"His Master's Voice"

SERVICE MANUAL

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AM-FM STEREOPHONIC RADIOGRAM · MODEL 1644

DESCRIPTION

A ten valve, plus metal rectifier, AC Mains, (200-250V) stereophonic, superheterodyne radiogramophone covering VHF/FM, Long and Medium waveranges and incorporating a Foster-Seeley discriminator. For stereophonic record reproduction the output circuit is of the double channel mode, and when used for monodic reproduction, the power output valves give push-pull amplification.

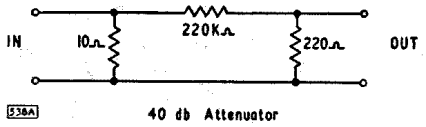
Reverberation, obtainable on both monodic and stereophonic reproduction, is controlled by four push buttons giving " OFF—MIN—MED—MAX " with approximately 6db difference between positions of reverberation.

The record changer is a Garrard Model 210. Sockets are provided to allow an ancillary tape recorder to be used for monodic tape recording and stereophonic or monodic tape playback. There are extension loudspeaker sockets for both channels with internal loudspeaker muting facilities.

SERVICING NOTES

Audio Amplifier Check

Equipment. 1000 cps signal generator: 40 db attenuator Two output meters (one per channel)



40 db Attenuator

Method

1. Insert 40 db attenuator in place of reverberator unit, green lead to " in."
2. (a) Connect signal generator to the gram input tags—Black lead and screen located on second and third tags on tag strip beneath chassis angle support adjacent to switch S1. Switch reverberator to " OFF."
   (b) Switch to MONODIC—both meters should indicate output.
   (c) Switch to STEREO—L.H channel meter only should indicate output.
   (d) Change output live lead from tag two (black) to tag one (red) and R H channel meter only should indicate output.
3. (a) Connect generator to both channels simultaneously (tags 1 and 2). Set the balance control for equal readings on both meters with reverberation set to " OFF."
   (b) Unsolder yellow lead from tag 43 on the audio printed board. Output reading will cease on R H meter.
   (c) Operate reverberation push button (MED), Output will return on R H meter and should be of similar amplitude to original.
   (d) Operate reverberation MAX and MIN buttons, these should give readings of 6 db increase or decrease on the original. Disconnect signal generator, resolder yellow lead, switch reverberation to " OFF," remove attenuator pad and reconnect reverberator unit.

Valve Matching. The two output **EL 84's** are a matched pair and should be within 2mA anode current of each other.

Drive Cord Replacement

To replace drive cord first remove the scale. Cord A consists of a five foot length with ends knotted together to form a loop. Start by inserting the knot into the drive drum slot with the front of the cord as it is wound around the drive drum going to the left, and the rear to the right, as shown in Fig. 1. Withdraw the tuning indicator valve from its holder and feed cord A through and arrange on the pulleys, with the surplus of the loop to the right of the R H scale support. Cord B (approx. 22 inches) should be wound around the drive drum and tuning spindle as illustrated and attached to cord A via the pulley wheel and spring. The attachment of cord B to the spring should be done last, its length being adjusted so as to keep a reasonable amount of tension on the spring at all times.

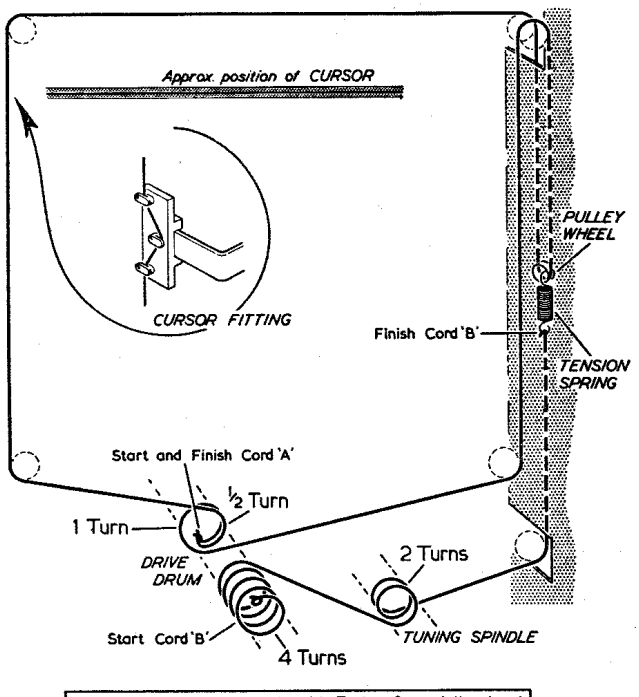


Fig. 1. Drive Cord Arrangement.

Chassis Removal

1. Remove control knobs : this is best done by using a piece of stout cord wound around behind the knob and used as a ' puller.'
2. Remove cabinet back, then unplug internal FM aerial and detach aerial panel from cabinet.
3. Unhook ferrite rod assembly from support bracket.
4. Remove wooden back panels from rear of lower loudspeaker compartments. Note loudspeaker lead connections to output transformers before unsoldering them and also release record player earth lead from radio chassis : disconnect mains lead to record player unit from connection block on cabinet floor and, after withdrawing lead through hole in shelf, insulate bare ends if chassis is to be bench tested.
5. Remove chassis fixing bolts and release retaining clip at top of chassis front panel.
6. Remove roundhead retaining screws (3) from record changer baseplate, located on front and rear sides and through hole immediately behind pick-up rest, lift mechanism and prop up : the control panel fixings (two 4BA nuts and washers) can now be removed.
7. Note location of leads before pulling out plugs from left-hand side of reverberator unit.
8. Draw chassis and control panel assembly backwards to allow pick-up leads to be unsoldered from tag panel adjacent to push-button switch. Unsolder indicator lamp leads from tags 49 and 50 on audio printed board, then slide chassis out.

ALIGNMENT DATA

Note : A hexagonal trimming tool must be used for the IF transformer cores ; tune to the outer peak in all cases.

IF Alignment—AM Circuits

Equipment

470 Kc/s, 30% modulated, signal generator.
1 output meter (12Ω—15Ω).
1 dummy load (12Ω—15Ω).

Method

1. Connect output meter and dummy load, observing correct polarity, in lieu of loudspeakers.
2. Switch the receiver to MW, turn tuning gang to minimum capacitance position and volume control to maximum.
3. Inject a 470 Kc/s, 30% modulated, signal at tage 18 of the IF printed board (input capacitor to **V2** grid).
4. Peak **L15, L16, L19** and **L20** for maximum indicated output.

RF Alignment—AM Circuits

MW must be aligned first, 30% modulated signals being injected via a loop loosely coupled to the ferrite rod aerial. With the tuning gang at maximum, set cursor to the top end of the scale opening. Pad and trim markers are provided on MW and a calibration marker on LW.

Range	Frequency	Cursor position	Adjust
MW	580 Kc/s	Pad Marker	L17/L18 and L9A/L10*
	1460 Kc/s	Trim Marker	C34 and C22
LW	220 Kc/s	Cal. marker	C35 and L9B/L11†

* Tuned from below chassis—hexagonal trimming tool adjustment.
† Tuned from top—slot adjustment.

IF Alignment—FM Circuits

Equipment

10.7 Mc/s AM/FM signal generator with modulation of 30% on AM and 25 Kc/s deviation on FM.
1 output meter (12Ω—15Ω)
1 dummy load (12Ω—15Ω)

Method

1. Connect output meter and dummy load, observing correct polarity, in lieu of loudspeakers.
2. Switch the receiver to VHF and allow the receiver to warm up for at least 10 minutes. Set the volume and treble controls to maximum.
3. Inject 10.7 Mc/s FM signal onto tag 18 of the IF printed board and tune **L13, L14, L21, L22** and **L24** for maximum output with signal generator output adjusted to give a reading of approximately 100 mW on the output meter.
4. AM rejection check :
   (a) Switch generator to 10.7 Mc/s **AM**, increase output by 20 db's and turn down volume control to retain output at 100mW FM. Tune **L25** for minimum AM.
   (b) Switch generator to 10.7 Mc/s **FM** and check that FM output has been retained. If maximum AM rejection does not coincide with maximum FM output, **L25** should be tuned for maximum rejection at the expense of a slight reduction in FM output.
5. Switch generator back to FM and transfer 10.7 Mc/s input to tuner unit TEST POINT. Adjust **L7** for maximum output and then peak **L8.**

RF Alignment—FM Circuits

Check that the cursor coincides with the top of the scale opening when the tuning gang is fully closed.

1. Adjust tuning control to set cursor to 91 Mc/s on the scale.
2. Inject 91 Mc/s FM signal at the aerial socket and tune by adjusting **L5/L6.** If two peaks occur within the tuning range, that obtained with the core nearest the top of the former must be chosen.
3. Adjust **L4** for maximum audio output with the core towards the bottom of the former.
4. Check calibration at 88 Mc/s and 95 Mc/s.

Coil Adjustment Locations

Coil positions are identified in Fig. 2. The following is a summary of the slug adjustment positions.

Top of Can Adjustments—**L4, L5/L6, L7, L11, L13, L15, L17/L18, L20** and **L25.**

Bottom of Can Adjustments—**L8, L10, L14, L16, L19, L21/L22,** and **L24.**

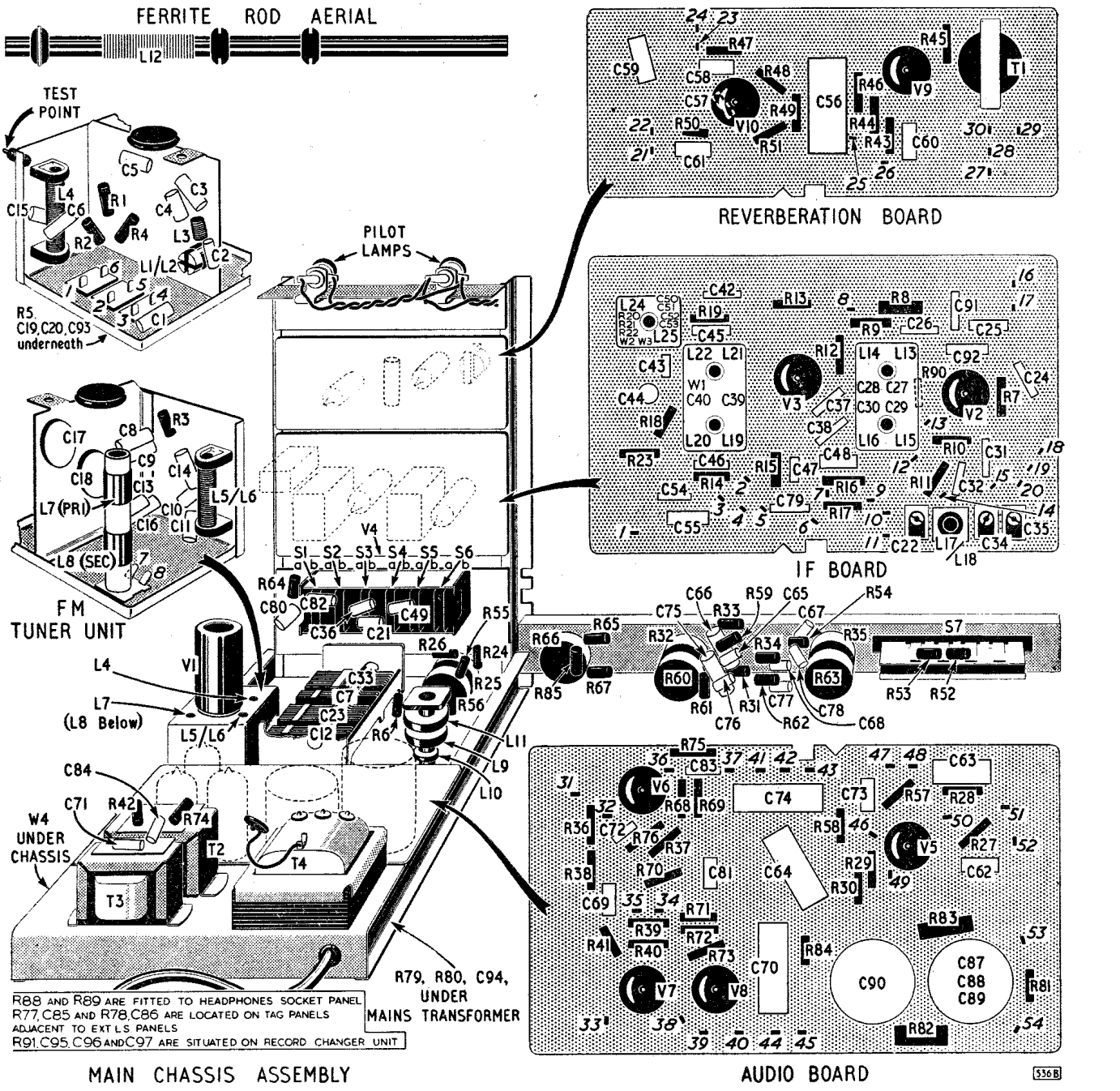


Fig. 2. Chassis Layout and Component Locations.

TAG CONNECTIONS

IF Board

1. AGC—C19 and tuner unit.
2. Switch S4B contact 7 and C49.
3. Screening for 2 and 4.
4. Switch S5A contact 1.
5. Balance control R66 and S1B contact 9.
6. V4 (tuning indicator) pin 1.
7. Switch S4B contact 8.
8. HT—switches S2A contact 5 and S5B contact 5.
9. Switch S4B contacts 1 and 9.
10. Switch S4B contact 12, C21 and L10.
11. Earth.
12. Switch S5A contact 6.
13. Switch S5B contact 6.
14. Swith S4A contact 4.
15. C33 tuning gang and switch S3B contact 5.
16. } Heaters.
17. }

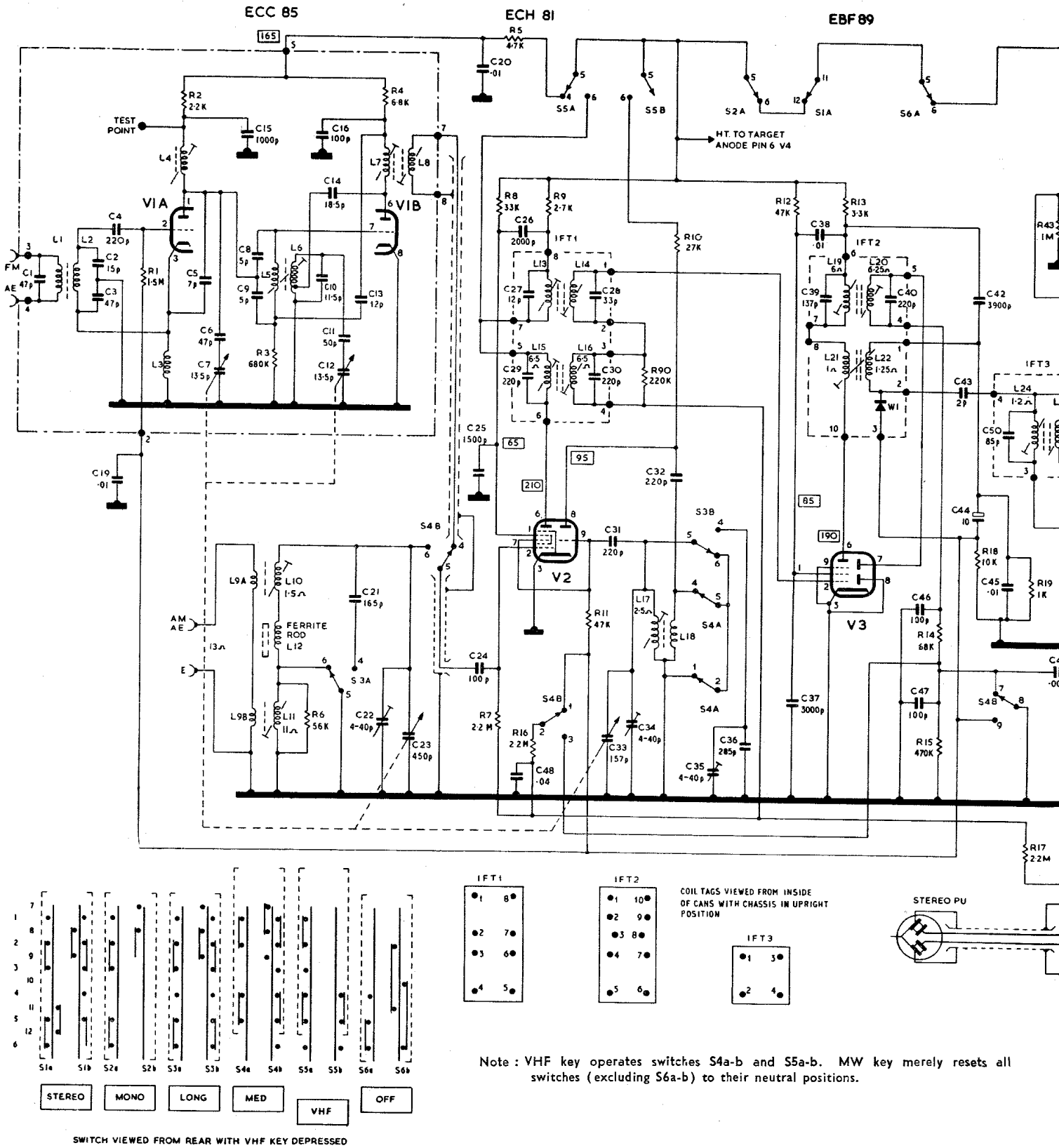
18. Switch S4B contact 5.
19. Screening for 18.
20. Switch S3B contact 4.

Reverberation Board

21. Centre contacts—reverberator switches.
22. Shielding for 21.
23. Reverberator delay line output.
24. Shielding for 23.
25. HT—Switch S6A contact 6.
26. Tag 46 on audio board.
27. } Heaters.
28. }
29. Reverberator delay line input.
30. Shielding for 29.

Audio Board

31. R34, R54 and RH treble control R35.
32. T2 secondary
33. T2 primary and C71.
34. S2A dummy tag 4 and C82.
35. Shielding for 34.
36. Switch S1A contact 2.
37. Switch S1B contact 4.
38. } Heaters.
39. }
40. T2 Primary and R74.
41. LH } To bass and treble controls and
42. Earth } associated circuitry on control
43. RH } panel.
44. W4 negative tag.
45. W4 positive tag.
46. Reverberation board input, C60.
47. LH channel volume control R56.
48. Shielding for 46 and 47.
49. } Heaters.
50. }
51. Shielding for 52.
52. RH channel volume control R25.
53. R64 on tag strip adjacent to switch S1.
54. HT—take off point to switch S6A contact 6.



Note : VHF key operates switches S4a-b and S5a-b. MW key merely resets all switches (excluding S6a-b) to their neutral positions.

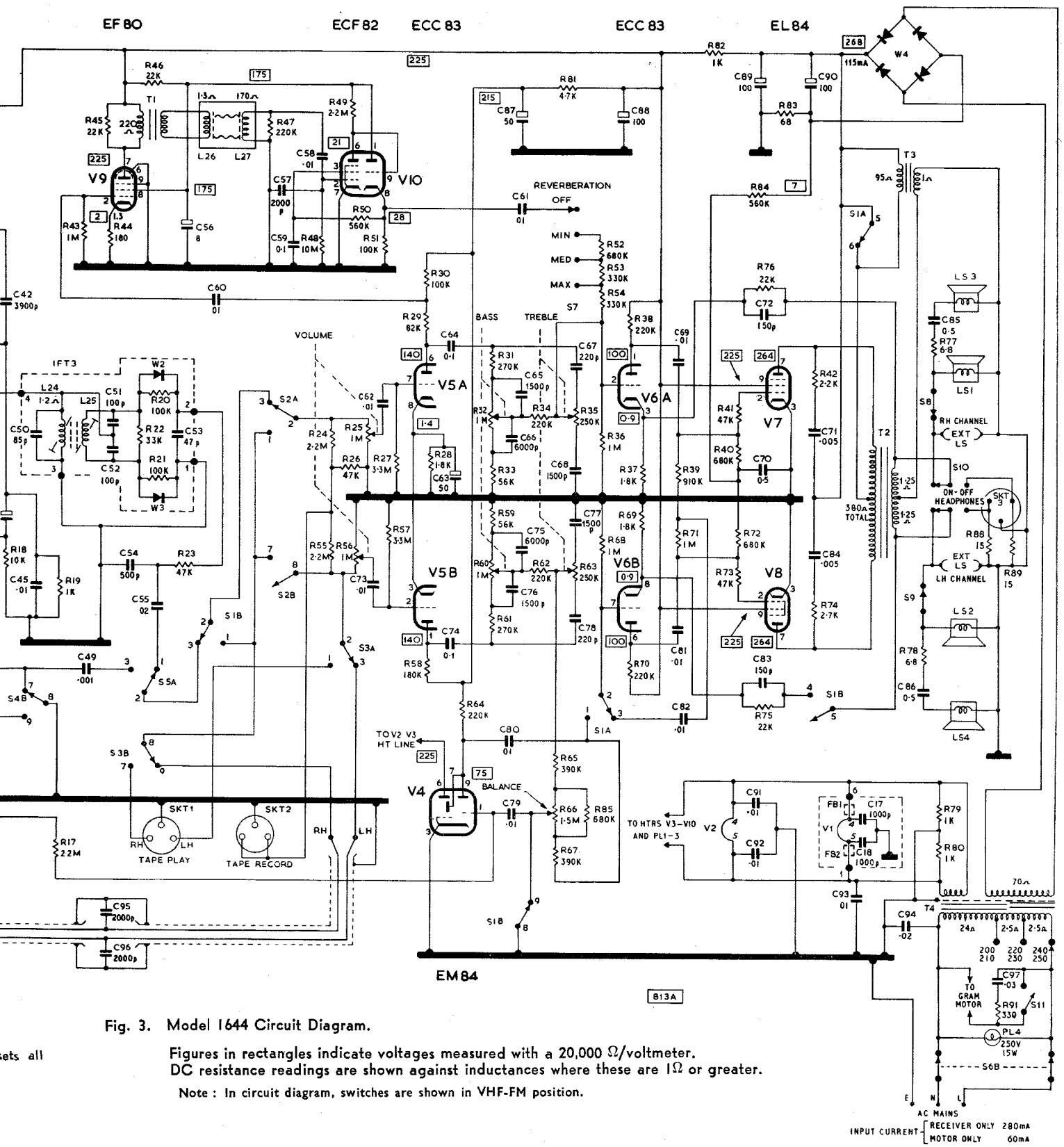


Fig. 3. Model 1644 Circuit Diagram.

sets all

Figures in rectangles indicate voltages measured with a 20,000 Ω/voltmeter.
DC resistance readings are shown against inductances where these are 1Ω or greater.

Note : In circuit diagram, switches are shown in VHF-FM position.

CIRCUIT NOTES

FM Tuner

V1A functions as a combined grid/cathode injection RF amplifier, the aerial feeder being coupled into the circuit by **L1** and **L2**. The secondary, **L2**, is tuned by **C2** and **C3**, centre-tapped to chassis, and serves to divide the signal input between the grid and the cathode of **V1A**. **L3** acts as an RF choke and provides a high impedance between the cathode and chassis for the RF signal, whilst offering a low impedance to the steady valve current. This type of operation is a compromise between the earthed grid and earthed cathode methods of operation and provides a higher input impedance than would be obtained with the earthed grid method. Also neutralization is simplified, a single capacitor, **C5**, fitted between anode and cathode serving to neutralize the stage.

The output from **V1A**, developed across **L4**, and tuned by **C6** and **C7** in series, is fed to the junction of **C8** and **C9**. This serves as the signal injection point for the self-oscillating mixer, **V1B**, and is the null point of a bridge formed by **C9**, **C8**, **C13** and **C16** in series. At this point the oscillator voltage is negligible and the possibility of oscillator radiation feeding into the aerial circuits via the grid/anode capacitance of **V1A** is much reduced.

Oscillator feedback coupling is provided by **L5** and **L6** and the circuit is tuned by **C12** in series with **C11**. Additive mixing takes place at the grid of **V1B** and the **10.7** Mc/s IF signal is selected in the anode by **L7**. A small amount of positive feedback is provided by **C13** to offset the effect of oscillator circuits which tend to shunt **L7**.

L7 and **L8** comprise the first FM IF transformer and couple the output of the tuner unit to **V2** heptode which acts as an IF amplifier.

Demodulation

FM Detector. When switched to FM a Foster-Seeley discriminator is employed.

The 10.7 Mc/s IF signal is developed in the anode circuit of **V3**, EBF 89 (the final IF amplifier), by the RF transformer **L21—L22**, and is then fed to the limiter and discriminator stages. The limiter diode **W1** is in series with a parallel resistance capacitance network **R18**, **R19**, **C44** and **C45**, the time constant of this combination being longer than the lowest audible frequency. Amplitude changes, with a period shorter than the time constant of the RC network, are suppressed by variation of the loading of the limiter tuned circuit, and amplitude changes, with a period longer than that of the RC time constant, are countered by using the diode load voltage for automatic gain control. A delay voltage is applied to the diode to improve the AGC characteristic and hence the suppression of slow amplitude fluctuations.

The limiter is coupled to the discriminator by **C43** acting as an impedance inverter, which effectively changes the low impedance caused by the presence of the limiter into a high impedance source for the discriminator. **L24** and **L25** form the discriminator transformer. The insertion of the primary voltage into the secondary circuit with the correct phase relationship is achieved by feeding the junction of **C51** and **C52** (two equal capacitors providing secondary tuning) with the same signal that is applied to **L24**. **W2** and **W3** are the discriminator diodes, the audio signal being developed across **C53** and fed out via **R23** and **C54** which provide de-emphasis. Coupling to the audio amplifier is via **C55**.

AM. The pentode section of **V3** (EBF 89) operates as the IF amplifier and the 470 Kc/s IF signal is developed across **L19**, **C39** and is coupled by **L20**, **C40** to one of the two diode sections of **V3** operating as an AM detector. The unused diode section is strapped to the cathode. **R14** in conjunction with **C46** and **C47** provide the IF filter network. **R15** is the diode load and the DC potential developed across the load is fed to the AM mixer and IF stages as AGC bias.

The audio signal is developed across **R15** and fed via **C49** to the audio amplifier.

Audio Amplification

Monodic and Radio. When switched to a monodic function (radio or monodic record reproduction) the audio signals are fed via **R25**, the RH channel volume control and **C62** to the grid of **V5A**. The amplified signal at **V5A** anode is then fed via **C64** to the bass and treble control networks and also, via **R29** and **C60** to the grid of **V9** the first reverberation amplifier. At the grid of **V6A** the two circuits combine when switch **S7** is in any of its three "on" positions and the signal, now tone adjusted, may be supplemented by varying levels of reverberation and amplified by **V6A**. The reverberation circuit is described later.

The signal at the anode of **V6A** is resistance capacitance coupled to **V7** grid by **R38** and **C69** and also through **R39**, **C82** and **S1A**, contacts 3 and 2, to **V6B** grid. **V6B** acts as a unity gain phase inverter and its anode is resistance capacitance coupled to **V8** grid by **R70** and **C81**. The grids of **V7** and **V8** are now fed by anti-phase signals of equal amplitude and push-pull power amplification takes place in these valves. **T2** primary is centre-tapped to HT and secondary centre-tapped to earth. **T3** primary is shorted by **S1A**, contacts 5 and 6, and plays no part in monodic reproduction.

Negative feedback is from **T2** secondary to **V6A** cathode via **R76** and **C72** in parallel.

Stereophonic. When switched for stereophonic record or tape reproduction the two channels are handled separately, the right-hand signal being fed to **V5A** and the left-hand to **V5B** via the volume controls and grid capacitors. From the anodes of **V5** the two signals are fed to the tone control networks, reverberation being available on the RH channel, which is then fed to **V6A** grid.

The left-hand channel signal does not go directly to **V6B** grid, but is fed from the LH treble control **R63** through a unity gain phase inverter first (**V4** triode section—part of the tuning indicator). Contacts 1 and 2 of **S1B** are made, removing the "earth" presented to the LH channel signal during monodic reproduction. The grid circuit of **V4** triode consists of a resistance network in which the balance control **R66** ensures that the anti-phase signals appearing at **V6A** and **V6B** grids are of equal amplitude when both channel inputs are of an equal level. **V4** triode anode is resistance capacitance coupled by **R64** and **C80** to **V6B** grid, the circuit being made through contacts 1 and 2 of **S1A**.

The signals are now anti-phase and are handled as push-pull up to the primary of **T2**; **V6**, **V7** and **V8** giving two stages of conventional amplification to each channel with intervalve resistance capacitance coupling. The two signals are developed across their respective halves of **T2** primary and the combined signals across **T3** primary.

At an instant when the RH channel swings positive (+R) and the LH channel negative (—L), then +R—L is applied to **T3** and the two halves of **T2** accommodate their individual signals. A signal present in any part of **T2** primary will be present in all the secondary but with an opposite phase at each end due to the earthed centre tap, and ignoring transformer phase reversals, **T2** secondary, RH channel half, accommodates a signal of +R+L, and the LH channel half, a signal of —R—L. Added to both these halves, through

T3, is the primary centre tap signal of +R—L which gives the following signals in each loudspeaker circuit.

RH : +R+L and +R—L : Total +2R

LH : —R—L and +R—L : Total —2L

In this way the two channel signals are kept separate while at the same time having the advantage of push-pull amplification.

Feedback loops for each channel are independent, that for the right-hand being through **R76** and **C72** to **V6A** cathode, and that for the left-hand through **S1B**, contacts 10 and 11, **R75** and **C83** to **V6B** cathode.

Reverberation. This facility is provided in the right-hand channel, paralleling the tone control network and can be used for both stereophonic and monodic reproduction. Part of the audio signal at **V5A** anode is resistance capacitance coupled to **V9** grid by **R30** and **C60**, amplified and fed from **V9** anode to the reverberator unit via **T1**. The reverberator unit delays and repeats the signal periodically with diminishing amplitude and feeds **V10** (pentode) a second amplifier. **V10** (triode section) is a cathode follower and is used for matching the reverberating signal back into the audio amplifier at **V6A** grid, via **S7**. The three "on" positions of **S7** select levels of reverberation with differences in level of 6 db between "Min" and "Med" and between "Med" and "Max".

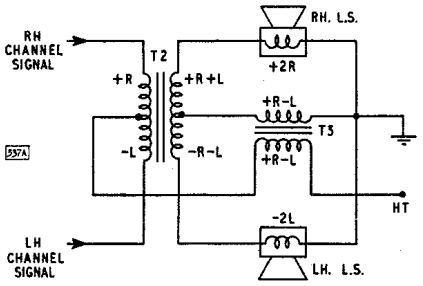


Fig. 4. Simplified diagram of Output Circuit.

SPARE PARTS LIST

Description	Part No.
Cabinet	50585
Cabinet back	50701
Control knobs (clip 45931)	25493/23
Cursor	33448
Support	29401
Drive cord	33963
Spring	25697
Brass eyelet	35886
Drive pulleys (2)-black-(circlip 47478) ...	7255
Drive pulley (circlip 47478)	17522
Drive drum (clip 37309)	10483
Lampholder (for pilot lamp)	13303/2
Lampholder (for gram. compart. lamp)	50781
Scale (clip 25480/1)	50703
Warning lamp indicator	33285/1

RESISTORS

All 20% ¼ Watt carbon unless otherwise stated

Ref.	Value	Tol.	Rating	Function	Part No.
R1	1.5MΩ	10%		V1A AGC feed	
R2	2.2KΩ			V1A HT feed	
R3	680KΩ	10%		V1B grid leak	
R4	6.8KΩ			V1B HT feed	
R5	4.7KΩ	10%		V1 HT feed	
R6	56KΩ			L11 damping	
R7	2.2MΩ	10%		V2 heptode grid leak and AGC feed	
R8	33KΩ	10%		V2 heptode screen grid feed	
R9	2.7KΩ	10%		V2 heptode anode feed	
R10	27KΩ	10%		V2 triode anode feed	
R11	47KΩ	10%		V2 triode grid leak	
R12	47KΩ	10%		V3 screen grid feed	
R13	3.3KΩ	10%		V3 anode feed	
R14	68KΩ	10%		Part IF filter (AM)	
R15	470KΩ	10%		AM detector load	
R16	2.2MΩ	10%		AGC feed	
R17	2.2MΩ	10%		Tuning indicator feed	
R18	10KΩ	10%	}	Part limiter network	
R19	1KΩ	10%	}		
R20	100KΩ	10%		W2 shunt	
R21	100KΩ	10%		W3 shunt	
R22	33KΩ	10%		Detector load	
R23	47KΩ	10%		Audio feed and de-emphasis	
R24	2.2MΩ	10%		Part high impedance load (tape recording)	
R25	1MΩ	Log. Pot.		Volume control (RH channel)	20204
R26	47KΩ			Part high impedance load (Recording)	
R27	3.3MΩ	10%		V5A grid leak	
R28	1.8KΩ	10%		V5A & B cathode bias	
R29	82KΩ	10%	}	V5A anode load	
R30	100KΩ	10%	}		
R31	270KΩ	10%		Part Bass network (RH channel)	
R32	1MΩ	Inv. Semilog. Pot.		Bass control (RH channel)	20201
R33	56KΩ	10%		Part Bass control network (RH channel)	
R34	220KΩ	10%		Part Treble control network (RH channel)	
R35	250KΩ	Log. Pot.		Treble control (RH channel)	20202
R36	1MΩ	10%		V6A grid leak	
R37	1.8KΩ	10%		V6A cathode bias	
R38	220KΩ	10%		V6A anode load	
R39	910KΩ	5%		Part R/C coupling to V6B	
R40	680KΩ	10%		V7 grid leak	
R41	47KΩ	10%		V7 grid stopper	
R42	2.7KΩ	10%	½W	Part harmonic correction (RH channel)	
R43	1MΩ			V9 grid leak	
R44	180Ω	10%		V9 cathode bias	
R45	22KΩ	10%		T1 primary damping	
R46	22KΩ	10%		V9 screen grid feed	
R47	220KΩ	10%		L27 damping	
R48	10MΩ			V10 grid leak	
R49	2.2MΩ	10%		V10 anode load	
R50	560KΩ	10%		V10 screen grid feed	
R51	100KΩ	10%		V10 cathode follower load	
R52	680KΩ	10%	}		
R53	330KΩ	10%	}	Fixed reverberation attenuators	
R54	330KΩ	10%	}		
R55	2.2MΩ	10%		Part high impedance load (tape recording)	
R56	1MΩ	Log. Pot.		Volume control (LH channel)	20204
R57	3.3MΩ	10%		V5B grid leak	
R58	180KΩ	10%		V5B anode load	
R59	56KΩ	10%		Part Bass control network	
R60	1MΩ	Inv. Semilog. Pot.		Bass control (LH channel)	20201
R61	270KΩ	10%		Part Bass network (LH channel)	
R62	220KΩ	10%		Part Treble control network (LH channel)	
R63	250KΩ	Log. Pot.		Treble control (LH channel)	20202
R64	220KΩ			V4 triode anode load	
R65	390KΩ	10%		Part Balance control network	
R66	1.5MΩ	Lin. Pot.		Balance control	20205
R67	390KΩ	10%		Part Balance control network	
R68	1MΩ	10%		V6B grid leak	
R69	1.8KΩ	10%		V6B cathode bias	
R70	220KΩ	10%		V6B anode load	
R71	1MΩ	5%		Part anti-phase feed to V8	
R72	680KΩ	10%		V8 grid leak	
R73	47KΩ	10%		V8 grid stopper	
R74	2.7KΩ	10%	½W	Part harmonic correction (LH channel)	
R75	22KΩ	10%		NFB tone correction (LH channel)	
R76	22KΩ	10%		NFB tone correction (RH channel)	
R77	6.8Ω	10%		Part tweeter crossover network (RH channel)	
R78	6.8Ω	10%		Part tweeter crossover network (LH channel)	
R79	1KΩ	10%	}	Heater balance	
R80	1KΩ	10%	}		
R81	4.7KΩ	10%		V5 HT smoothing	
R82	1KΩ	10%	3W	Main HT smoothing	
R83	68Ω	5%	1W	V7, V8 neg. bias	
R84	560KΩ	10%		V7, V8 neg. bias feed	
R85	680KΩ	10%		Balance control shunt	
R88	15Ω	10%	3W }	Headphones load	
R89	15Ω	10%	3W }		
R90	220KΩ			L16 damping	
R91	330Ω			Part gram motor switch suppression	

CAPACITORS

All 350 Volts working, 20% tolerance, unless otherwise stated

Ref.	Value	Tol.	Rating	Function	Part No.
C1	47pF	5%		L1 tuning	
C2	15pF	5%		Part L2 tuning	
C3	47pF	5%		Part L2 tuning	
C4	220pF			V1A grid coupling	
C5	7pF	±.5pF		V1A neutralizing	
C6	47pF	5%		C7 padder	
C7	13.5pF			VHF amplifier tuning	*
C8	5pF	±.5pF	}	Oscillator/mixer signal injection	
C9	5pF	±.5pF	}		
C10	11.5pF	±2.5%		Part L6 tuning	C115XR35
C11	50pF	5%		C12 padder	
C12	13.5pF			VHF osc. tuning	*
C13	12pF	±2.5%		Part V1B IF mixer feedback	C120R35
C14	18.5pF	±.5pF		Part VHF oscillator feedback	C185XH35
C15	1000pF	+20-80%		V1A HT decoupling	
C16	88pF or 100pF	2½%		V1B HT decoupling	
C17	1000pF		}	V1 heater RF bypass	
C18	1000pF		}		
C19	.01uF			V1A AGC line decoupling	
C20	.01uF			V1 HT decoupling	
C21	165pF	5%		Part L10, L11 tuning (LW)	45753
C22	4-40pF			C23 trimmer	25547
C23	450pF			L10, L11 main tuning (AM)	*
C24	100pF			V2 heptode grid coupling	
C25	1500pF	10%		V2 heptode screen decoupling	
C26	2000pF	10%		V2 heptode neutralizing	
C27	12pF	5%		L13 tuning	
C28	33pF	5%		L14 tuning	
C29	220pF	2%		L15 tuning	
C30	220pF	2%		L16 tuning	
C31	220pF			AM osc. grid coupling	
C32	220pF			AM osc. feedback coupling	
C33	157pF			AM osc. tuning	*
C34	4-40pF			MW osc. trimmer	25547
C35	4-40pF			LW osc. trimmer	25547
C36	285pF	1%		Part L16 tuning (LW)	45766
C37	3000pF	10%		V3 screen grid decoupling	
C38	.01uF			V3 neutralizing	
C39	137pF	2.5%		L19 tuning	
C40	220pF	2%		L20 tuning	
C42	3900pF	10%		R13 decoupling	
C43	2pF	±0.5pF		Discriminator coupling	
C44	10uF	ELEC	25V	AGC delay voltage decoupling	13222/18
C45	.01uF			R19 RF bypass	
C46	100pF		}	AM IF filter	
C47	100pF		}		
C48	.04uF			AGC decoupling	
C49	.002uF			Audio amplifier coupling (AM)	
C50	85pF	2%		L24 tuning	
C51	100pF	2%	}	L25 tuning	
C52	100pF	2%	}		
C53	47pF	5%		Discriminator reservoir	
C54	500pF			Part de-emphasis	
C55	.02uF			Audio amplifier coupling (FM)	
C56	8uF	ELEC	250V	V9 screen grid decoupling	13222/17
C57	2000pF			Part grid time constant	
C58	.01uF			Grid coupling (V10 pentode)	
C59	0.1uF		150V	V10 screen grid decoupling	
C60	.01uF			Reverberator input coupling	
C61	.01uF			Reverberator output coupling	
C62	.01uF			V5A grid coupling	
C63	50uF	ELEC	25V	V5A cathode bypass	13228/18X
C64	0.1uF		400V	V6A coupling	
C65	1500pF	10%	}	Part Bass control network	
C66	6000pF	10%	}		
C67	220pF	10%	}	Part Treble control network	
C68	1500pF	10%	}		
C69	.01uF			V7 coupling	
C70	0.5uF		500V	V7, V8 grid bias decoupling	
C71	.005uF		500V	Part harmonic correction	(RH channel)
C72	150pF	10%		NFB tone correction	(RH channel)
C73	.01uF			V5B grid coupling	
C74	0.1uF		400V	V4 coupling	
C75	6000pF	10%	}	Part Bass control network	
C76	1500pF	10%	}		
C77	1500pF	10%	}	Part Treble control network	
C78	220pF	10%	}		
C79	.01uF			V4 triode grid coupling	
C80	.01uF			V6B coupling	
C81	.01uF			V8 coupling	

CAPACITORS (continued)

Ref.	Value	Tol.	Rating	Function	Part No.
C82	.01uF			V6B coupling	
C83	150pF	10%		NFB tone correction	(LH channel)
C84	.005uF		500V	Part harmonic correction	(LH channel)
C85	0.5uF		150V	Part tweeter crossover network	(RH channel)
C86	0.5uF		150V	Part tweeter crossover network	(LH channel)
C87	50uF	ELEC	275V	V4, V5A & B HT smoothing	
C88	100uF	ELEC	275V	Main HT smoothing	13239/12
C89	100uF	ELEC	275V	V7, V8, HT smoothing	
C90	100uF	ELEC	275V	HT reservoir	13229/21
C91	.01uF		}	Heater RF bypass	
C92	.01uF		}		
C93	.01uF		}		
C94	.02uF		350V AC	Mains RF bypass	C203W35A
C95	2000pF	10%	}	PU frequency compensation	
C96	2000pF	10%	}		
C97	.03uF			Part gram motor switch suppression	

*Part of Tuning Gang Assy. Part No. 33260

INDUCTORS AND TRANSFORMERS

Ref.	Description	Part No.
L 1	VHF aerial	29232
L 2	Input transformer	
L 3	RF choke	29280
L 4	VHF amp tuning	25835
L 5	VHF osc. coil	29230
L 6		
L 7	FM IFT 1	33600
L 8		
L 9		
L10	AM aerial coupling coil	33615
L11		
L12	Ferrite rod aerial	Y33175/1
L13	FM IFT 2	X33321
L14		
L15	AM IFT 1	
L16		
L17	MW & LW osc. coil	25829
L18		
L19		
L20	AM IFT 2	33322
L21		
L22	FM IFT 3	
L24		
L25	Phase discriminator assy.	33323
L26		
L27	Reverberator unit	33609
T1	Matching transformer	33584
T2	Output transformer	32915
T3	Output transformer	32914
T4	Mains transformer	32913

MISCELLANEOUS

Ref.	Description	Part No.
FB1-FB2	Mullard FX 1115 type Ferrite beads	34759
LS1	Loudspeaker—15Ω	16023/4
LS2	Loudspeaker—15Ω	16023/4
LS3	Tweeter—15Ω	16019/1
LS4	Tweeter—15Ω	16019/1
PL1	Scale lamp—6.5V .3A	33755
PL2	Scale lamp—6.5V .3A	33755
PL3	Warning lamp—6.5V .3A	33755
PL4	Gram compart. lamp 250V 15W SES	33780
S1-S6	Press-key switch	32912
S7	Push-button switch	33585
S8	Ext. LS muting switch—RH channel	33595
S9	Ext. LS muting switch—LH channel	33595/1
S10a-b	Headphones switch	50630
S11	Gram motor switch	See Automech.
S01	Socket 3-pin	16512
S02	Socket 3-pin	16512
S03	Headphone socket	50622
W1	OA 70 Mullard	—
W2	OA 79 Mullard	—
W3	OA 79 Mullard	—
W4	HT rectifier	Z33308

BRITISH RADIO CORPORATION LIMITED

Service Depots:

LONDON: Eley's Estate, Angel Road, N.18 · Edmonton 3060
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