

Philips 13RB561

1864

A.M./F.M. mains operated transistored radio receiver

complete with stereo decoder

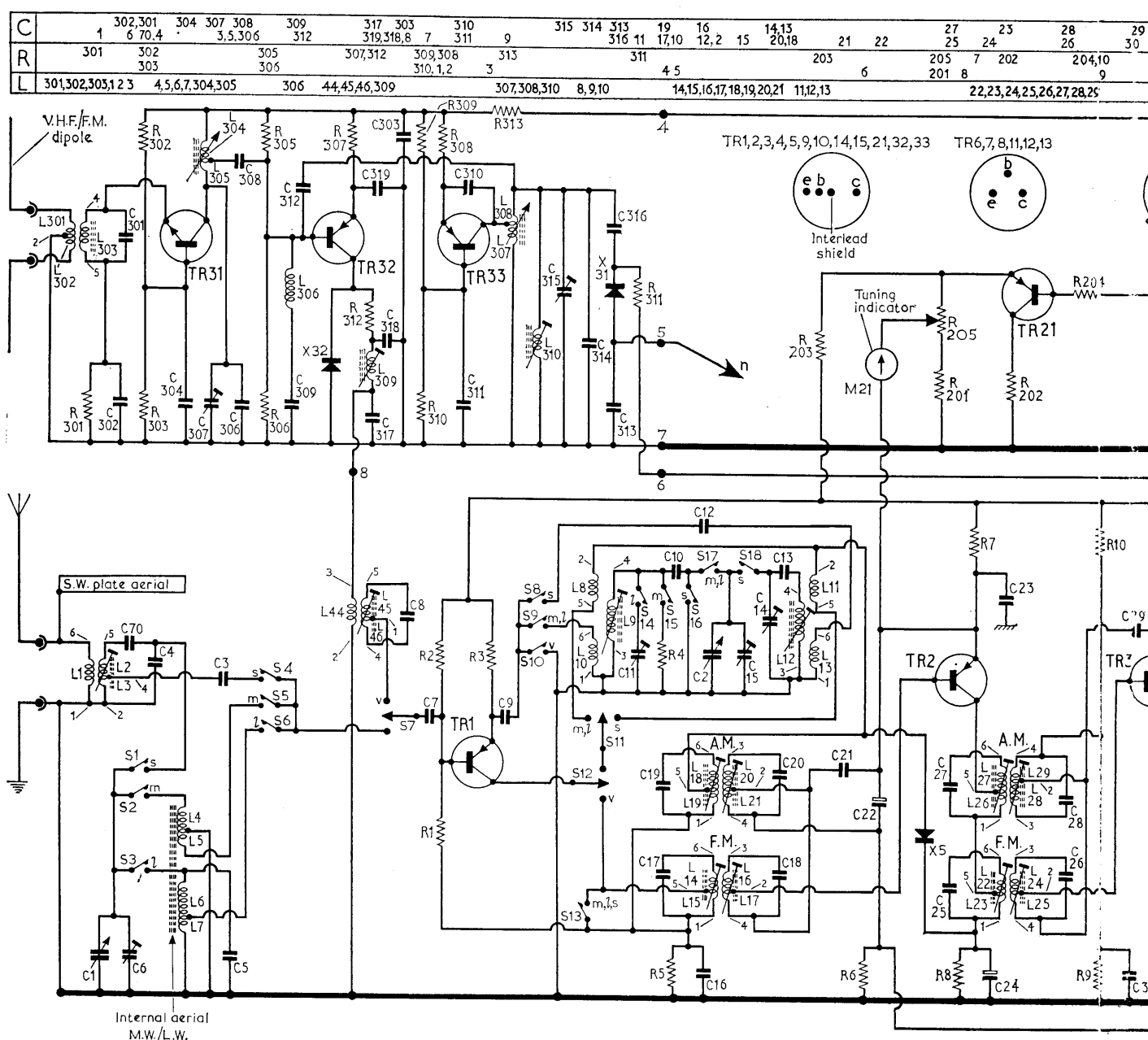
Introduction

Operating from a.c. mains power supplies
 Philips 13RB561 is a complete stereophonic
 table radio receiver incorporating twenty-three
 transistors and eleven crystal diodes. It features a

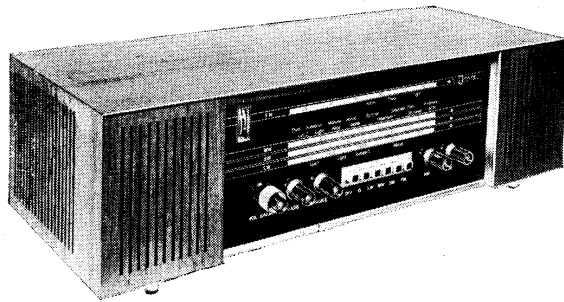
built-in stereo decoder and two audio channels
 for the reproduction of stereophonic programme
 material when transmitted.

Reception of the four wavebands covered by
 this receiver is by three internal aerials. A ferrite

rod aerial for m.w. (187-569m), and l.w.
 (1,175-2,000m); a plate aerial for s.w. (25-50m),
 and a dipole for v.h.f./f.m. (87-100Mc/s).
 Sockets are provided for the connection of
 external aerials, these for the optimum reception
 s.w., and v.h.f. bands only. For v.h.f., best results



Vintage Service Data CD-Rom



Threequarter view of the Philips 13RB561 a.m./f.m. radio receiver.

Resistors			R11	820Ω	E4	R29	5-6
			R12	220Ω	E4	R30	33
R1	47kΩ	C3	R13	180Ω	F4	R31	1
R2	6-8kΩ	C3	R14	220kΩ	F4	R32	1-2
R3	1kΩ	C3	R17	4-7kΩ	F4	R33	15
R4	150kΩ	E3	R18	4-7kΩ	F4	R34	82
R5	470Ω	C3	R21	10kΩ	F4	R35	56
R6	120kΩ	F3	R22	470Ω	E4	R36	8-2
R7	470Ω	F4	R25	47kΩ	E4	R37	1
R8	2-2kΩ	E3	R26	47kΩ	B2	R38	22
R9	22kΩ	E4	R27	10kΩ	C1	R39	47
R10	3-9kΩ	E4	R28	47kΩ	E3	R40	18

are obtained when a 75Ω unscreened balanced feeder is used.

Two 5 pin (180deg) D.I.N. sockets are provided. One for the connection of a record player to play mono/stereo records, the other for the connection of a tape recorder for both record and playback of mono/stereo tape recordings.

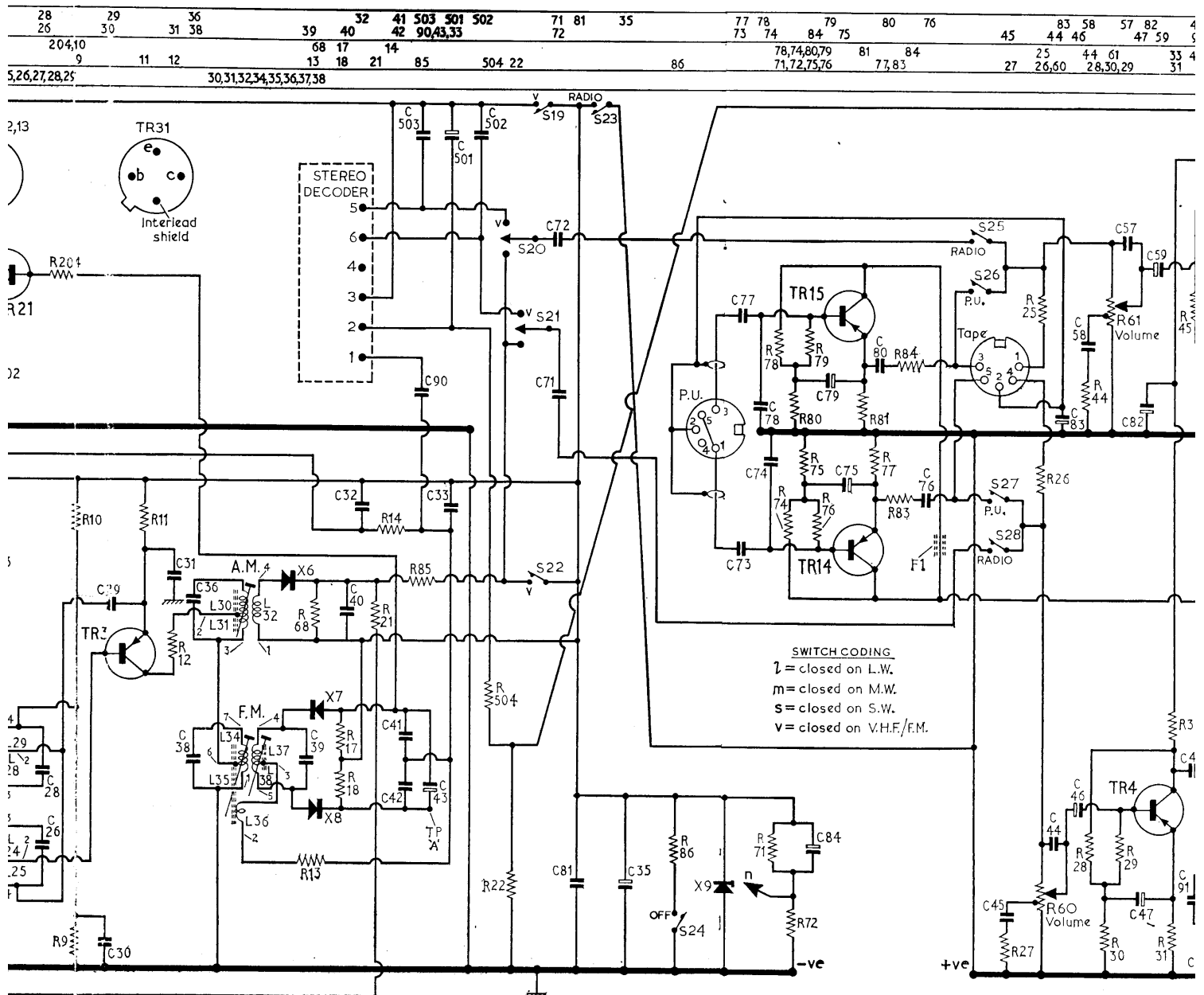
A power output of 3½ watts per channel is handled by four loudspeakers, two for each channel. These are; one 7in dia dual cone, 15Ω impedance, and one 3in dia tweeter of 20Ω impedance. Two 2 pin D.I.N. sockets are fitted to facilitate the connection of extension loudspeakers of 15Ω impedance.

The power supply is designed for operation from a 50c/s 200-240V mains voltage, and providing

the voltage is within this range no adjustment is required.

Transistor analysis

Transistor voltages given in the table overleaf are those derived from information supplied by the manufacturer. They were measured on a 100,000Ω/V meter, with the receiver operating from a 240V 50c/s mains



E4	R29	5.6kΩ	E3	R41	18kΩ	D4	R53	1kΩ	D3	R65	20kΩ	B1	R204	100kΩ	C2	C9	0.022μF	F3	C501	400μF
E4	R30	33kΩ	E3	R42	2.2Ω	D4	R54	220Ω	D4	R68	4.7kΩ	E4	R205	4.7kΩ	C2	C10	300pF	E3	C502	2,200pF
F4	R31	1kΩ	E3	R43	2.2Ω	D4	R55	470Ω	D4	R69	NTC	D4	R301	680Ω	H5	C11	275pF	F3	C503	2,200pF
F4	R32	1.2kΩ	D4	R44	10kΩ	C1	R56	180Ω	D4	R70	NTC	D4	R302	27kΩ	H5	C12	2.200pF	E3		
F4	R33	15kΩ	D3	R45	47kΩ	D3	R57	18kΩ	D4	R71	560Ω	F4	R303	8.2kΩ	H5	C13	240pF	E3	Coils and Transformers*	
F4	R34	820Ω	D3	R46	5.6kΩ	D3	R58	2.2Ω	D4	R72	4.7kΩ	F4	R305	5.6kΩ	H5	C14	40pF	E3		
F4	R35	56kΩ	D4	R47	33kΩ	D3	R59	2.2Ω	D4	R74	56kΩ	E3	R306	22kΩ	G5	C15	—	A2		
E4	R36	8.2kΩ	D4	R48	1kΩ	D3	R60†	200kΩ	C1	R75	68kΩ	E3	R307	1.5kΩ	H5	C16	0.1μF	F3	L1	—
E4	R37	1kΩ	D4	R49	15kΩ	D3	R61†	200kΩ	C1	R76	1.2kΩ	E3	R308	680Ω	G5	C17	91pF	F3	L2	—
B2	R38	220Ω	D4	R50	820Ω	D3	R62	20kΩ	B1	R77	15kΩ	E3	R309	4.7kΩ	G5	C18	91pF	F3	L3	—
C1	R39	470Ω	D4	R51	56kΩ	D3	R63	20kΩ	B1	R78	56kΩ	E3	R310	27kΩ	G5	C19	100pF	F4	L4	1.2Ω
E3	R40	180Ω	D4	R52	8.2kΩ	D3	R64	20kΩ	B1	R79	1.2kΩ	E3	R311	470kΩ	G5	C20	100pF	F4	L5	—

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1864

Philips 13RB561

Continued from overleaf -

Circuit alignment

Equipment required for spot frequency method. - An r.f. signal generator with an output impedance of 70-80Ω capable of being amplitude modulated 30 per cent, and covering the range 140kc/s-100Mc/s; an audio output meter of 15Ω impedance, or alternatively, an a.c. voltmeter; a d.c. voltmeter, sensitivity not less than 20,000Ω/V; two 15Ω, 5W load resistors; one 1kΩ damping resistor; one each 0.47μF, 0.1μF, 1,000pF and 20pF capacitors, and an r.f. coupling coil.

Notes on procedure

A.m. circuits. - Disconnect all six loudspeaker leads (pin and socket connectors) and connect the 15Ω load resistors one each to the extension loudspeaker sockets with the output meter in parallel with the left-hand channel resistor. If an audio output meter is being used the left-hand channel load resistor should be omitted. All measurements are to be made on one channel only. Preset left-hand channel volume, bass and treble controls to maximum, and right-hand channel volume, bass and treble controls to minimum. Restrict signal input consistent with accurate observation of output change. At no time should output exceed either 500mW or 2.5V.

F.m. circuits. - When aligning the f.m. circuits restrict the signal input consistent with accurate observation. The output measured across **C43** should not at any time be allowed to exceed 0.5V.

Alignment procedure

Switch receiver to m.w., withdraw screen cover from coil can of **L30-L32**. Preset cores of a.t.h. i.f. transformers flush with top of coil cans. Adjust for second peak.

1. - Rotate tuning gang to maximum capacitance, and feed in a 470kc/s a.m. signal via a 0.1μF capacitor to the base of **TR3**. Adjust **L30-L32** for maximum output.
2. - Feed in a 470kc/s a.m. signal via a 0.1μF capacitor to the base of **TR2**. Adjust **L26/L27** and **L28/L29** in that order for maximum output.
3. - Disconnect **C7** from **TR1** base, and feed in a 470kc/s a.m. signal via a 0.1μF capacitor to **TR1** base. Adjust **L18/L19** and **L20/L21** in that order for maximum output. Re-connect **C7**.

Transistor table

Transistor					(m.w./a.m.)		(v.h.f./f.m.)		
					Emitter (V)	Base (V)	Collector (V)	Emitter (V)	Base (V)
TR1	AF115	..	..	..	8.45	8.20	0.53	8.45	8.18
TR2	AF116	..	..	..	8.82	8.42	2.75	8.80	8.40
TR3	AF116	..	..	..	8.22	7.97	0.35	8.20	7.95
TR21	AF117	..	..	..	9.30	8.90	0	9.20	8.50
TR31	BF115	..	..	..	0	0	0	1.08	1.75
TR32	AF115	..	..	..	0	0	0	7.00	6.75
TR33	AF115	..	..	..	0	0	0	7.35	7.20

Switch receiver to 'Gram'								<i>Note: Transistor voltages quoted in the first part of the table i.e. TR1 - TR33, are all positive with respect to chassis. Voltages quoted in the second part (TR4 - TR15) are all negative with respect to positive line.</i>	
TR4	AF117	..	..	..	0.61	0.86	2.38
TR5	AF117	..	..	..	0.09	0.40	0.80
TR6	AC128	..	..	..	0	0.15	11.40
TR7	AC176	..	..	..	11.50	11.40	0
TR8	AC128	..	..	..	11.50	11.70	24.00
TR9	AF117	..	..	..	0.61	0.86	2.38
TR10	AF117	..	..	..	0.09	0.40	0.80
TR11	AC128	..	..	..	0	0.15	11.40
TR12	AC176	..	..	..	11.50	11.40	0
TR13	AC128	..	..	..	11.50	11.70	24.00
TR14	AF117	..	..	..	8.75	8.80	16.70
TR15	AF117	..	..	..	8.75	8.80	16.70

4. - Do not re-adjust **L28/L29** and **L18/L19**. Re-seal all cores, and replace screen cover over coil can **L30-L32**.

5. - Check a.m. cursor setting (see under drive cord replacement). Preset cores **L9** and **L12** flush with top of coil cans. With a.m. tuning control turned fully anti-clockwise, the tuning gang over-runs (slightly) true minimum capacity. After checking the a.m. cursor setting, tune to the point at which the a.m. cursor lines-up with the edge of the m.w./l.w./s.w. station scale at the high frequency end of the wavebands, i.e. the cursor just visible inside the left-hand end of the m.w./l.w./s.w. scale window. For operations 6-11 feed in the signal via a 0.47μF capacitor to the junction **C7/S7**.

6. - Switch receiver to m.w., rotate tuning gang to maximum capacitance, and feed in a 525kc/s a.m. signal. Adjust **L9** for maximum output.

7. - Rotate tuning gang to minimum capacitance (see operation 5), and feed in a 1,610kc/s a.m. signal. Adjust **C15** for maximum output.

8. - Repeat operations 6 and 7 until no further improvement can be obtained. Re-seal **L9**.

9. - Switch receiver to l.w., rotate tuning gang to maximum capacitance, and feed in a 145kc/s a.m. signal. Adjust **C11** for maximum output.

10. - Switch receiver to s.w., rotate tuning gang to maximum capacitance, and feed in a 5.97Mc/s a.m. signal. Adjust **L12** for maximum output.

11. - Rotate tuning gang to minimum capacitance see (operation 5), and feed in a 12.03Mc/s a.m.

signal. Adjust **C14** for maximum output.

12. - Repeat operations 10 and 11 until no further improvement can be obtained. Re-seal **L12**.

13. - For operations 14-17 feed the signal into the ferrite rod aerial via a loosely coupled r.f. coupling coil.

14. - Switch receiver to m.w., tune to 500m on scale, and feed in a 600kc/s a.m. signal. Adjust **L4/L5** for maximum output.

15. - Tune to 200m on scale and feed in a 1,500kc/s a.m. signal. Adjust **C6** for maximum output.

16. - Repeat operations 14 and 15 until no further improvement can be obtained. Re-seal **L4/L5**.

17. - Switch receiver to l.w., tune to 1,579m on scale, and feed in a 190kc/s a.m. signal. Adjust **L6/L7** for maximum output.

18. - For operations 19 and 20 feed in the signal via a 20pF capacitor to the s.w. plate aerial.

19. - Switch receiver to s.w., tune to 42.87m on scale, and feed in a 7Mc/s a.m. signal. Adjust **L2** for maximum output.

20. - Tune to 27.27m on scale, and feed in an 11Mc/s a.m. signal. Adjust **C4** to first peak from minimum capacity while rocking gang (to prevent pulling).

21. - Preset all f.m. i.f. transformer cores flush with top of coil cans. For operations 22-25 feed in a 10.7Mc/s unmodulated signal via a 1,000pF capacitor, and set tuning to maximum inductance.

22. - Switch receiver to v.h.f./f.m., and connect d.c. voltmeter (set to 10V range) across **C43** observing polarity. Feed the signal into the base of **TR3**, and adjust **L34/L35** for maximum output.

23. - Connect d.c. voltmeter between junction **C41/C42** and chassis. Feed the signal into **TR3** base and adjust **L37/L38** for zero output.

24. - Re-connect d.c. voltmeter across **C43**, and damp **L24/L25** with the 1kΩ resistor. Feed the signal into **TR2** base, and adjust **L22/L23** for maximum output. Transfer damping resistor to **L22/L23** and adjust **L24/L25** for maximum output.

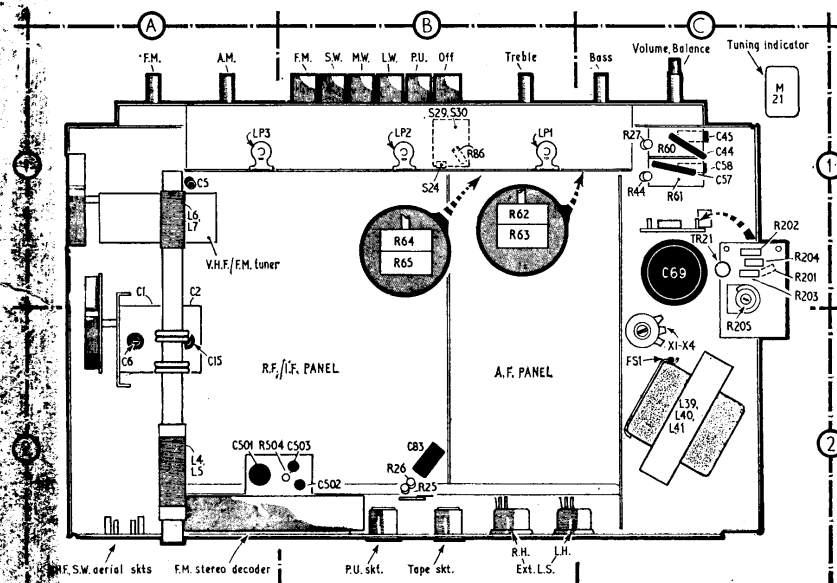
25. - Transfer signal feed to junction **C7/S7** and damp **L16/L17**. Adjust **L14/L15** for maximum output. Transfer damping to **L14/L15** and adjust **L16/L17** for maximum output. Remove damping.

Note: L309 may not require adjustment if f.m. tuner is, or has been pre-aligned.

26. - Feed a 10.7Mc/s unmodulated signal directly from 70-80Ω source to one v.h.f. aerial socket and earth (chassis). Adjust **L309** and **L44** for maximum output.

27. - Do not readjust any cores after setting. Re-seal all cores, excepting **L309**.

28. - Check f.m. cursor setting (see under drive cord replacement). Turn f.m. tuning control fully clockwise (tuner at maximum inductance) and mark the position of the f.m. tuning cursor accurately on the diffusion screen. To tune to 87Mc/s, turn f.m. tuning control anti-clockwise to position the cursor 22mm from the point marked on the diffusion screen. To tune to 96.7Mc/s, position cursor 180mm from the point marked on diffusion screen. For the following



General view of complete chassis from above showing location of components not mounted on printed panels.

Additional voltages and currents

Measurement	Switch mode M.w.	V.h.f.	Gram
Volts			
Across C69	23.5	23.5	24
Across C35	9.5 ± 0.5	9.5 ± 0.5	0
Bias to tuner*	—	1	0
Current mA			
To i.f. panel†	32.0	35.0	0
To a.f. panel‡	54.0	54.0	56.0
Total††	86.0	89.0	60.0
To v.h.f. tuner**	0	5.0	0

* Positive to tag 4, negative to tag 5. V.h.f. tuner.

† Measured in black lead from X1-4 to i.f. panel.

‡ Measured in black lead from C69 — ve to a.f. panel.

†† Measured in two red leads (combined) from C69 + ve to a.f. panel.

** Measured in green lead from S19 to tag 4 v.h.f. tuner.

operations feed the signal (unmodulated) in at the v.h.f. aerial socket as for operation 26.
29. — Tune receiver to 87Mc/s, and feed in an 87Mc/s unmodulated signal. Adjust **L310**, **C307**, **L309** in that order for maximum output.
30. — Tune receiver to 96.7Mc/s, and feed in a 96.7Mc/s unmodulated signal. Adjust **C315** for maximum output.
31. — Tune receiver to 93Mc/s, and feed in a 93Mc/s unmodulated signal. Adjust **C307** for maximum output.
32. — Repeat operations 29-31 in that order until no further improvement can be obtained. Disconnect and remove test apparatus.

F.m. i.f. alignment using wobulator

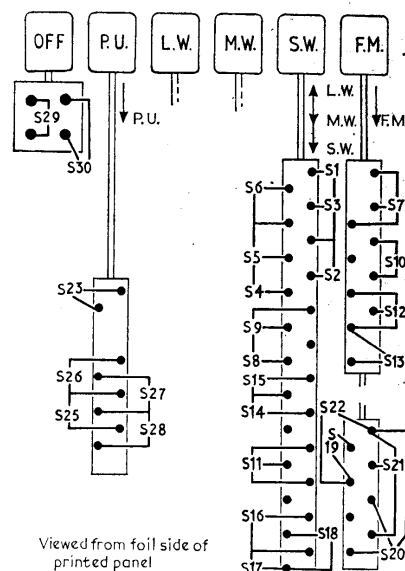
Note: The manufacturers advise that alignment of the f.m. i.f. circuits by this method should be undertaken only by an experienced servicing technician in possession of the necessary test equipment.

Equipment required. — An f.m. sweep generator and variable marker source with optional amplitude modulation; an oscilloscope (c.r.o.);

a 20,000Ω/V d.c. voltmeter; one 1,000pF capacitor, and a 100kΩ resistor.

1. — Switch receiver to v.h.f., preset volume, bass and treble controls to minimum and the f.m. tuning to maximum inductance. In all operations the input signal should be fed in via the 1,000pF capacitor and the c.r.o. connected as indicated via the 100kΩ resistor. Attenuate input signal sufficiently to avoid overloading and consequent waveform distortion. During operations 2-4, the voltage measured across **C41/C42** should not exceed 0.5V.
2. — Preset **L34/L35** and **L37/L38** cores flush with top of coil cans. Disconnect one end of **C43** (test point 'A', location F4 on printed panel illustration). Connect voltmeter across **C41/C42** and c.r.o. across **R17**. Feed in a 10.7Mc/s signal, deviated 300kc/s at 50c/s, to base of **TR3**. Adjust **L34/L35** for maximum amplitude. Transfer voltmeter and c.r.o. to between junction of **C41/C42** and chassis. Feed in a 10.7Mc/s unmodulated signal to base of **TR3**. Adjust **L37/L38** through first peak and down to zero volts. Re-connect **C43**.
3. — Feed in a 10.7Mc/s signal, deviated 300kc/s at 50c/s, to base of **TR3** and check that 'S' curve is centred about the 10.7Mc/s marker. Check also, that peak separation is ≥ 380kc/s, i.e. ± 190kc/s about 10.7Mc/s and that curve is straight over approximately 200kc/s. Now apply in addition to the f.m. signal a 10.7Mc/s signal amplitude modulated 30 per cent at 50c/s; the straight portion of the curve should remain unchanged. If necessary repeat operation 2 above.
4. — Preset **L14/L15**, **L16/L17**, **L22/L23** and **L24/L25** cores flush with top of coil cans. Feed in a 10.7Mc/s signal, deviated 300kc/s at 50c/s, to base of **TR2**. Adjust **L22/L23** for maximum amplitude, then **L24/L25** for symmetry. Transfer signal input to the junction **C7/S7**. Adjust **L14/L15** for maximum amplitude, then **L16/L17** for symmetry.
Transfer signal input (70-80Ω source impedance) to between one v.h.f. aerial socket and earth. Adjust **L309** for maximum amplitude and symmetry, then **L44** for symmetry.
5. — Connect voltmeter across **C43**. Feed in a 94Mc/s signal, deviated 300kc/s at 50c/s, and tune receiver to this signal. Attenuate input signal such as to produce 1V across **C43**. The detector curve should be straight over ± 75kc/s. Disconnect and remove test equipment.

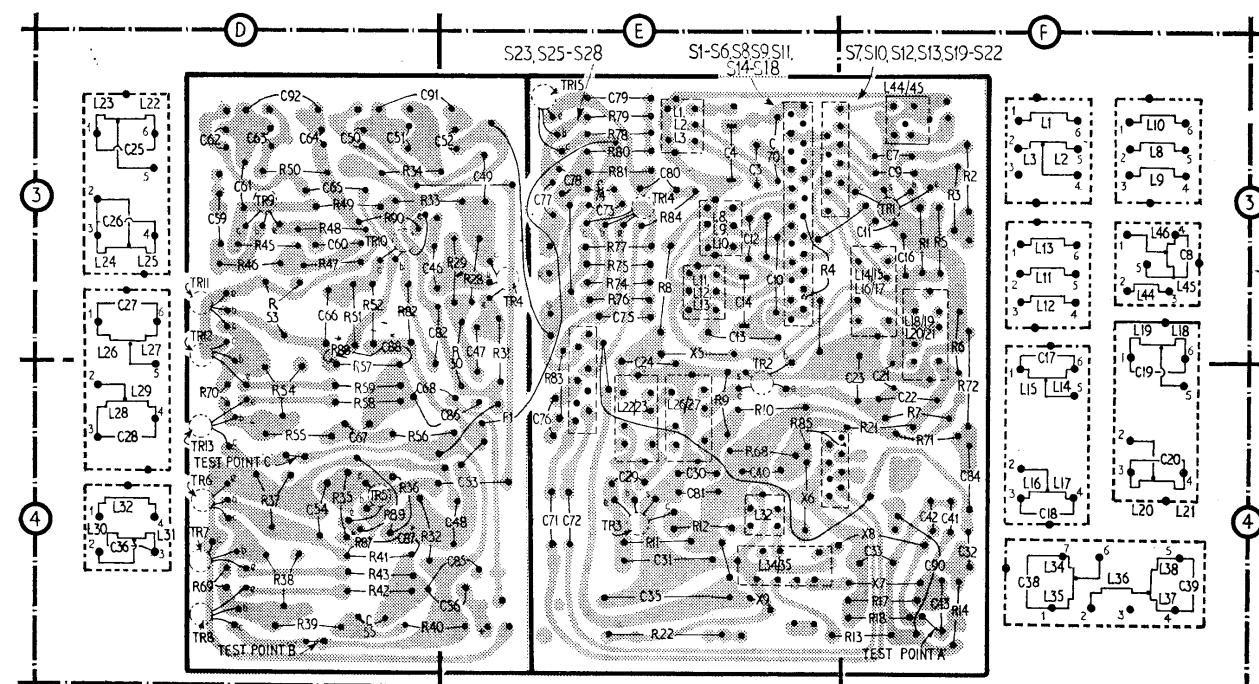
A.f.c. check. — Short circuit a.f.c. feed to tuner unit (tag 6) to positive supply line (tag 4).



Feed in a signal of 5mV at 94Mc/s, deviated 22.5kc/s at 1kc/s, source impedance 70-80Ω, between one v.h.f. aerial socket and earth. Tune receiver to this signal, turn bass and treble controls to maximum and adjust left-hand volume control to give an a.f. output power of 27dB measured across the left-hand loudspeaker socket: Detune signal generator ± 150kc/s, then remove short circuit from the a.f.c. line — power output > 25dB should be restored.

General notes

Dismantling. — Disconnect receiver from mains power supply, and withdraw all plugs from their sockets at the back of the cabinet. Pull off control knobs (five). Release metal trim supporting station scale (three screws beneath lower front edge), then ease scale downwards to disengage top edge. The scale is now free from the cabinet but captive to chassis by the tuning indicator leads. Note colour code of tuning indicator connecting leads, then detach connections



Component locations and transformer connections on printed panel viewed from foil side.

(pin and socket) from tuning indicator panel; releasing station scale with tuning indicator attached.

Unscrew and remove two screws securing chassis front mounting brackets to cabinet base (recover washers and bushes), then ease chassis forward to release the two support grommets from their locating pillars. Check that ferrite rod aerial is positioned lengthwise from front to back of cabinet. Failure to observe this precaution may result in damage to the aerial assembly during withdrawal of chassis.

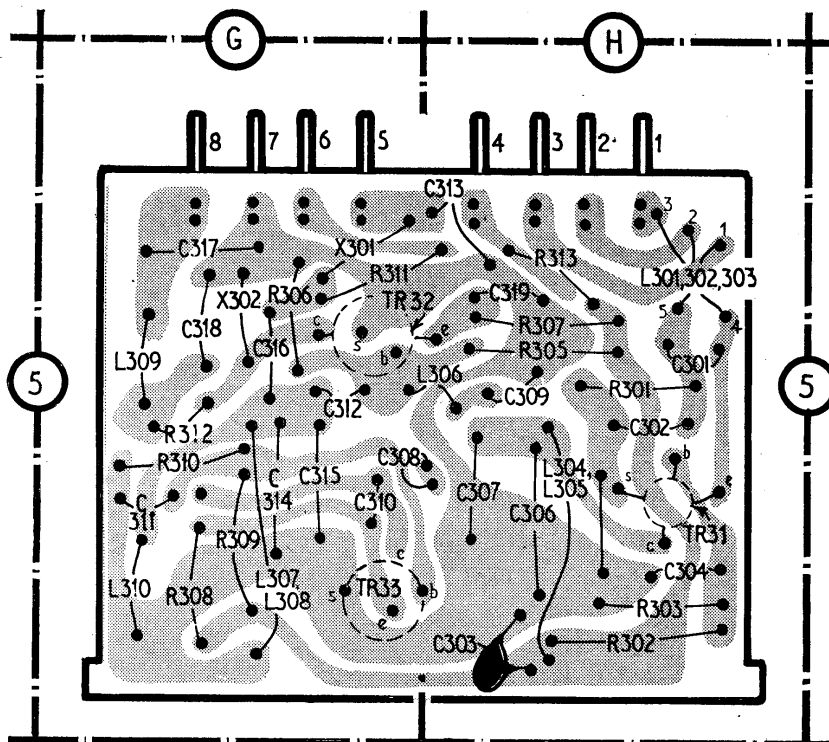
Withdraw chassis from cabinet as far as connecting leads will allow. Note colour code of leads to loudspeakers and to s.w. plate aerial, then disconnect them. The chassis may now be eased forward and out of the cabinet.

Stereo decoder. — The manufacturers advise that the stereo decoder is not repairable. In the event of faulty operation it should be replaced. Replacement decoder units are supplied pre-aligned at time of manufacture and should be fitted without further adjustment of decoder or receiver alignment.

Drive cord replacement. — To gain access to the two drive cord assemblies. First remove main chassis from cabinet as described in the dismantling procedure, then unclip diffusion screen from chassis supports. Refer to illustration of drives for guidance with the notes that follow.

A.m. drive cord. — Remove old cord, cursor and tension spring. Make up replacement cord to the dimensions illustrated, note that measurement includes looped ends. Rotate tuning drum fully anti-clockwise to maximum capacitance. Attach one looped end of cord to tension spring and hook other end of spring to anchor lug within drum. Route spring and cord three-quarter turn clockwise round inner periphery of drum to pass anti-clockwise round pillar in aperture in outer periphery and on clockwise round pulley A. clockwise rear pulley B, up anti-clockwise round rear pulley C, across chassis to anti-clockwise round rear pulley D, down anti-clockwise round pulley E, across chassis to clockwise round pulley F, down and back to $2\frac{1}{2}$ turns (wound from back to front) clockwise round tuning spindle, back anti-clockwise round pulley G, on anti-clockwise round pulley H, up to $2\frac{1}{2}$ turns (wound from back to front) anti-clockwise round tuning drum, passing end of cord anti-clockwise over pillar and in through aperture to hook on end of tension spring to which other end of cord is already attached. Fit cursor.

A.m. cursor setting. — Temporarily fit tuning scale in position on chassis (press-buttons will locate and tuning control knobs hold *in situ*). Rotate a.m. tuning control fully clockwise, then set cursor to line-up with the edge of the l.w./s.w./m.w. window of the tuning scale at the low frequency end of the wavebands, i.e. cursor to be just visible inside the right-hand end of the l.w./s.w./m.w. window.



V.h.f./f.m. tuner panel. Note: X301, and X302 should read X31 and X32.

F.m. drive cord. — Remove old cord, cursor and tension spring. Make up replacement cord to the dimensions illustrated, note that measurement includes looped ends. Rotate f.m. tuning drum fully anti-clockwise to minimum inductance. Attach one looped end of cord to tension spring and hook other end of spring to anchor lug within drum opposite aperture in periphery. Route cord out through aperture to one-quarter turn anti-clockwise round drum, on clockwise round pulley I, clockwise round front pulley B, up anti-clockwise round front pulley C, across chassis to anti-clockwise round front pulley D, down anti-clockwise round pulley J, across chassis to anti-clockwise round pulley K, up to three complete turns (wound from back to front) anti-clockwise round tuning spindle, on

anti-clockwise round pulley L to $2\frac{1}{2}$ turns (wound from back to front) anti-clockwise round tuning drum, in through aperture to hook on to end of tension spring to which other end of cord is already attached. Fit cursor.

F.m. cursor setting. — Temporarily fit tuning scale (see a.m. cursor setting). Rotate f.m. tuning control fully clockwise (maximum inductance), then set cursor to line-up with edge of the f.m. tuning scale window at the low frequency end of the waveband, i.e. cursor to be just visible inside the right-hand end of the f.m. window.

Note: Backing cord for diffusion screen measures $14\frac{1}{2}$ in overall, this includes looped ends.

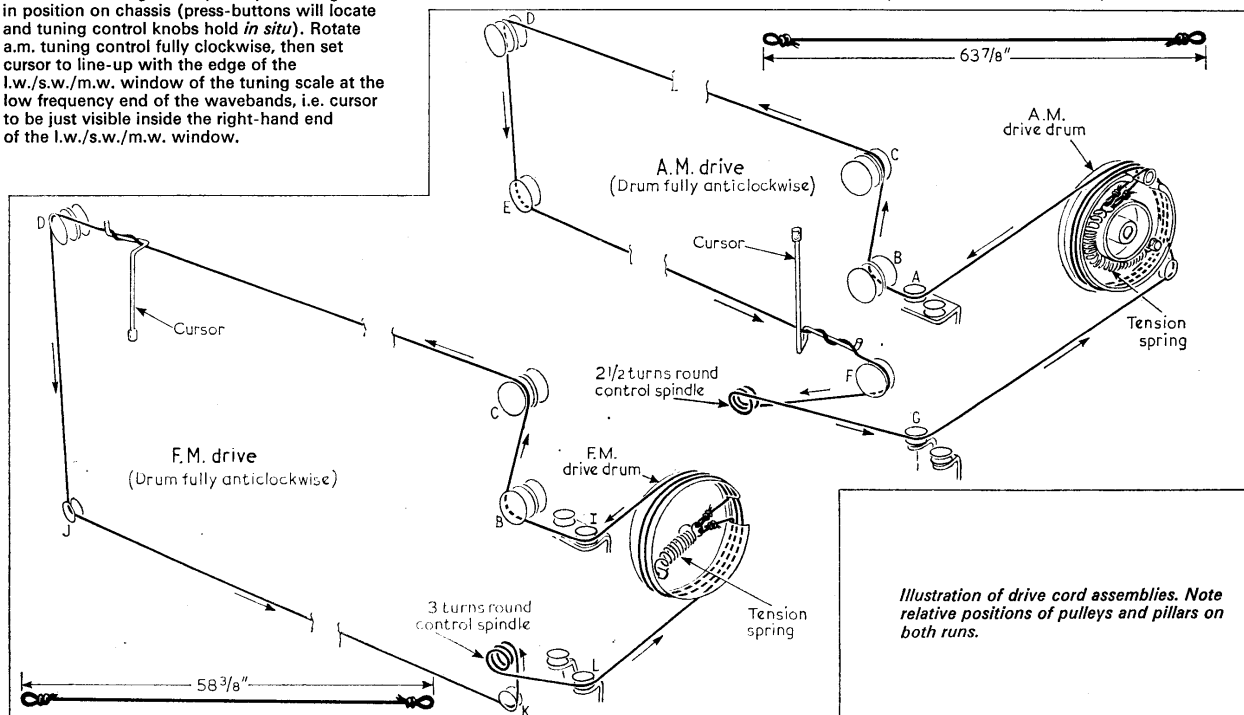


Illustration of drive cord assemblies. Note relative positions of pulleys and pillars on both runs.