusting the reaction condenser to keep the receiver just below the oscillation point.

NOTES

This space is reserved for recording any further information you may find useful. If advice is required at any time the Lissen Service Dept. will be pleased to help you.