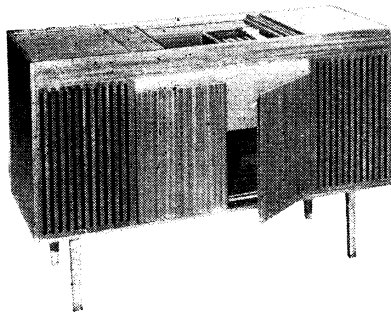


"TRADER" SERVICE SHEET
1687



Circuit diagram (right) and external appearance of Marconiphone 4310 Stereogram

MARCONIPHON

"Solid State" Stereophonic Radi
Employing 22 Transistors and 8

Resistors			Capacitors		
R1	68Ω	L6	C1	32pF	L6
R2	330Ω	L6	C2	0.05μF	L6
R3	2.2kΩ	L6	C3	220pF	L6
R4	330kΩ	L6	C4	56pF	L6
R5	330Ω	L7	C5	1,000pF	L6
R6	680Ω	L7	C6	0.01μF	L6
R7	10kΩ	L7	C7	510pF	L6
R8	3.3kΩ	L7	C8	15pF	L6
R31	22kΩ	B2	C9	5.6pF	L6
R32	3.9kΩ	B2	C10	220pF	L6
R33	1kΩ	B2	C11	47pF	L7
R34	15kΩ	B2	C12	1,000pF	L7
R35	150kΩ	B2	C13	510pF	L7
R36	470Ω	B2	C14	5.6pF	L7
R37	15Ω	B2	C15	47pF	L7
R61	2.7kΩ	G5	C16	21pF	L7
R62	22kΩ	E4	C17	510pF	L7
R63	3.9kΩ	E4	C31	2,000pF	B2
R64	10kΩ	E5	C32	40pF	B2
R65	6.8kΩ	F5	C33	20pF	B2
R66	1kΩ	E5	C34	100pF	B2
R67	1kΩ	E5	C35	40pF	B2
R68	560Ω	F5	C36	1,000pF	B2
R69	100kΩ	G4	C37	100pF	B2
R70	1kΩ	F4	C38	4,700pF	B2
R71	470Ω	G4	C39	40pF	B2
R72	330Ω	F5	C40	310pF	B2
R73	820Ω	G4	C41	300pF	B2
R74	22kΩ	G4	C42	40pF	B2
R75	4.7kΩ	G4	C43	40pF	B2
R76	330Ω	G4	C44	250pF	B2
R77	8.2kΩ	G4	C45	0.02μF	B2
R78	220Ω	G5	C61	4,700pF	E4
R79	4.7kΩ	H4	C62	8μF	E5
R80	100kΩ	H4	C63	0.01μF	E5
R81	15kΩ	H5	C64	375pF	F5
R82	15kΩ	H5	C65	150pF	F5
R83	1.2kΩ	H4	C66	0.02μF	F4
R101	10kΩ	J4	C67	0.02μF	F5
R102	220kΩ	J4	C68	0.05μF	F5
R103	22kΩ	J4	C69	0.05μF	E4
R104	10kΩ	J4	C70	3.3pF	F4
R105	330Ω	J4	C71	8μF	G4
R106	220kΩ	J5	C72	375pF	F4
R107	2.2kΩ	K4	C73	0.02μF	F4
R108	68Ω	J5	C74	150pF	G5
R109	3.9kΩ	J4	C75	0.05μF	G4
R110	4.7kΩ	K5	C76	1,500pF	G5
R111	2.2kΩ	K5	C77	0.022μF	G4
R112	6.8kΩ	K4	C78	375pF	G4
R113	1kΩ	J5	C79	100pF	G5
R114	47kΩ	K5	C80	50pF	G5
R115	150Ω	K4	C81	0.01μF	H4
R116	56Ω	K5	C82	330pF	H5
R117	150Ω	K5	C83	330pF	H5
R118	4.7Ω	K4	C84	5,000pF	H5
R119	4.7Ω	K5	C85	500pF	H4
R141	150kΩ	C2	C86	150μF	H4
R142	150kΩ	C2	C87	8μF	H4
R143	22kΩ	C2	C88	8μF	H4
R144	22kΩ	C2	C89	0.05μF	G4
R145	10kΩ	C2	C101	0.05μF	J4
R146	2.2kΩ	C2			
R147	2.2kΩ	C2			
R148	10kΩ	C2			
R149	4.7kΩ	C2			
R150	4.7kΩ	C2			
R161	100kΩ	B3			

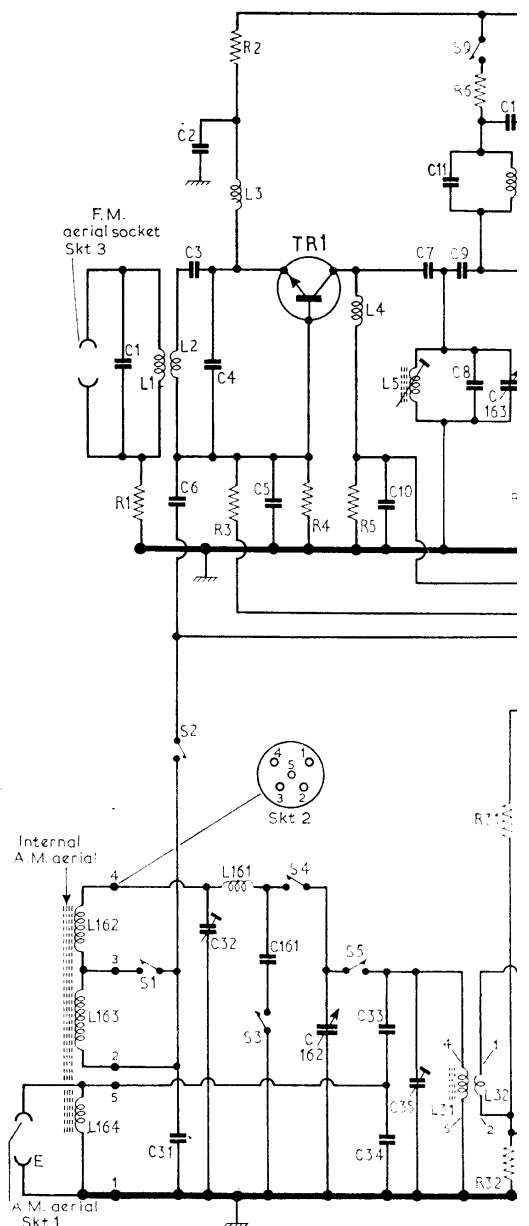
C102	8μF	J4
C103	8μF	J5
C104	400μF	J4
C105	25μF	J5
C106	25μF	K4
C107	100μF	J5
C108†	220pF	K5
C109	400μF	K4
C141	5,000pF	C2
C142	5,000pF	C2
C143	8μF	C2
C144	100μF	C2
C145	100μF	C2
C146	8μF	C2
C161	85pF	B1
C162	383pF	A2
C163	10.5pF	A2
C164	323pF	A2
C165	10.5pF	A2
C166	4,500pF	B3
C167	0.5μF	C1
C168	0.5μF	C1
C169	5,000pF	B1
C170	0.05μF	C1
C171	0.5μF	C1

Coils*		
L1	—	L6
L2	—	L6
L3	—	L6
L4	—	L6
L5	—	L6
L6	—	L6
L7	—	L7
L8	—	L7
L9	—	L7
L31	—	B2
L32	—	B2
L33	—	B2
L34	—	B2
L35	—	B2
L36	10.5	B2
L37	—	B2
L61	—	E4
L62	2.5	E4
L63	—	E5
L64	8.5	F5
L65	—	F5
L66	—	F5
L67	8.3	F4
L68	4.5	G5
L69	—	G5
L70	—	G5
L71	4.5	H4
L72	—	G4
L73	—	G5
L74	—	G5
L75	—	G5
L161	—	B1
L162	—	B3
L163	8.3	A3
L164	—	B3
L165	—	B1

Miscellaneous		
LS1	25Ω	C3
LS2	25Ω	C3
PL161†	—	B3
PL162†	12V 0.2A	B3
S1-S24	—	B1
S25, S26	—	C1
W61	OA79	F4
W62	OA79	H4
W63	OA79	H4
W64	OA79	H5
W101	AA120	K4
W102	AA120	K4
W161	LT120VA	A3
T161	—	C3

* Approximate d.c. resistance in ohms.
† Not fitted in some receivers.

C	1	6	3,2,4	5	10	7	11,9,8	13
		31	32	161	162		33,34,35	16
R	1	2	4	5	6	31		
		3						
L	152,163,164	1,2	3,161	4	5	31,32	6	



plied by the manufacturers. They were measured on a 20,000Ω/V meter with the receiver connected to 245V a.c. All readings are negative with respect to positive chassis line.

CIRCUIT NOTES

TR1 and TR2 are silicon planar n-p-n transistors which are incorporated in a tuner unit which provides r.f. amplification and a.g.c. on all wavebands. TR1 operates as r.f. amplifier on v.h.f., l.w.

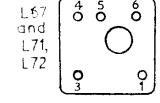
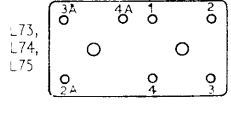
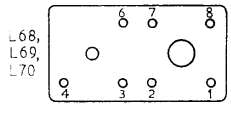
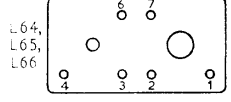
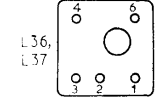
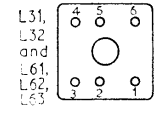
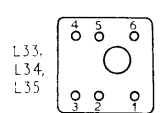
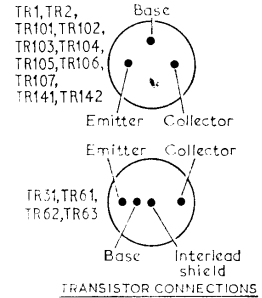
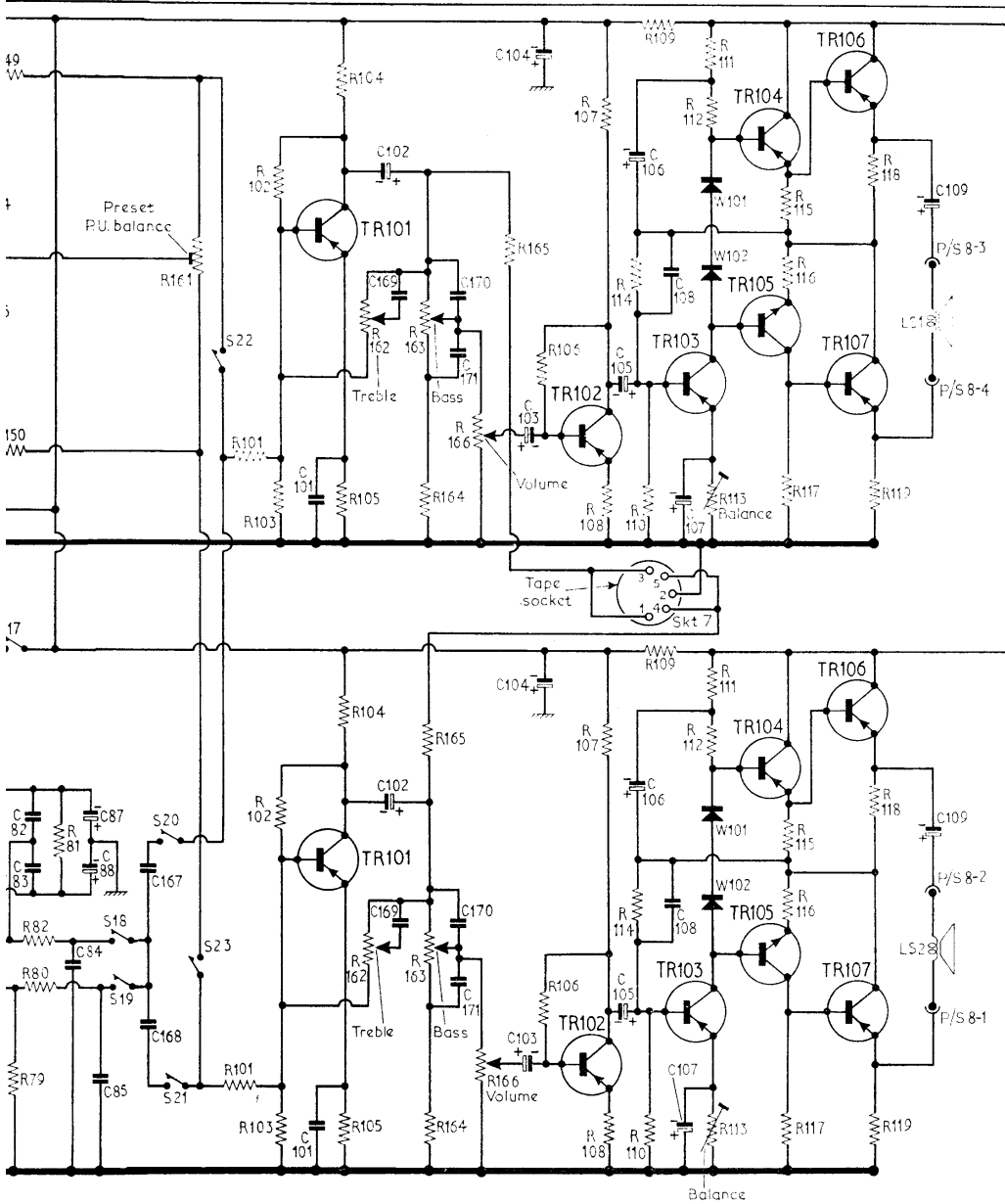
and m.w., and as i.f. amplifier on s.w. TR2 operates as v.h.f. self-oscillating mixer.

On a.m. TR1 is connected in the earthed emitter mode as r.f. amplifier, and signals are fed from the ferrite rod aerial via C6 to its base. The collector is aperiodically loaded by R5 and the signal is conducted to the output terminal through the pi filter formed by C7 and C10 with L7 and C17 (L4 and L5 represent a very low impedance at these

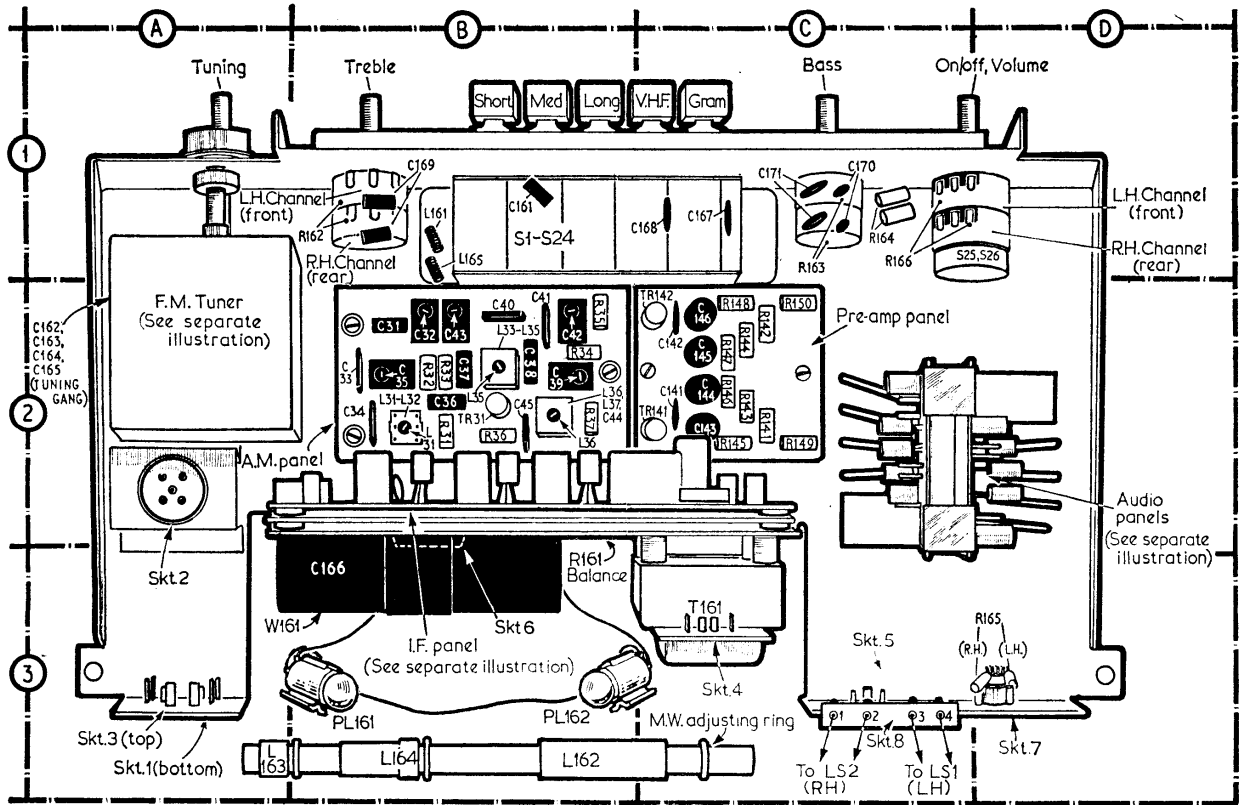
frequencies with negligible effect.)

On f.m. TR1 is connected in the earthed base mode. Signals from the f.m. aerial via the wide band transformer L1/L2 are fed to the emitter base junction. L5, C8 and C163 comprise the parallel-fed collector tuned circuit through C7. L9 and C165 form the local oscillator tuned circuit, and feedback from collector to emitter is obtained via C14. I.f. loading of the collector is completed by (Continued overleaf, col. 1)

0 82	87	167		101	102	170	103	105	108		109	C	
1 83	84,88,85	168		169	171	104	106	107				R	
149,82,81		161	101	102	104,162	163	166	106	107	114,110	111	115	118
150,80		103	105	105	164	165		108	109	112,113	116,117	119	
													L51,L52



COIL TAGS VIEWED FROM UNDERSIDE OF PRINTED BOARD



Plan view of the complete chassis showing the modular units in the assembled position

Circuit Notes—continued

L8 and C17 which provide correct impedance matching to the base of the i.f. amplifier TR61.

TR31 is the a.m. s.w. oscillator mixer and TR61 the m.w. and l.w. oscillator mixer. Aerial section tuning gang C162 is switched by S4 and S5 between the medium and long wave aerial coils L162/L163 and the short wave aerial coil L31 as appropriate, and the oscillator section C164 is similarly switched between the s.w. oscillator tuning coil L35 and the common m.w. and l.w. oscillator coil L62.

I.f. output in TR31 collector circuit is coupled via the transformer L36/L37 to the base of TR1 which operates on s.w. as i.f. amplifier. TR2 is made inoperative on a.m. by the action of S9, and the use of a common output terminal for TR1 eliminates the need for signal frequency switching.

Standing base bias for TR1 is derived from the d.c. voltage dropped along TR61 feed resistor R66 through R65, R64 and R3. When the voltage at TR61 reaches a sufficiently high amplitude, diode W61 conducts and its output developed across the diode load resistor R65 is applied via the filter R64, C62 to the base of TR1, thus providing a.g.c. action.

Common a.m. and f.m. i.f. amplifiers TR62 and TR63 are connected in the earthed base mode on f.m. and in the earthed emitter mode on a.m. Output from TR63 is fed to conventional detector circuits associated with W63, W64 (f.m.) and W62 (a.m.). Radio output is applied via C167 and C168 to the bases of the left-hand and right-hand preamplifiers TR101, and from TR101 via the tone and volume controls to the second preamplifier TR102.

TR103 is a driver transistor with its collector output d.c. coupled to the bases of a complementary driver pair TR104 and TR105. These in turn are d.c. coupled to the push-pull output transistors TR106 and TR107 which are series connected across the 30V line supply voltage. Balance is achieved by the setting of preset control R113. The two

audio channels are identical in operation.

TR141 and TR142 come into operation on gram only and comprise l.h. and r.h. preamplifiers for the two independent outputs from the pick-up.

CIRCUIT ALIGNMENT

To perform circuit alignment, the chassis should be removed from the cabinet as described under "Dismantling."

Equipment Required.—An a.m. signal generator; an f.m. signal generator also capable of being switched to a.m. 30 per cent modulation; an output meter with an impedance of 25 Ω or alternatively a high impedance a.c. voltmeter; a 0.1 μ F capacitor and a 20pF capacitor.

Switch Table

Switch	Gram	V.H.F.	Long	Medium	Short
S1				C	
S2				C	
S3				C	
S4				C	
S5					
S6					
S7					
S8					
S9					
S10					
S11					
S12					
S13					
S14					
S15					
S16					
S17					
S18					
S19					
S20					
S21					
S22					
S23					
S24					

Transistor Table

Transistor	Emitter (V)	Base (V)	Collector (V)	
TR1	SE1002	10.6	9.15	1.69
TR2	SE1001*	9.05	8.55	1.69
TR31	AF115	1.3	1.4	9.3
TR61	AF116	1.3	1.44	8.2
		1.25	1.6	9.4
TR62	AF116	0.54	0.7	13.7
		0.64	0.8	14.6
TR63	AF116	2.4	2.5	13.2
		2.55	2.7	14.0
TR101	AC156	0.21	0.31	5.9
TR102	AC156	0.19	0.31	6.91
TR103	AC165	1.1	1.2	14.1
TR104	AC166	15.7	15.8	29.0
TR105	AC168	15.45	14.1	0.15
TR106	AC167	15.55	15.7	29.0
TR107	AC167	0.05	0.15	15.5
TR141, TR142	AC156	1.35	1.07	5.7

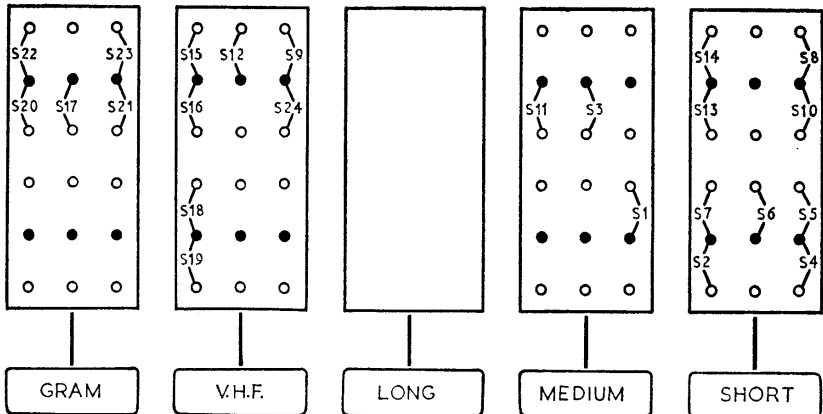
*Or SE1002.
§Receiver switched to a.m.
¶Receiver switched to .m.

A.M. Circuits

- 1.—Connect the audio output meter in place of one of the loudspeakers, or connect the a.c. voltmeter switched to a suitable range across the right-hand or left-hand speaker socket. Connect the a.m. signal generator via the 0.1 μ F capacitor to the junction of S4 and S5, i.e., across C162.
- 2.—Switch receiver to m.w. and turn the tuning gang to maximum capacitance. Feed in a 475kc/s modulated signal and adjust L71 (location reference H4), L68 (G5), L67 (F4) and L64 (F5) in that order for maximum output.
- 3.—Switch receiver to s.w. and adjust L36 for maximum output.
- 4.—Connect the a.m. signal generator to the a.m. aerial socket (Skt 1) via the 20pF capacitor. Set the tuning gang at maximum capacitance and check that the cursor coincides with the zero marker on the scale backing plate.
- 5.—Tune receiver to 600kc/s (marker on scale backing plate), feed in a 600kc/s 30 per cent modulated signal and adjust L62 (E4) and L162 m.w. ferrite rod aerial coil for maximum output.
- 6.—Tune receiver to 1,400kc/s (marker), feed in a 1,400kc/s signal, and adjust C43 (B2) and C32 (B2) for maximum output.
- 7.—Switch receiver to s.w. and set the cursor at the 600kc/s m.w. marker on the scale backing plate. Feed in a 6.7Mc/s signal and adjust L35 (B2) and L31 (B2) for maximum output.
- 8.—Set the cursor to 1,400kc/s m.w. marker. Feed in a 15.8Mc/s signal and adjust C39 (B2) and C35 (B2) for maximum output.
- 9.—Switch receiver to l.w. and tune to 220kc/s (marker on scale backing plate). Feed in a 220kc/s signal and adjust C42 (B2) and L163 (l.w. ferrite rod aerial coil) for maximum output.

F.M. Circuits

- 1.—Switch receiver to v.h.f. and allow receiver and test equipment a ten-minute warm-up period. Set the volume control 90 deg. back from maximum, set the treble and bass controls on "O." Connect an output indicator as described for a.m. circuits.
- 2.—Connect the f.m. signal generator between the junction C17/C61 and chassis (between tags 63 and 62 on the i.f. panel). Feed



Waveband switch assembly as seen from above when facing the control panel

- in a 10.7 f.m. signal, and adjust L74 (G5), L73 (G5), L69 (G5) and L65 (F5) for maximum output.
- 3.—Switch the signal generator to 10.7Mc/s a.m. and adjust L74 for minimum a.m. output (maximum a.m. rejection). Switch the generator to 10.7Mc/s f.m. and check that the f.m. output has not fallen. If maximum a.m. rejection and maximum f.m. output do not coincide, L74 should be adjusted for maximum a.m. rejection at the expense of a slight reduction in f.m. output.
- 4.—Set the signal generator to give a 100 μ V f.m. input signal and check operations 1 and 2.
- 5.—Tune receiver to 94Mc/s (marker on scale backing plate). Connect the signal generator to the f.m. aerial socket (Skt 3) and feed in a 94Mc/s signal. Adjust L9 (L7), L8 (L7) and L5 (L6) for maximum output. Repeat as necessary for correct calibration.

Audio Sensitivity Checks

Gram.—Connect a 25 Ω impedance output meter in place of each loudspeaker, or alternatively connect an oscilloscope between the junction C109/LS2 and chassis, i.e., between tag 109 and chassis on the audio

panel. Switch to gram and turn both treble and bass controls fully clockwise. Connect an audio oscillator via a 500pF capacitor between TR142 base and chassis (between pins 1 and 4 of p.u. socket, Skt. 6). Feed in 280mV 800c/s audio signal and observe that the output is approximately 2W for a correctly functioning amplifier.

Transfer the input to the base of TR141 (pins 2 and 3 of Skt. 6) and similarly check the other audio channel.

Radio.—Switch to f.m. and connect the audio oscillator to the junction of C167 and C168 via an 8 μ F capacitor. For 7mV at 800c/s input the output should be 200mW on each channel.

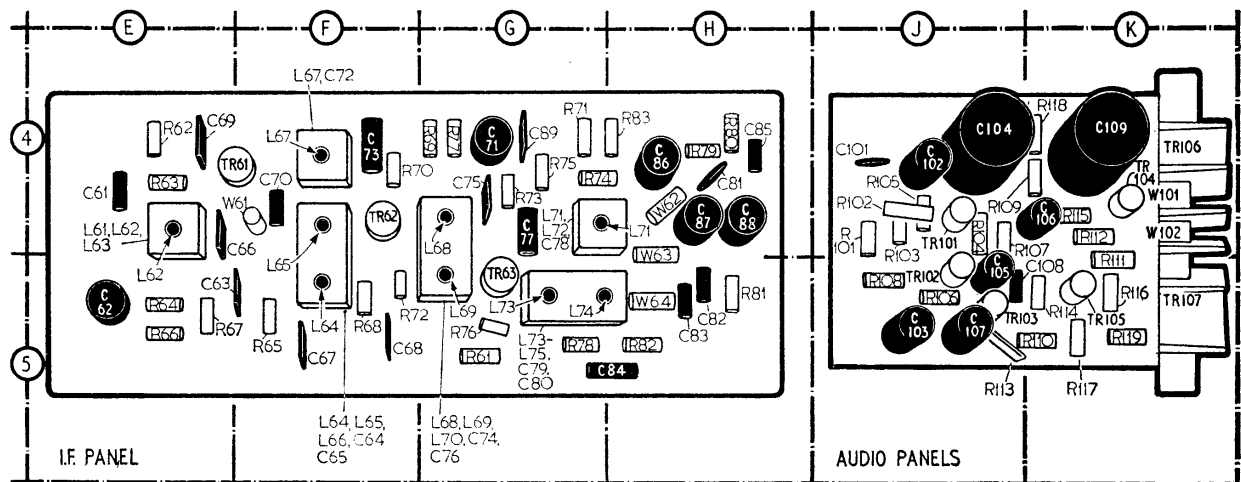
DISMANTLING

Record Changer Removal.—To withdraw the record changer first remove the central back cover and disconnect the pick-up and motor lead plugs from the chassis.

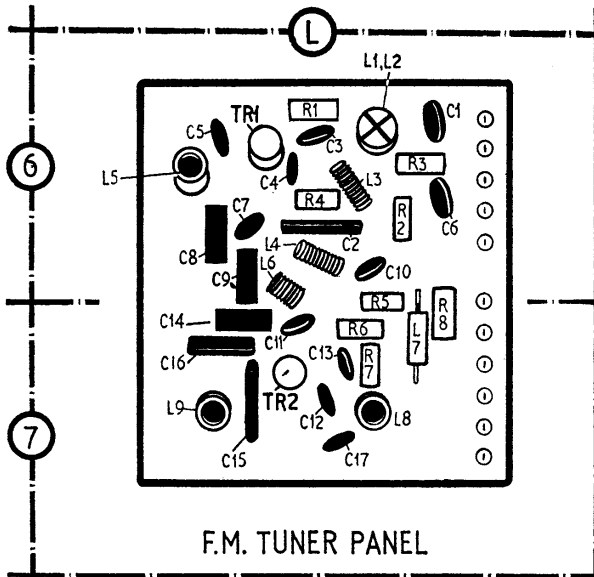
With access from the rear of the cabinet, pivot the clips on the transit screws to enable them to pass through the motor board and lift the changer clear of the cabinet.

Chassis Removal.—To remove the chassis from the cabinet, pull off the rotary control knobs.

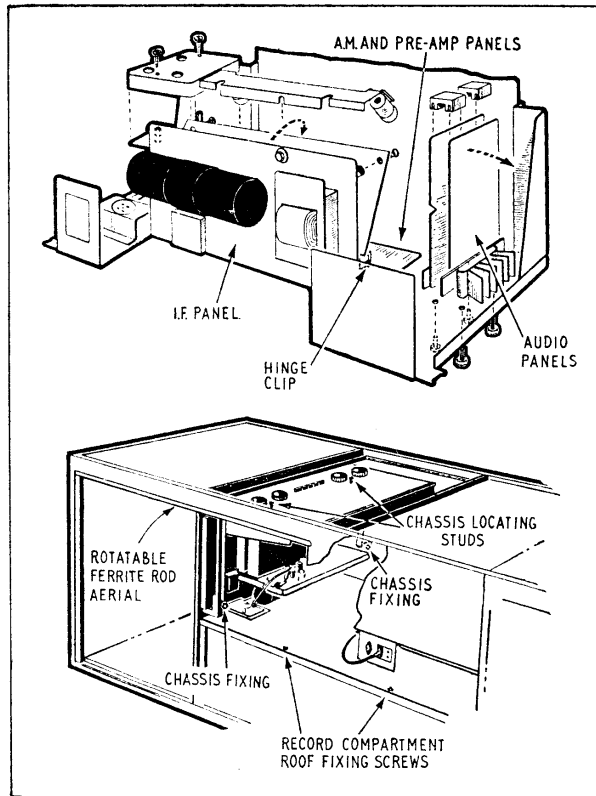
Remove the central back cover and slide



Component-side view of the i.f. panel and one of the two identical audio panels. These three panels are assembled on the main chassis as illustrated in the drawing at the top of the previous page



The f.m. tuner unit panel, and (right) two sketches which are included to supplement dismantling instructions. When replacing the loudspeaker plug connections, it is important to ensure that the speakers are correctly phased



out the record compartment roof, after removing two screws from rear edge.

Detach the chassis plug connections, i.e., a.m. and f.m. aerial, ferrite rod, pick-up, tape, loudspeaker and motor.

Remove two chassis fixing nuts and washers, pull chassis clear of locating studs, lower slightly to clear scale, then withdraw from cabinet.

GENERAL NOTES

Drive Cord Replacement.—For a replacement drive cord, approximately 45 inches of nylon braided cord is required. The length of cord required between the tension spring in the assembled condition is approximately 39in.

Thread the cord as shown in the sketch below right where the assembly has been drawn with the tuning gang fully closed.

Output Balance Adjustment.—To adjust pre-set resistor **R113**, connect an oscilloscope between the junction **C109/LS1** and chassis (earthy lead to chassis). Feed in a 1kc/s signal to the appropriate input on the tape socket. Set the volume control to maximum and increase the signal input level until clipping of the output waveform occurs. **R113** should then be adjusted until the clipping is symmetrical on positive- and negative-going peaks. Similarly adjust the other channel.

An alternative method is to adjust **R113** so that the potential at **TR107** collector relative to chassis, is 1V higher than half the d.c. supply as measured across **C104**, with no signal input and the volume control at minimum.

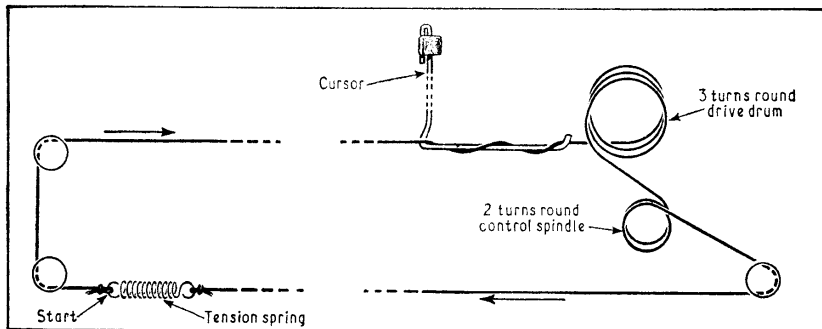
Pick-up Balance Adjustment.—The pick-up balance control **R161** is pre-set during manufacture and will not normally require readjustment unless a replacement pick-up cartridge is fitted.

Switches.—Waveband switches **S1-S24** are housed in a press-button unit shown in location reference **B1**. A separate drawing which appears in col. 5 shows the individual switch contacts, and the table in col. 1 gives the operating condition of each switch for every waveband position (C means closed and a "dash" means open).

ADDITIONAL NOTES AND MODIFICATIONS

Additional Link: In addition to the connection between the centre earthing tag on the tuning gang and tag 62 of the i.f. board, a link is now provided between the rear earthing tag and tag 62. The link prevents any tendency to v.h.f. instability.

For a number of reasons, the use of extension loudspeakers on transistor radiograms and record players is not recommended and connector sockets are not provided. The output stages are designed to give optimum results with a load impedance of 25 ohms. The correct load impedance is much more important on these amplifiers than on valve types, since the effect of connecting a second loudspeaker in parallel causes the output transistor to give increased power with a consequent danger of thermal runaway. A short-circuit, or a very low impedance such as a 3-4 ohms loudspeaker, is very likely to destroy the transistors. An open circuit is harmless.



Drive cord assembly illustrated with the tuning gang fully closed