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"TRADER" SERVICE SHEET

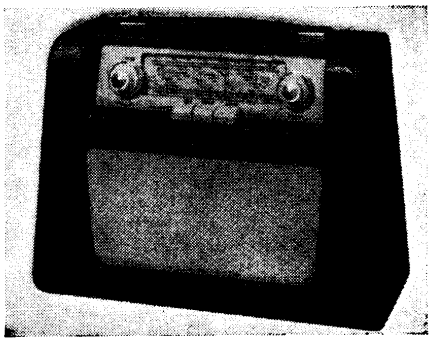
1484

ROBERTS RT7

Two-Band Portable A.M. Radio Receiver

SEVEN transistors, two germanium crystal diodes and a printed circuit are employed in the Roberts RT7, a two-band portable A.M. radio receiver that operates from a large-capacity 9V battery. Waveband ranges are 182-570 m and 1,120-2,000 m, and waveband switching is press-button operated. A long internal ferrite rod aerial is fitted, but provision is made by means of a car aerial socket for the connection of an external aerial.

Release date and original price: October, 1960. £18 5s 8d including battery. Purchase tax extra.



Appearance of the Roberts RT7.

TRANSISTOR ANALYSIS

Transistor terminal voltages given in the table below are those supplied by the manufacturer. They are negative readings measured with a high resistance (20,000Ω/V) meter whose positive lead was connected to chassis. The receiver was switched to M.W., but there was no signal input, and it was operating from a new 9V battery.

Transistor Table

Transistor	Emitter (V)	Base (V)	Collector (V)
TR1 OC44	1·07	1·03	6·55
TR2 OC45	0·53	0·7	5·35
TR3 OC45	0·92	1·09	7·15
TR4 OC71	1·04	1·14	3·02
TR5 OC81D	1·6	1·69	8·7
TR6 OC81	—	0·2	9·0
TR7 OC81	—	0·2	9·0

CIRCUIT DESCRIPTION

Ferrite rod aerial coils **L3** (M.W.) and **L2** (L.W.) are tuned by **C1**. A special winding **L1** provides coupling for a car aerial or any other external aerial. Coupling to first transistor **TR1** is effected by means of low impedance windings **L4, L5** via capacitor **C5**, which isolates the base electrode of the transistor from the coil circuit.

TR1 operates as a self-oscillating mixer, with reaction coupling by **L6** and **L7** between collector and emitter circuits. **L8** is tuned by **C13,** with the addition of **C12** on M.W., or of **C10, C11** on L.W. The operation of the waveband switches is explained under "General Notes."

Signals at intermediate frequency in **TR1** collector circuit are selected by double-tuned transformer **L9, L10** and passed to a two-stage amplifier comprising **TR2** and **TR3,** the transistor connections being tapped down on each coil winding to provide low impedance couplings and to avoid unduly damping the tuned circuits.

Intermediate frequency 470 kc/s.

Output from **TR3** is applied via **L14** to

(*Continued overleaf, col.* 1)

Coils*

L1	2·5	C2
L2	0·8	D2
L3	5·0	A2
L4	0·1	D2
L5	0·8	A2
L6	1·65 total	A2
L7	1·65 total	A2
L8	0·7	A2
L9	0·3	A2
L10	2·5	A2
L11	1·65 total	B2
L12	1·65	B2
L13	4·0	C2
L14	1·3	C2
L15	3·0	—

Capacitors

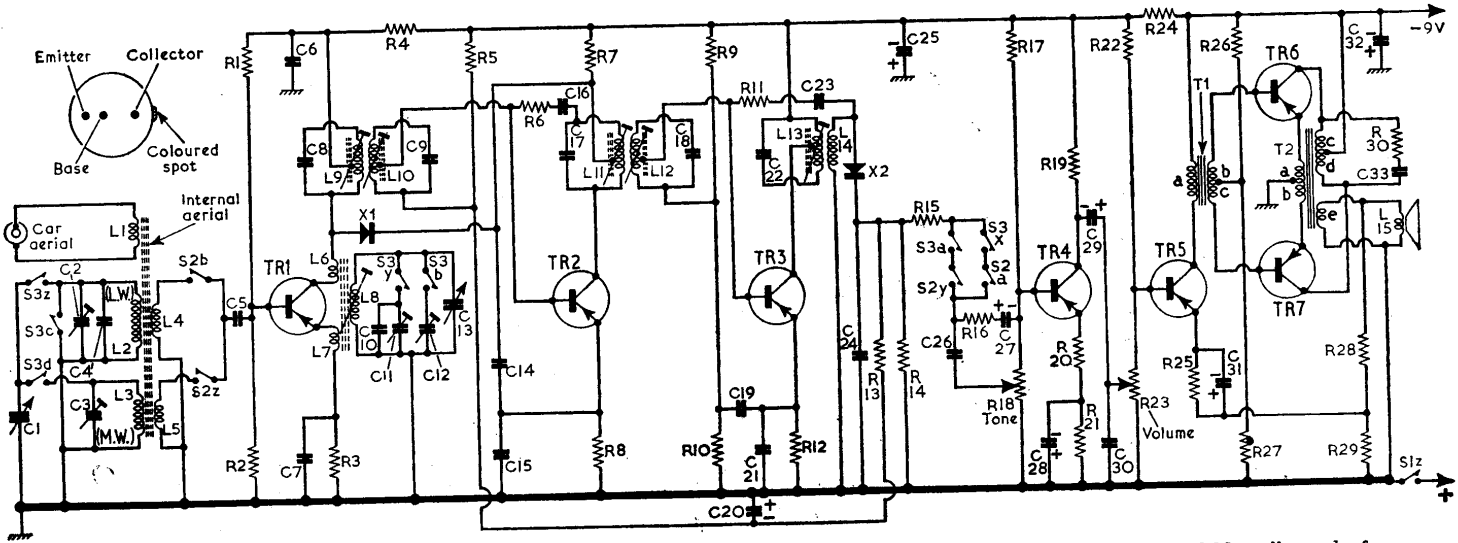
C1	—	A1
C2	—	B2
C3	40pF	D1
C4	0·04μF	A1
C5	0·04μF	A2
C6	0·01μF	A2
C7	800pF	A2
C8	800pF	A2
C9	250pF	C2
C10	—	C2
C11	—	B2
C12	—	B1
C13	0·04μF	B2
C14	0·1μF	B2
C15	10pF	B2
C16	800pF	B2
C17	800pF	B2
C18	0·1μF	C2
C19	10μF	B2
C20	0·1μF	C2
C21	250pF	C2
C22	18pF	C2
C23	0·01μF	C2
C24	100μF	A2
C25	0·1μF	C1
C26	2μF	D2
C27	100μF	D2
C28	2μF	D1
C29	0·01μF	C1
C30	100μF	D2
C31	100μF	D1
C32	0·25μF	D2
C33	[illegible]	[illegible]

R1	39kΩ	A1
R2	8·2kΩ	A1
R3	2·7kΩ	A2
R4	1kΩ	A1
R5	68kΩ	B2
R6	6·8kΩ	B2
R7	1·5kΩ	A2
R8	470Ω	B2
R9	22kΩ	C2
R10	4·7kΩ	C2
R11	3·9kΩ	C2
R12	1kΩ	C2
R13	8·2kΩ	C2
R14	8·2kΩ	C2
R15	4·7kΩ	C2
R16	4·7kΩ	C2
R17	75kΩ	D2
R18	20kΩ	D1
R19	4·7kΩ	D2
R20	180Ω	D2
R21	1kΩ	D2
R22	22kΩ	D2
R23	10kΩ	D1
R24	470Ω	D2
R25	470Ω	D2
R26	2·2kΩ	C2
R27	51Ω	D2
R28	270Ω	D2
R29	[illegible]	[illegible]

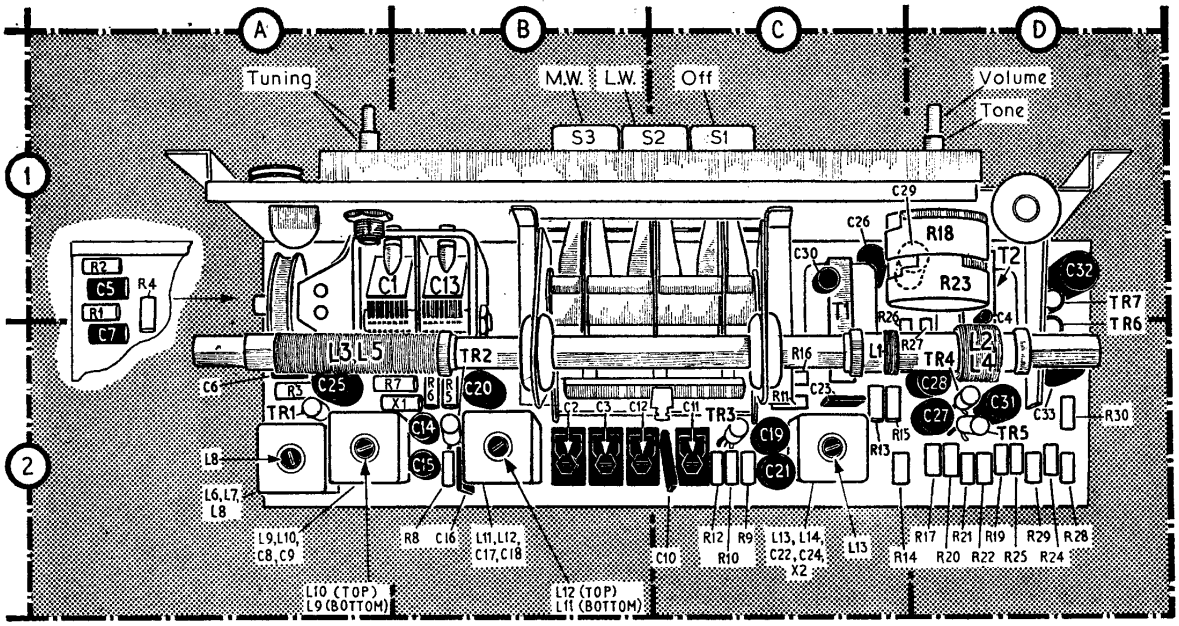
Miscellaneous*

T1 a	90·0	C1
T1 b	35·0	
T1 c	35·0	
T2 a	2·5	D1
T2 b	2·5	
T2 c	0·5	
T2 d	0·5	
T2 e	0·2	
X1	OA70	B2
X2	OA70	C2

*Approximate D.C. resistance in ohms.



Circuit diagram of the Roberts RT7. The method adopted for numbering the switches is explained under "General Notes" overleaf.



Plan view of the chassis. The small section inset in location A1 shows the components which are hidden by the tuning drive drum. The drive cord is not included in this illustration.

Circuit Description—*continued*

crystal rectifier **X2,** which operates as signal detector, and its rectified output is developed across load resistor **R14.** The D.C. component developed across **R14** is tapped off and applied to **TR2** base circuit as bias, giving A.G.C.

Actually, the A.G.C. bias is developed in part of the base bias potential divider for **TR2,** which comprises **R5, R13** and **R14,** and it is decoupled by **C20.** Supplementary A.G.C. is derived from the action of diode of the [illegible] rectifies large positive excursions **R7** across **L9,** damping collector and shunts current through **R7** biases the [illegible] collector rectifying smaller signal excursions.

Audio frequency component in the rectified output from **X2** is passed via either **S3a** and **S2y** or **S3x** and **S2a,** according to which button is pressed, and **R16, C27** to base of **TR4** which operates as A.F. amplifier. When the M.W. button is pressed, **S3a** and **Sy** close, and when the L.W. button is pressed, **S3x** and **S2a** close.

Output from **TR4** collector is coupled via **C29, C30** and volume control **R23** to base of driver transistor **TR5,** which is transformer coupled by **T1** to class B output stage **TR6, TR7.** A split-load output circuit is used, in which part of the load is in the emitter circuit (windings **a** and **b** on **T2**) while the larger proportion is in the collector circuit (windings **c** and **d**). This method requires increased drive to the output stage, but it reduces cross-over distortion when the battery voltage begins to fall.

The speaker speech coil is coupled by means of an isolated secondary winding **e** whose output voltage is developed across the potential divider **R28, R29,** tapped off at their junction, and fed back to **TR5** emitter circuit, giving negative feed-back over the two stages.

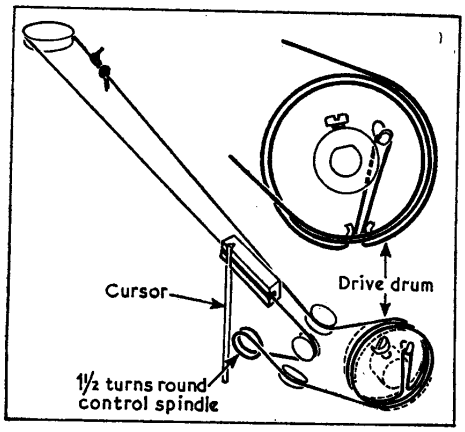


Diagram of the tuning drive system. When replacing the cord, begin with one end at the position of the knot and run to the right over the drive drum as shown.

CIRCUIT ALIGNMENT

Connect a 3Ω output meter in place of the speaker speech coil, or alternatively connect a A.C. voltmeter across the speech coil. Keep output reading as low as possible consistent with positive indications by reducing the input signal as the circuits come into line to prevent A.G.C. action.

I.F. Stages.—Switch receiver to M.W., turn the gang to maximum capacitance and the volume control to maximum. Connect signal generator output to the junction of **S2** and **C5** (location reference A1) and chassis, feed in a 470kc/s signal, and adjust the cores of **L13** (C2), **L12, L11** (B2), **L10** and **L9** (A2) for maximum output.

R.F. Stages.—Transfer signal generator leads to the vicinity of the ferrite rod aerial, so as to obtain loose coupling. Check that with the gang at maximum capacitance the cursor coincides with the high wavelength end of the tuning scales, then tune to 500m on scale, feed in a 600kc/s signal, and adjust the cores of **L8** and **L3** for maximum output. Tune to 200m on scale, feed in a 1,500m signal, and adjust **C12** and **C3** (B2) for maximum output.

Return to 500m and repeat the adjustment of **L8,** then that of **L3,** alternately until no improvement can be obtained. Then return to 200m, and readjust **C12** and **C3** in turn. Then repeat the 500m and 200m adjustments for optimum results.

Switch set to L.W., tune to 1,500m on scale, feed in a 200kc/s signal, and adjust **C11** (C2) for maximum output. Feed in a 250kc/s signal, tune it in, and adjust **C2** (B2) for maximum output. Feed in a 164kc/s signal, tune it in, and adjust **L2** by sliding it along the ferrite rod for the maximum output. Repeat the L.W. adjustments throughout for optimum results.

GENERAL NOTES

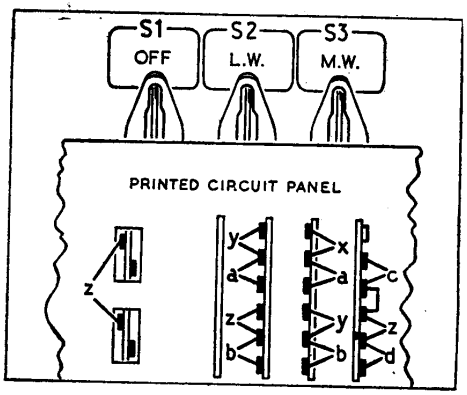
Transistors.—The makers warn service engineers not to make continuity measurements with the transistors in circuit, and they point out that they may be damaged if the full battery voltage is applied to their bases. When a transistor is replaced, its leads must not be cut shorter than ⅜in, and then a heat shunt should be used while soldering them. If either of the output transistors **TR6** or **TR7** is replaced, they must both be replaced with a matched pair.

Battery.—The battery supplied with the receiver is an Ever Ready PP10, rated at 9V.

Modifications.—In a small number of early models the value of **R27** was 43Ω (instead of 51Ω), and the value of **R28** was 180Ω (instead of 270Ω). Similarly, **C30** was 0.02μF (instead of 0.01μF).

Switches.—Waveband switching is performed by a press-button unit with "off," "L.W." and "M.W." buttons, reading from left to right as seen from the front. The tags of these switches are identified in the diagram below. The action of the switches is indicated by the suffix letter of each switch number. If the suffix is **a, b, c** or **d** the switch closes when its button is pressed; if the suffix is **x, y** or **z** it opens.

The number of any switch is derived from the button that operates it. Thus **S1z** belongs to button No. **1,** which is the "off" button, and it opens when the button is pressed to switch the set off. Most of the switches are operated by the M.W. button, and therefore they are numbered **3.** Thus when the M.W. button is pressed **S3d** closes to connect **C1** to the M.W. aerial coil, and **S3z** opens to disconnect **L2.** And so on.



Sketch of the switch connections, as seen below the printed circuit panel.

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