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1843

MARCONIPHONE 4140 ULTRA 6144

Transistored Portable Radio Receivers

Appearance of Marconiphone 4140.

MARCONIPHONE 4140 and Ultra 6144 are three-waveband plus bandspread portable radio receivers, employing seven transistors and two germanium diodes, powered by two, series connected 9V dry batteries.

A ferrite rod internal aerial is used for reception of the m.w. (190-566m.), b.s. (185-216m.) and l.w. (1,120-2,025m.) bands; the short waveband (17·6-50m.) is covered using a tuned input transformer and telescopic aerial. An external socket provides for the connection of a car type aerial, while a second socket allows the output to be fed to an earphone (15Ω minimum impedance) or a tape recorder input.

A transformerless complementary push-pull output stage is featured which provides 600mW audio power to a 5in. 35Ω loudspeaker.

TRANSISTOR ANALYSIS

Transistor voltages given in the table in col. 1 were taken from information supplied by the manufacturers. They were measured with a 20,000Ω/V meter, and are negative with respect to the relevant transistors positive power supply line.

CIRCUIT ALIGNMENT

Equipment Required.—An a.m. signal generator modulated 30 per cent; an audio output

(*Continued overleaf, col.* 1.)

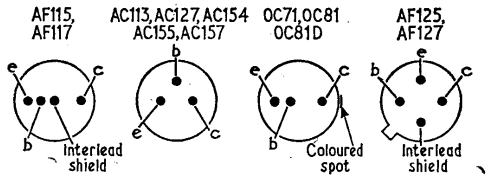
Resistors		
R1	47Ω	C1
R2	5·6kΩ	C2
R3	1·5kΩ	B1
R4	680Ω	B1
R5	100kΩ	C1
R6	100kΩ	B2
R7	820Ω	B2
R8	22kΩ	C2
R9	3·3kΩ	B2
R10	1·2kΩ	B2
R11	8·2kΩ	B2
R12	4·7kΩ	B2
R13	5kΩ	A1
R14	500Ω	B2
R15	12kΩ	A1
R16	12kΩ	B1
R17	56kΩ	A1
R18	180Ω	B1
R19	1·5kΩ	A2
R20	5·6kΩ	A1
R21	390kΩ	B2
R22	4·7Ω	B2
R23	4·7Ω	B1
R24	390Ω	B2
R25	470kΩ	C1
R26	1kΩ	B1
Capacitors		
C1	20pF	C1
C2	267pF	C2
C3	15pF	C2
C4	60pF	C1
C5	25pF	C1
C6	15pF	C2
C8	2,000pF	C1
C9	15pF	C2
C10	5,000pF	C1
C11	5,000pF	C1
C12	0·01μF	C2
C13	25pF	B1
C14	2,000pF	C1
C15	20pF	C2
C16	6·2pF	C1
C17	210pF	C2
C18	25pF	C2
C19	210pF	C2
C20	267pF	C2
C21	15pF	C2
C22	0·05μF	B1
C23	4·7pF	C2
C24	175pF	B2
C25	75μF	C2
C26	0·02μF	C2
C27	175pF	C2
C28	0·02μF	B2
C29	0·02μF	B2
C30	175pF	B2
C31	0·01μF	B2
C32	0·02μF	B2
C33	0·47μF	B1
C34	75μF	B1
C35	75μF	B2
C36	1,000pF	A1
C37	100μF	B2
C38	100μF	B2
C39	150μF	A1
Coils*		
L1	—	C1
L2	—	C1
L3	2Ω	C1
L4	—	B1
L5	10Ω	C1
L6	—	B2
L7	1Ω	B2
L8	—	B2
L9	—	C2
L10	—	C2
L11	2·5Ω	C2
L12	6·5Ω	B2
L13	—	B2
L14	6·5Ω	C2
L15	—	C2
L16	5Ω	B2
L17	—	B2
L18	—	B1
L19	35Ω	†
Miscellaneous		
S1-S8	—	C1
S9, S10	—	A1
D1	OA90	A1
D2	AA120	B2

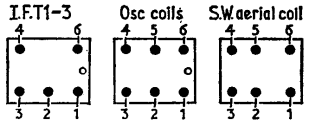
* *Approximate resistance in ohms.*
† *Loudspeaker.*

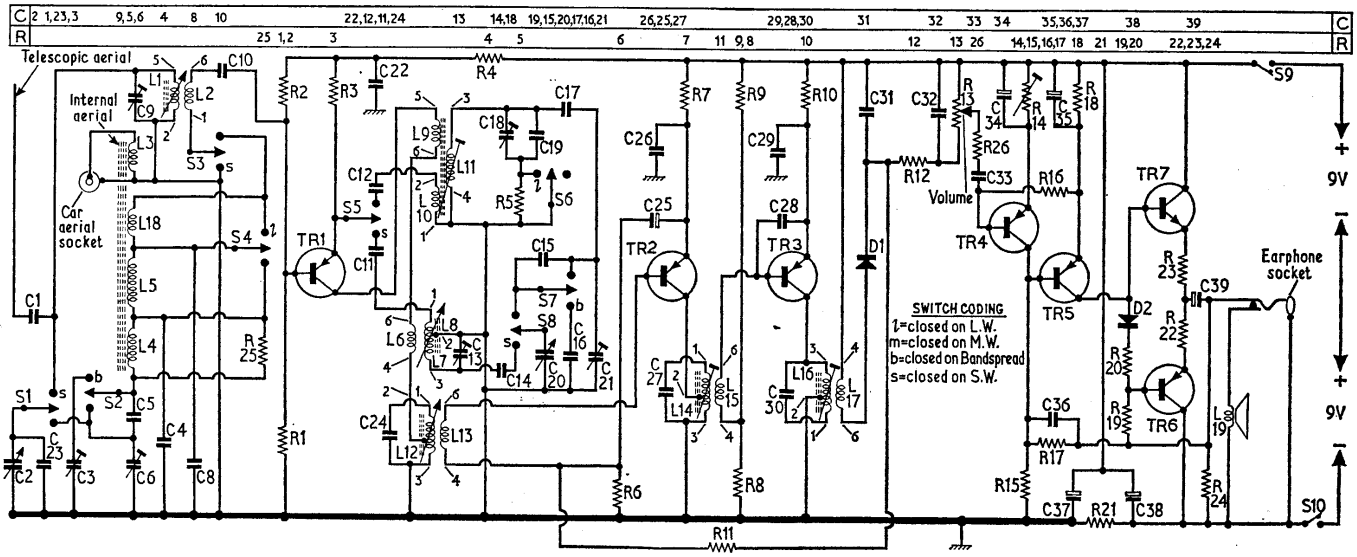
Transistor Table

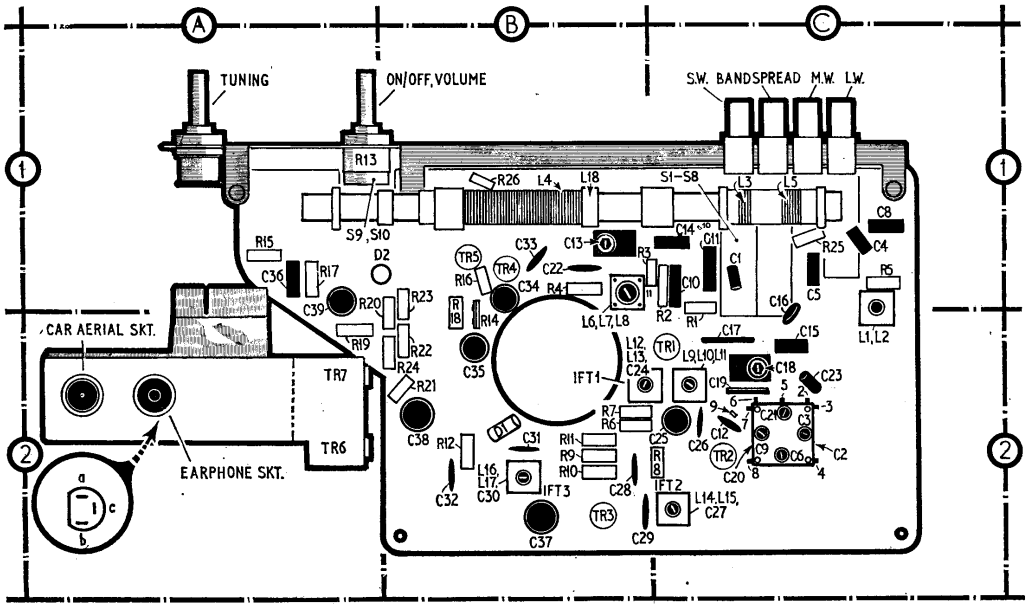
Transistor		Emitter (V)	Base (V)
TR1	AF115 / AF125†	1·5	1·55
TR2	AF117 / AF127†	1·0	1·2
TR3	AF117 / AF127†	1·85	2·1
TR4	OC71 / AC155†	0·3	0·45
TR5	OC81DM / AC113†	0·9	1·0
TR6	OC81M / AC154†	10·0*	10·0
TR7	AC127 / AC157†	10·0*	9·5

Measured at the junction of **R22/R23.**
Alternative type.









General view of the component side of receiver as seen when removed from the case.

Continued from overleaf—

meter with an impedance of 35Ω, or alternatively a model 8 Avometer set to its 10V a.c. range; a 0·1μF capacitor, and a length of insulated wire to be used as an r.f. coupling loop.

During alignment the input signal level should be attenuated to maintain a receiver output level of 50mW (approximately 1V using an Avometer).

1.—Switch receiver to m.w. and turn the tuning capacitor to maximum capacitance. Set the volume control to maximum, and connect the output meter via a jack plug to the earphone socket, or connect the Avometer across the loudspeaker speech coil.

2.—Connect the signal generator via the 0·1μF capacitor across the tuning gang aerial section **C2**. Feed in a 475kc/s 30 per cent modulated signal and adjust **L16, L14** and **L12** for maximum output, repeating until there is no further improvement.

3.—Check that cursor travel is central in scale window, i.e. the gap between cursor and edge of window, is equal at both ends. Connect the signal generator to the r.f. coupling loop and loosely couple the loop to the ferrite rod aerial. Tune receiver to 500m. Feed in a 600kc/s signal and adjust **L11** and **L4** for maximum output. *Note: L4 is adjusted by sliding the ring along ferrite rod.*

4.—Switch receiver to b.s. and tune to 200m. Feed in a 1,500kc/s signal and adjust **C21** for maximum output.

5.—Switch receiver to m.w. and tune to maximum output at 200m. Adjust **C6** for maximum output.

6.—Switch receiver to b.s., tune to 200m. and adjust **C3** for maximum output.

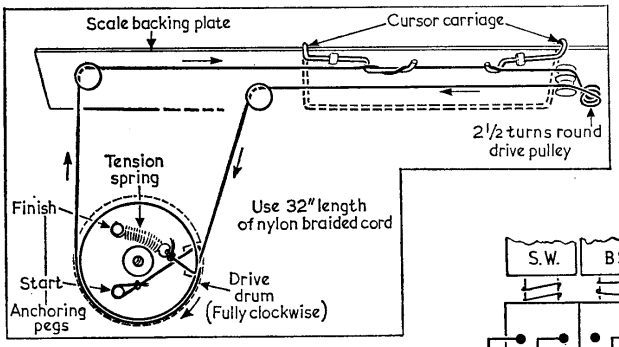
7.—Repeat operations 3-6 as necessary for accurate calibration and maximum output.

8.—Switch receiver to l.w. and tune to 1,500m. Feed in a 200kc/s signal and adjust **C18** and **L5** for maximum output. *Note: L5 is adjusted by sliding coil former along ferrite rod.*

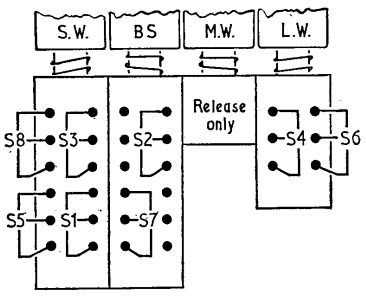
9.—Switch receiver to s.w., extend the telescopic aerial and place signal generator lead nearby to provide a loose coupling. Tune receiver to 7Mc/s. Feed in a 7Mc/s signal and adjust **L7** and **L1** for maximum output.

10.—Tune receiver to 16Mc/s. Feed in a 16Mc/s signal and adjust **C13** and **C9** for maximum output. *Note: In order to prevent pulling, the tuning gang should be rocked when C9 is being adjusted.*

11.—Repeat operations 9 and 10 as necessary for accurate calibration and maximum output.



Left: Drive cord assembly and below, waveband switches.



GENERAL NOTES

Dismantling.—To remove printed pane from case, first slide open battery compartment cover then disconnect and remove batteries. Unscrew the three countersunk screws located in the base of the case and remove the back cover. Pull off control knobs and unsolder lead to telescopic aerial. Unscrew and remove five screws and washers securing printed panel, then unsolder leads on loudspeaker tag panel. The printed panel may then be removed without further disconnection.

Drive Cord Replacement.—To replace drive cord, remove printed panel assembly as described under "Dismantling". Replace cord as illustrated in the diagram on this page.

Output Balance Adjustment.—R14 is incorporated in the emitter circuit of TR4, and its adjustment sets the emitter potential, and hence the collector potential of TR4, and the base potential of TR5. TR5 collector is in turn directly coupled to the bases of TR6 and TR7 so that the setting of R14 ultimately determines the base bias of TR6 and TR7, which should be such that the output transistors are correctly balanced across the battery supply.

Correct balance is obtained when the potential of TR6/TR7 emitter junction is 10V with respect to the positive line.

The discrepancy from half power supply voltage is due to TR5 emitter bias voltage developed across R18 which determines the limit of negative signal excursion before TR5 bottoms.

Alternatively the output balance can be checked with the aid of an oscilloscope, a.f. signal generator and output meter (35Ω).

Connect the output meter in place of the loudspeaker and connect the oscilloscope input in parallel with the output meter. Feed in a 1kc/s sinewave across the volume control R13, and with the volume control at maximum attenuate the signal generator output so as to produce at the output meter 600mW of audio power.

Adjust R14, in conjunction with the volume control, for symmetry of both waveform, and clipping at maximum output.

Heat Sink Note:—In the event of the removal and replacement of the output transistors TR6 and TR7 it is essential for the preservation of a low thermal resistance that there should be no airspace between the outside surface of the transistor and the inside of the heat sink. In the case of small transistors in cylindrical encapsulation, this air-space must be filled by the application of a suitable heat conducting grease and the transistor pushed fully into its sink.

Although the heat sink grease is applied during production it must always be re-applied when replacing a transistor during servicing.

Suitable compounds are, Anti-tracking grease MS4 or Heat sink compound DP2623. Both marketed by Midland Silicones Ltd.

Batteries.—Two 9V Ever Ready PP7 or equivalent.

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