

E·M·I SERVICE LTD.

**"HIS MASTER'S VOICE" 1103, 1300
MARCONIPHONE 878, 883**

SERVICE MANUAL

5-Valve Superhet Press-button Table & Console Models

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SPECIFICATION

PHYSICAL.

	Model 1103.	Model 1300.	Model 878.	Model 883.
Height	20½ ins.	35¾ ins.	20 ins.	35¾ ins.
Width	17¾ "	18½ "	17¾ "	18½ "
Depth (overall)	10½ "	13 "	10½ "	13 "
Net Weight	36 lb.	51 lb.	35 lb.	51 lb.
Gross Weight	45 "	70 "	44 "	70 "

SUPPLY.

195 to 255 volts 50—100 cycles/second.
Consumption 80 volt/amps, 70 watts at 225 volts.
Connect only to supply points protected with 2 ampere fuses.

WAVE-RANGES.

Manual—			
Short Waves	13.8	— 50 metres.
Medium Waves	196	— 580 "
Long Waves	726	— 2,000 "
Press Buttons—			
2 at 1,200—2,100 metres	...	Nos. 2 and 3.	
3 at 310— 600 "	...	Nos. 4, 5 and 6.	
3 at 195— 340 "	...	Nos. 7, 8 and 9.	

SPEECH OUTPUT.

Maximum 3 watts.

The setting of the press-button trimmers must be done on the customer's mains, after the instrument has been set to the correct mains voltage. Allow 10 to 15 minutes for the receiver to warm up before making adjustments.

VALVES.

Marconi X65 (V1) ...	Frequency-changer.
" KTW63 (V2) ...	I.F. Amplifier.
" DH63 (V3) ...	Second Detector, A.V.C., L.F., and A.F.C. Amplifier.
" KT63 (V4) ...	Output Valve.
" U50 (V5) ...	H.T. Rectifier.
Pilot Lamps, 2 at 6.5 v.	Part No. 22704H.

LOUDSPEAKER AND EXTRA LOUDSPEAKERS.

No. 20277B.

The circular cone loudspeaker with the energised field used as an L.F. smoothing choke (CK1) in the positive supply lead. For resistance data see circuit on page 7. One or two extra low resistance speakers may be connected to the sockets provided, and should be adjusted to a total impedance of as near as possible to 5 ohms. To silence the receiver loudspeaker remove the plug from the third socket in the E.L.S. panel.

CONNECTING A PICK-UP.

A high resistance pick-up may be connected to the sockets provided, **but both plugs must be removed to revert to radio reception.** The volume and tone controls are operative on gramophone. Pick-ups fitted with three leads should have the screening lead and one of the other leads joined to one plug, which should be inserted in the lower socket.

CIRCUIT DESCRIPTION

AERIAL CIRCUIT.

High impedance inductive coupling is employed on all bands to high efficiency tuned circuits. The medium and long wave coils are iron-cored (L4 and L8) and image rejection on LW is provided by L5, L6 and C1. The push-button circuits employ the same MW and LW inductances (L4 and L8) as for manual tuning but pre-set condensers (TC3—8 and TC15, TC16) are switched across them instead of the variable condenser VCI.

FREQUENCY CHANGER.

A triode-hexode (X65) valve is used. Inductive and capacitive coupled iron-cored circuits (L11, L12) are used on MW and LW to produce oscillations, whilst on short waves coupled coils (L9, L10) are used; the intermediate frequency is 465 kc. For the push-button ranges a fixed capacity (C12, C47) has pre-set inductances (L13—18 and L24, L25) switched in a capacity (C19) coupled circuit.

I.F. AMPLIFIER.

The first iron-cored I.F. transformer (L19, L20) of very stable characteristics is in the anode circuit of

V1 and couples to the KTW63 I.F. amplifier. This valve has I.F. transformer (L21, L22) coupling it to the second detector valve.

SECOND DETECTOR.

The second detector is V3. A tuned secondary feeds the signal diode which has a load resistance R10, R11, with the signal tapped off through C22 to the volume control VR1. The A.V.C. diode is fed through C25 and the voltage produced is applied to V1 and V2.

OUTPUT STAGE.

Resistance capacity (R15, C28) coupling is employed between the DH63 and the KT63 output valve. The latter has a tone control circuit (C29, VR2) connected between the anode and grid and feeds the loudspeaker through the usual output transformer T2.

RECTIFIER.

A full wave U50 rectifier supplies H.T. current for all valves. Smoothing is by means of the L.S. field in conjunction with electrolytic condensers C33, C32.

PRELIMINARY TESTS

1. **H.T. Current Test.**—The voltage between tags 3 and 4 on the L.S. panel should be approximately 95 v. Higher voltage indicates excessive H.T. current possibly caused by a short circuit on some part of the H.T. feed line, soft or unbiased output valve V4. Low voltage indicates insufficient current, suggesting faulty feed resistances, valves, etc., or L.S. feed coil (CK1).

2. **L.F. Test.**—Gramophone reproduction O.K. or loud hum when top pick-up socket or top grid V3 (DH63) is touched, volume fully up, earth disconnected. Results on "gram" but not radio indicate a fault in VI. 2 or possibly V3. If no result is obtained from this test connect a small battery or ohmmeter across the extra L.S. sockets. A definite "click" indicates that the speech coil circuit is continuous.

3. **H.F. Test.**—Elimination of the earlier parts of the circuit can be done by contacting the aerial lead on to fixed vanes VCI. This eliminates the coupling circuit L1, 3, 5, 6 and 7, and medium wave results should be obtained but with whistles and loss of selectivity. Alternatively correct operation on push-button stations but not manual obviously suggests faulty gang condenser, switching or tuning coils. Bear in mind, however, that the M.W. and L.W. tuning and coupling coils are in use during push-button operation.

4. **Oscillator Test.**—No radio results may be brought about by failure of VI to oscillate. To check this connect a voltmeter across R3 and note normal reading and reading with VC2 short circuited. The latter reading will be considerably greater if the valve is oscillating. For push-button check short CI9.

CONDENSER DRIVE

Note: The following instructions apply also to Model 1102/874

The special wire drive fitted to this model should not often require renewal, but if it is necessary it is essential to use only the correct wire (Specification S2447 Code No. 390/04001). Approximately 43 inches will be required for one drive.

1. Form a loop with an opening just over $\frac{1}{8}$ inch in diameter at one end. It will be found that the twisted part of the wire can be readily soldered.

2. Form a similar loop at the other end of the wire so that the distance from loop end to loop end is as near as possible 3 ft. $4\frac{1}{4}$ inches.

3. Remove scale and pointer, and turn condenser to maximum position.

4. Pass one end of the wire through the right hand hole in the condenser drive disc and fasten spring on to the loop.

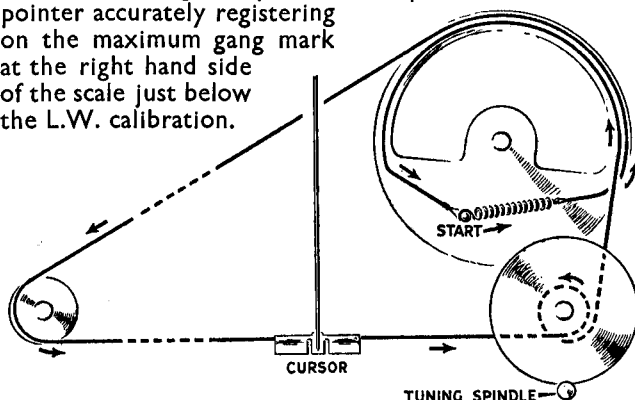
5. Hook coils of spring on to tongue of metal pressed out of disc where wire passes through so that the spring is held. Do not yet hook other end of spring on to anchor pin.

6. Wind the wire round pulleys exactly as shown in the diagram and hook loop end on to anchor pin.

7. Now tension drive by removing spring from temporary fastening and hooking other end on to anchor pin.

8. Replace pointer but do not yet tighten on to drive wire.

9. Replace scale, and ensuring that condenser is at maximum, tighten pointer clamp on to wire with pointer accurately registering on the maximum gang mark at the right hand side of the scale just below the L.W. calibration.



H.F. TESTS AND ADJUSTMENTS

Do not attempt to make any adjustment to the circuits of this receiver unless you have adequate equipment as outlined below. All necessary oscillators, trimming tools, etc., essential for the correct adjustment of H.F. and I.F. circuits can be obtained from:—

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This model is fitted with a coil unit comprising all tuning coils, the press-button switch and all trimmer condensers. The use of fully adjustable inductances on all wave-bands greatly simplifies ganging.

In general, the iron-cored inductances are very stable, and unless repair work or replacement has been carried out on the coil itself it is rarely necessary to re-adjust these inductances when ganging. The usual symptom of mis-matched inductances is low sensitivity at the

high end of the wave-scale. In the event of it being thought necessary to adjust inductances it is important first to scrape or melt the wax away from the thread on the L.W. aerial coil, and from the sides of the M.W. aerial coil.

Owing to the fact that the M.W. and L.W. aerial tuning coils are also used as the push-button inductances any adjustment to these coils must be followed by a check of all push button aerial circuit trimmers.

GANGING

Always follow any adjustment to the I.F. trimmers with complete R.F. alignment (L.W., M.W., S.W. and **Push Buttons**) but where work has been done or sensitivity is low on a specific band it is necessary only to regang this band.

A screened oscillator (30—2,000 metres) with an attenuator, an output meter, a trimming screwdriver, a S.W. inductance trimming tool and, if the M.W. aerial inductance is to be done, a special tool (Stock No. Q 2527) are required.

In carrying out all ganging operations the input to the receiver from the oscillator must be kept low and progressively reduced as the circuits are brought into line so that the output meter reading does not exceed 500 mW or 1.3 volts. The output meter should be connected between the anode V4 (KT63) and chassis if it is of the high resistance type, or across the E.L.S. sockets if a low resistance A.C. voltmeter is being used.

I.F. GANGING.

Set receive to L.W., tone control fully anti-clockwise, volume control and gang condenser to maximum. Short circuit VC2, and inject signal to V1 top cap (via a 0.1 mfd. condenser) leaving grid connexion in position, and chassis.

1. Tune oscillator exactly to 465 kc. (645.2 metres).
2. Adjust TC11, TC12, TC13, and TC14 in that order for maximum output.
3. Check adjustments in the same order.

SETTING OF TUNING POINTER.

Before commencing R.F. ganging operations it is essential to check the position of the wave-scale and pointer in relation to the gang condenser.

1. Turn gang condenser to maximum.
2. See that the pointer registers accurately on the small mark just below the L.W. calibration line in the bottom right-hand corner of the scale.
3. If adjustment is necessary slacken the two grub screws securing the drive disc to the condenser spindle.

SHORT WAVES.

Connect oscillator to A and E sockets via a S.W. dummy aerial device. Set receiver to S.W., volume fully up, and tone fully anti-clockwise.

1. Inject signal of 50 metres (6 Mc.), set tuning pointer to 50 metres and adjust loop in L10 for maximum output.
2. Set oscillator and receiver (by scale) to 30 metres (10 Mc.) and adjust loop of L2 for maximum output.

3. Repeat 1 and 2 several times if necessary until no further increase in output can be obtained.

MEDIUM AND LONG WAVES.

Set receiver to M.W., other control as for Short Waves. See "Setting of Tuning Pointer" above. Oscillator connected to A and E sockets.

1. Tune receiver to exactly 225 metres (1,333.3 kc.) by scale, and inject signal of this frequency from oscillator.
2. Adjust TC9 and TC1 for maximum output.
3. Set oscillator and receiver (by scale) to 530 metres (566 kc.) and adjust the cores of L11 and L4 for maximum. Unless either of these coils has been changed very little adjustment should be necessary.
4. Repeat operations 1, 2 and 3.
5. Set oscillator and receiver to 850 metres (352.9 kc.) and adjust TC10 and TC2 for maximum output.
6. Set oscillator and receiver to 1,900 metres (157.9 kc.) and adjust L12 and L8 for maximum output.
7. Repeat operations 5 and 6.

After ganging do **not** alter position of pointer in relation to the gang condenser. If the above instructions have been correctly carried out the calibration should be satisfactory.

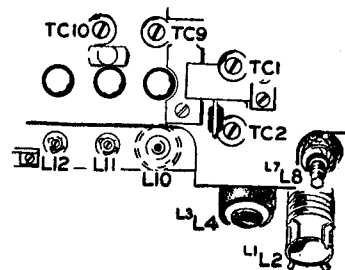
Remember to check adjustment of all push-button trimmers.

CHANGING PUSH-BUTTON STATIONS

The method of adjusting the trimmers to different stations is clearly given in the Instruction Card. Bear in mind that the buttons cover only the ranges given on page 2 of this Manual.

To ensure complete confidence in the operation of the receiver, the short time spent on checking over the push-button trimmer adjustments will not be wasted.

Allow 10 to 15 minutes for the receiver to warm up before making adjustments.



Resistance values \pm 20 per cent.

CONTINUITY CHECKS

Component.	Measured.	Switch.	Resistance.
L1, 3, 5, 6 and 7	Aerial and earth sockets	—	38.0 ohms. (L1 5.5 ohms.) (L3 0.6 ohms.) (L5 18.0 ohms.) (L6 10.0 ohms.) (L7 4.0 ohms.)
L2, L4, L8	Top grid V1 (X65) and C2	SW MW LW	L2 0.1 ohms. L4 2.0 ohms. L8 9.5 ohms.
L9	Across ends	—	0.6 ohms.
L10, L11, L12, R33	Fixed vanes VC2 and C7	SW MW LW	L10 0.1 ohms. L11 4.5 ohms. L12, R33 1.011 ohms. (L12, 11.0 ohms.)
L13, 14, 15, 16, 17, 18, 24, 25	Across ends	—	L13, 24 and 25 4.0 ohms (each). L14, 15 and 16 5.0 ohms (each). L17 and 18 10.5 ohms (each).
L19	Tag 3 L.S. panel and anode socket V1 (X65)	—	6.0 ohms.
L20	Across ends... ..	—	6.0 ohms.
L21	Tag 3 L.S. panel and anode socket V2 (KTW63)	—	4.0 ohms.
L22, R10, R11	Diode and cathode sockets V3 (DH63) ...	—	0.6 megohm. (L22, 4.0 ohms.)
For other grid resistances	See Valve Table	—	
For transformers, chokes, etc.	See Circuit Diagram	—	

VALVE TABLE

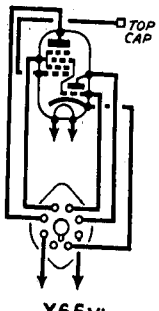
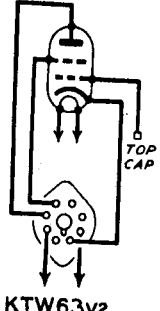
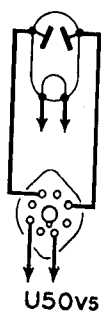
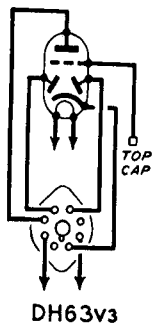
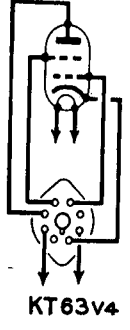
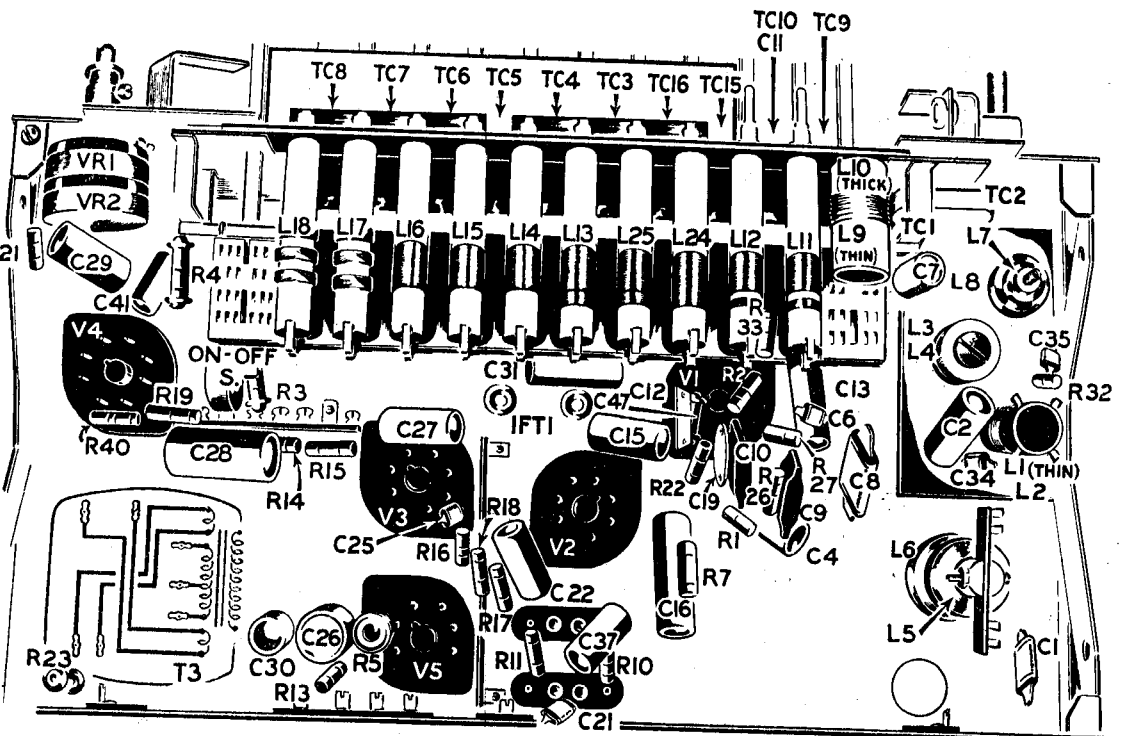
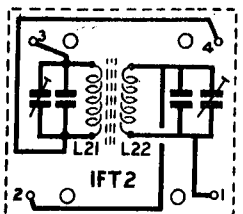
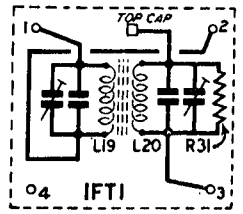
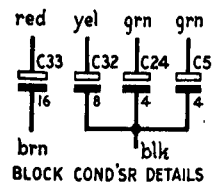
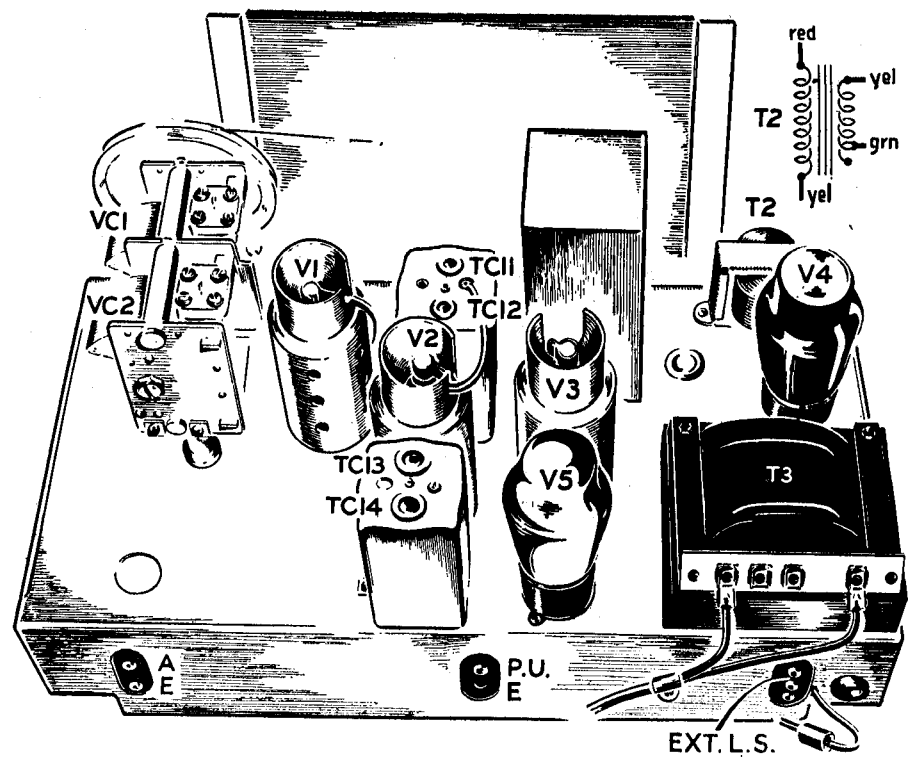
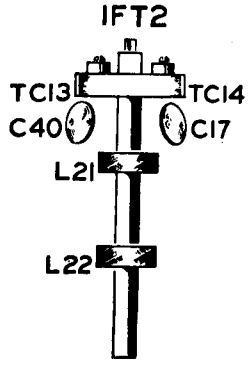
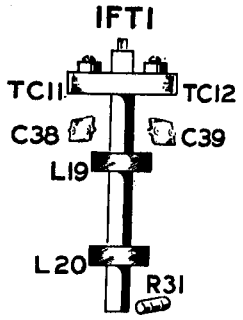
(Voltage, Current and Resistance Tests.)

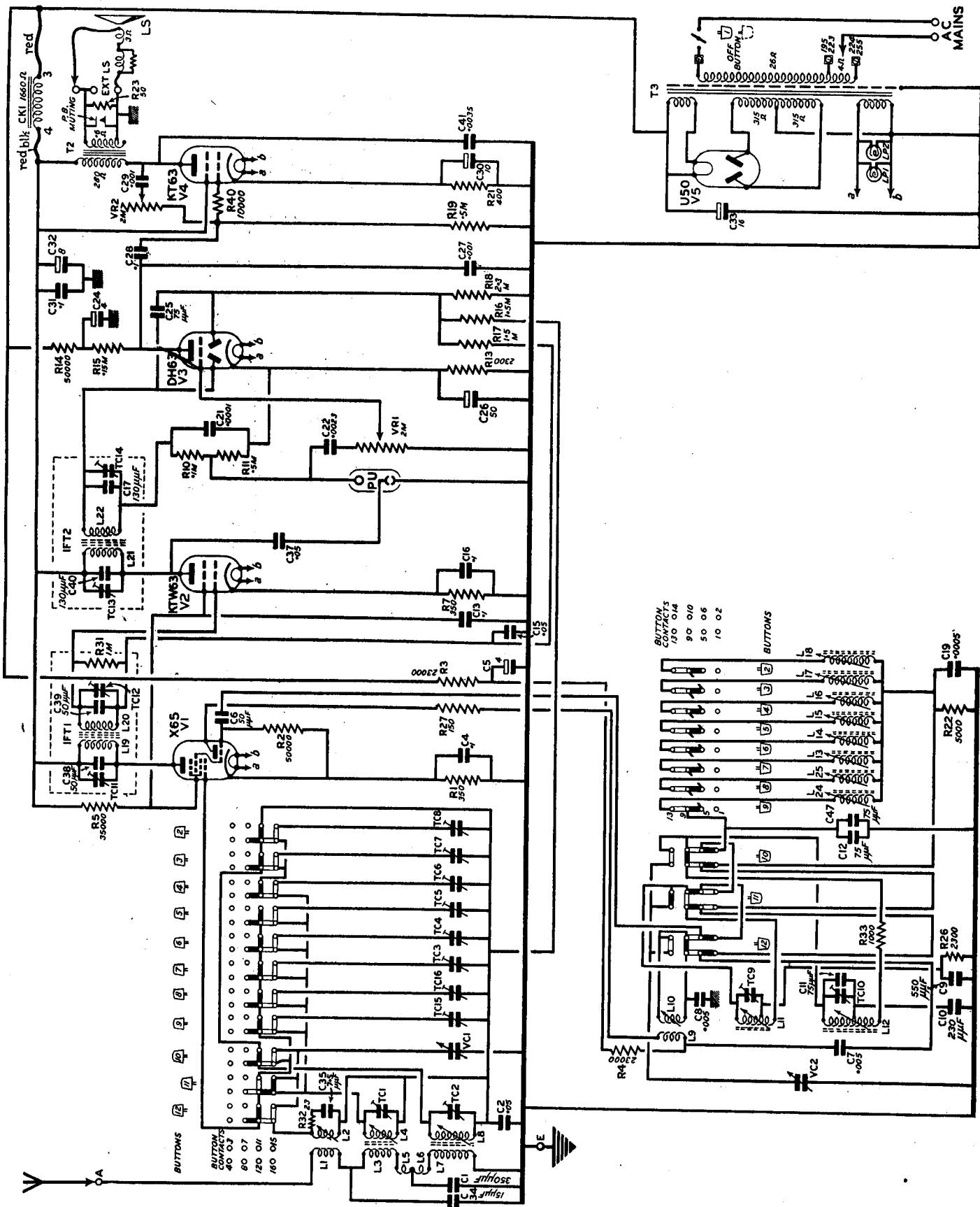
Voltage and current values \pm 20 per cent. Resistance values approximate. S = short circuit, ∞ = open circuit. The following readings were taken on receiver operating on 220 volt mains (195—223 tap) switched to M.W. and aerial disconnected. Resistance readings taken with valves and pilot lamps removed.

	Anode.			Screen.			Cathode.		Grid.
	Volts.	Milliamps.	Resistance to chassis.	Volts.	Milliamps.	Resistance to chassis.	Volts.	Resistance to chassis.	Resistance to chassis.
V1 (X65) ...	Mxr. 275 Osc. 125	1.0	∞	95	4.0	∞	3.8	350	3.8M*
		6.0	∞						
V2 (KTW63)	275	7.0	∞	95	1.4	∞	2.9	350	3.8M*
V3 (DH63)	150	0.8	∞	—	—	—	2.0	2,300	2M—10 Ω (VRI)
V4 (KT63)	260	34	∞	275	7.0	∞	16.0	400	.5M
V5 (U50)	360 A.C.	—	315 (both)	—	—	—	375	∞	—

Feed through L.S. field (at tag 3) 55.0 mA }
 Osc. anode feed 6.0 mA } Total 61 mA.

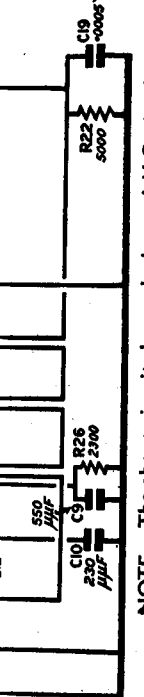
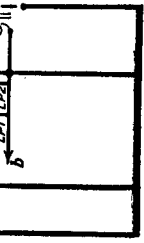
* On early models these resistances may be different. See note on page 7





NOTE.—The above circuit shows the latest A.V.C. circuit arrangement (R16, R17, R18). Early models may be found incorporating the same arrangement as that used in Models 1102/1874. Recent samples of the latter models also will contain the A.V.C. arrangement.

AC
MAINS



NOTE.—The above circuit shows the latest A.V.C. circuit arrangement (R16, R17, R18). Early models may be found incorporating the same arrangement as that used in Models 1102/874. Recent samples of the latter models also will contain the A.V.C. arrangement shown above.

The push-button switch is shown with MW button pressed.

Each button is in effect a two-position switch; the two positions are shown by solid and open bars. All switches, with the exception of M.W. (Button No. 11), are shown in the "off" position; the contacts closed when the button is pressed are shown by open bars as explained above.

The lay-out of the contacts is a physical representation of the actual switch, and will be helpful in tracing the circuit.

MODELS 878, 1103, 883 & 1300

Part No.	Description.	Part No.	Description
INDUCTANCES			
29838A	L1 & L2.	29827H	L18.
20666C	L3 & L4.	—	L19 & L20—in IFT1.
29861A	L5 & L6.	—	L21 & L22—in IFT2.
20661D	L7 & L8.	29827E	L24.
20657Y	L9 & L10.	29827E	L25.
29827C	L11.	26330BQ	IFT1—1st I.F. transformer, complete with L19, L20, R31, C38, C39, TC11 and TC12.
29827D	L12.	26330BL	IFT2—2nd I.F. transformer, complete with L21, L22, C17, C40, TC13 and TC14.
29827E	L13.	22624AE	T2—Output transformer.
29827K	L14.	26120S	T3—Mains transformer.
29827K	L15.	11543S	CK1—Loudspeaker field coil.
29827K	L16.		
29827H	L17.		
RESISTANCES			
24150AD	R1— 350 ohms.	24150AM	R18—2.3 megohm.
24150J	R2—50,000 ohms.	24150N	R19— .5 megohm.
19104P	R3—23,000 ohms.	30020CR	R21— 400 ohms, special limit.
19104P	R4—23,000 ohms.	24150E	R22— 5,000 ohms.
19105C	R5—35,000 ohms.	19104AA	R23— 50 ohms.
24150AD	R7— 350 ohms.	24150C	R26— 2,300 ohms.
24150L	R10— 1 megohm.	17541AF	R27— 150 ohms.
24150N	R11— .5 megohm.	24150P	R31— 1 megohm.
24150C	R13— 2,300 ohms.	17541DD	R32— 23 ohms.
24150J	R14—50,000 ohms.	19202B	R33— 1,000 ohms.
24150AJ	R15— 15 megohm.	24150F	R40—10,000 ohms.
24150Q	R16—1.5 megohm.	28403E	VR1 and VR2—Volume and tone control.
24150Q	R17—1.5 megohm.		
CONDENSERS			
22001AE	C1 —35 mmfd.	26300AA	C28— .1 mfd.
24900VV	C2 — .05 mfd.	26300A	C29— .001 mfd.
24900AA	C4 — .1 mfd.	17250A	C30—10 mfd., electrolytic.
29981B	C5 —4 mfd., electrolytic, with C24, C32 and C33.	24900AA	C31— .1 mfd.
		—	C32—8 mfd., electrolytic, with C5.
22164J	C6 —50 mmf.	22164D	C33—16 mfd., electrolytic, with C5.
24900J	C7 — .005 mfd.	22164B	C34—15 mmfd.
22005A	C8 — .005 mfd.	24900VV	C35—7.5 mmfd.
22330CS	C9 — .00055 mfd., special limit.	28444A	C37— .05 mfd.
22330BJ	C10— .00023 mfd., special limit.	28444A	C38—50 mmfd., special limit.
22164K	C11—75 mmfd.	28444E	C39—50 mmfd., special limit.
28444F	C12—75 mmfd., special limit.	26300G	C40— .00013 mfd., special limit.
24900AA	C13— .1 mfd.	28381B	C41— .0035 mfd.
24900W	C15— .05 mfd.	26350BE	C47—75 mmfd., special limit.
24900AA	C16— .1 mfd.	26350BF	TC1 and TC2—Double trimmer condenser.
28444E	C17— .00013 mfd., special limit.	26350AZ	TC3 and TC4—Double trimmer condenser.
28444H	C19— .0005 mfd., special limit.	26350BE	TC5 and TC6—Double trimmer condenser.
22164L	C21— .0001 mfd.	26350AP	TC7 and TC8—Double trimmer condenser.
26300E	C22— .0023 mfd.	26350A	TC9 and TC10—Double trimmer condenser.
—	C24—4 mfd., electrolytic, with C5.	26350AX	TC11 and TC12—Double trimmer condenser.
22164K	C25—75 mmfd.	20280G	TC13 and TC14—Double trimmer condenser.
17250F	C26—50 mfd., electrolytic.		TC15 and TC16—Double trimmer condenser.
24900A	C27— .001 mfd.		VC1 and VC2—Two gang condenser.

Order spare parts from:—

E·M·I SERVICE, LTD.,

SHERATON WORKS,

HAYES, MIDDLESEX.

Telephone: Southall 2468.

Telegraphic Address: Service, Hayes, Middlesex.

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