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"TRADER" SERVICE SHEET

1357

ROBERTS RT.1

Transistorized Battery Portable with Printed Circuit

SIX Mullard P-N-P transistors, a germanium diode detector, a printed circuit and a ferrite rod internal aerial are employed in the Roberts RT.1 2-band portable receiver designed to operate from a single 6V battery. The tuning range is 185-571m and 1,100-2,200m.

Release date and original price: April, 1958, £17 8s 9d including battery. Purchase tax extra.

CIRCUIT DESCRIPTION

M.W. and L.W. aerial coils **L1, L2** and coupling coils **L3, L4** are mounted on a ferrite rod and form the internal aerial. M.W. coils **L1, L3** are tuned by **C1, C2** and L.W. coils **L2, L4** by **C2, C3, C4. C2** forms one section of the tuning gang and **C1, C3, C4** are parallel trimmer capacitors. R.F. signal developed across the aerial coupling circuit is applied via low impedance coupling coils **L3, L4** to the base of **TR1,** which operates as frequency changer. Base bias is provided by the H.T. potential divider **R1, R2** in conjunction with the emitter resistor **R3.**

Local oscillator circuit is formed by **L5, L6, L7,** with tuning by **C7, C8** (M.W.) and by **C7, C9, C10** (L.W.). **C7** is one section of the tuning gang and **C8, C9, C10** are parallel trimmer capacitors. Tracking is by the adjustable inductances of **L5, L6, L7.** Reaction coupling from **TR1** collector via **L5.**

TR2 and **TR3** operate as a two-stage earthed-emitter I.F. amplifier with transformer couplings **L8, L9; L10, L11; L12, L13.** Neutralizing by **C15, R7, C19.** Base bias is provided by H.T. potential dividers **R4, R5, R11** and **R8, R9,** operating in conjunction with emitter resistors **R6, R10.**

Intermediate frequency 470kc/s

Germanium diode **X1** is employed as signal detector, and the audio frequency component in its rectified output is developed across the combined load resistor and volume control **R11.** I.F. filtering by **C22,** and additionally by **R13, C24** on L.W. A.F. coupling to driver stage **TR4** via **C23.**

The D.C. potential developed from the signal current through **R11** is fed back as bias to **TR2,** giving automatic gain control. Decoupling by **R5, C13. R13, C24** and **S8, S9** form a filter to stabilize operation on L.W. only.

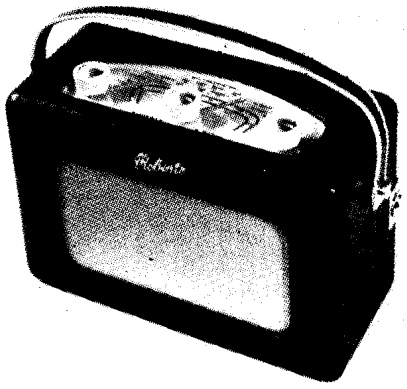
Output from **TR4** is coupled via driver transformer **T1** to **TR5** and **TR6,** which operate in a common-emitter class B push-pull output stage. Base bias for **TR5** and **TR6** is provided by H.T. potential divider **R18, R19** in conjunction with the common emitter resistor **R20.** Temperature compensation is provided by a thermistor connected in parallel with **R19** and situated close to **TR5, TR6.**

Outputs of **TR5** and **TR6** are coupled to the speaker via output transformer **T2.** Tone correction by negative feedback circuit comprising **R21, R22, R17, C25.** Pre-set resistor **R18** is adjusted to correct the H.T. current in the output stage.

CIRCUIT ALIGNMENT

Equipment Required.—An accurately calibrated signal generator; a high resistance voltmeter or an output meter of 3 ohms im-

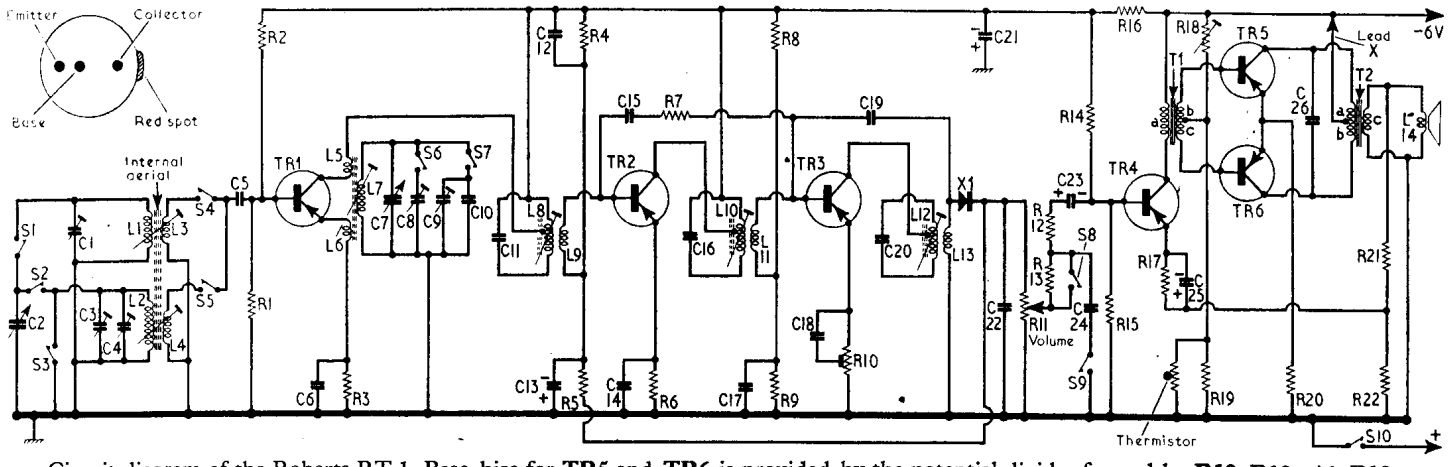
(*Continued overleaf col.* 1)



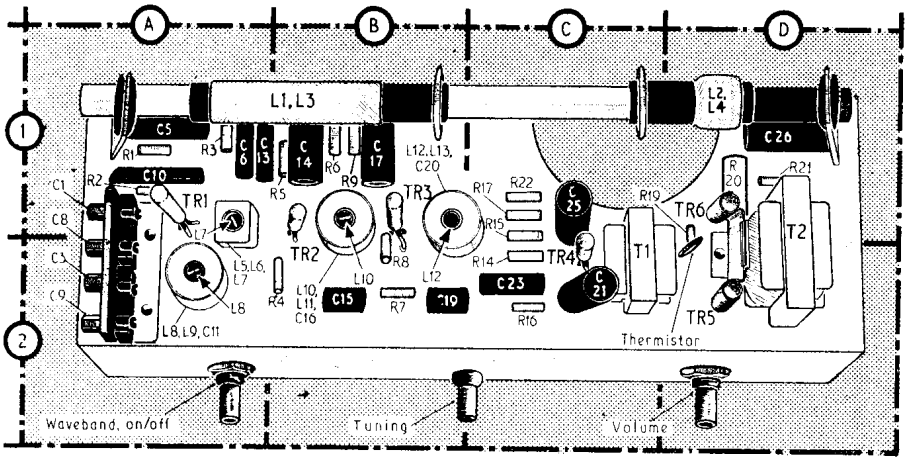
Appearance of the Roberts RT.1. For easy access to the battery, the back of the case is hinged at the left-hand end and fastened at the right-hand end with a clasp which is visible in our photograph.

Resistors		
R1	10k Ω	A1
R2	22k Ω	A1
R3	3·9k Ω	A1
R4	43k Ω	B2
R5	8·2k Ω	B1
R6	680 Ω	B1
R7	1·5k Ω	B2
R8	20k Ω	B2
R9	3·9k Ω	B1
R10	470 Ω	F4
R11	5k Ω	H3
R12	1·5k Ω	F3
R13	1·5k Ω	F3
R14	27k Ω	C2
R15	10k Ω	C2
R16	680 Ω	C2
R17	390 Ω	C1
R18	3k Ω	H3
R19	82 Ω	D1
R20	5·6 Ω	D1
R21	820 Ω	D1
R22	10 Ω	C1
Capacitors		
C1	—	A1
C2	—	F3
C3	—	A2
C4	—	E3
C5	0·1μF	A1
C6	0·01μF	A1
C7	—	F4
C8	—	A2
C9	—	A2
C10	—	A1
C11	250pF	A2
C12	0·1μF	F3
C13	0·01μF	A1
C14	0·1μF	B1
C15	58pF	B2
C16	250pF	B2
C17	0·1μF	B1
C18	0·1μF	F4
C19	18pF	B2
C20	250pF	B2
C21	100μF	C2
C22	0·02μF	G4
C23	8μF	C2
C24	0·02μF	F3
C25	100μF	C1
C26	0·1μF	D1
Coils*		
L1	1·0	B1
L2	4·7	D1
L3	—	B1
L4	—	D1
L5	—	A2
L6	—	A2
L7	1·9	A2
L8 (total)	4·0	A2
L9	—	A2
L10 (total)	4·0	B2
L11	—	B2
L12 (total)	4·0	B2
L13	—	B2
L14	3·0	—
Other Components*		
T1 a	150·0	C2
T1 b	43·0	C2
T1 c	50·0	C2
T2 a, b (total)	7·0	D2
T2 c	—	D2
X1 Mullard OA70		G4
Thermistor VA1040		D2
S1-S10	—	E3

**Approximate D.C. resistance in ohms. Read "Warning" under "General Notes" before making measurements*



Circuit diagram of the Roberts RT.1. Base bias for **TR5** and **TR6** is provided by the potential divider formed by **R18, R19** with **R18** employed as a variable pre-set adjustment. Variation in bias with temperature is compensated for by a thermistor in parallel with **R19.** In later versions **R10** is a fixed resistor. Adjustment of **R10** and **R18** is described under " General Notes."



Plan view of the chassis. Note the metal clamp which is fitted around **TR5** and **TR6** in order to dissipate any heat.

Circuit Alignment—*continued*

pedance; a non-metallic trimming tool for core adjustments.

Connect the output meter in place of the speaker, or the A.C. voltmeter across winding **c** of **T2**. The output must be limited to 50mW (0.38V) to prevent A.G.C. action masking the adjustments.

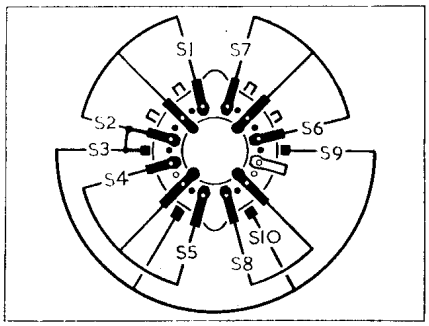
Check that with the gang at maximum capacitance the cursor coincides with the high wavelength ends of the M.W. and L.W. scales.

L1 (B1) and **L2** (D1) are ferrite rod tuned and should be adjusted for maximum output by sliding the formers along the ferrite rod and securing them to the rod after alignment to prevent them from moving. Carry out alignment as follows:—

1.—Switch receiver to M.W. Turn gang and volume control to maximum. Connect the signal generator between the junction of **C5, S4** and chassis. Feed in a 470kc/s signal and adjust the cores of **L12** (B1), **L10** (B1) and **L8** (A2) for maximum output. Repeat these adjustments until no further improvement can be obtained.
2.—Loosely couple the signal generator output leads to the ferrite rod aerial. Tune the receiver to 500m, feed in a 600kc/s signal and adjust the core of **L7** (A1) and the coil of **L1** (B1) for maximum output.
3.—Tune the receiver to 214m, feed in a 1,400kc/s signal and adjust **C8** (A2) and **C1** (A1) for maximum output.
4.—Repeat operation 2 until no further improvement in output can be obtained.
5.—Repeat operations 3 and 4 for optimum response.
6.—Switch receiver to L.W. and tune it to Kalundborg, feed in a 245kc/s signal and adjust **C9** (A2) and **C3** (A2) for maximum output. **C4** (E3) may be set to minimum or maximum according to the range required on **C3.**
7.—Tune the receiver to Paris, feed in a 164kc/s signal and adjust the coil of **L2** (D1) for maximum output.
8.—Repeat operations 6 and 7 for optimum response.

Switch Table

Switch	M.W.	L.W.
S1	C	—
S2	—	C
S3	C	—
S4	C	—
S5	—	C
S6	C	—
S7	—	C
S8	C	—
S9	—	C
S10	C	C



Above : Diagram of the switch unit as seen from the rear of an inverted chassis.

Right : Underside view of the chassis.

GENERAL NOTES

Switches.—S1-S10 are the combined waveband and battery switches, ganged in a single rotary unit and shown in our underside plan view of the chassis in location reference E3. This unit is also shown in detail in the diagram in col. 1, where it is drawn as seen from the rear of an inverted chassis. Above it is the associated table, giving the switch positions for the two "on" positions. The control knob is turned clockwise for M.W., and anti-clockwise for L.W.

Warning.—Transistors may be permanently damaged if the full negative battery voltage is connected to their bases, or if continuity measurements are made with the transistors in circuit. If a transistor has to be removed or replaced, the soldering or unsoldering operation should be completed as quickly as possible, and a heat shunt such as a pair of pliers should be clamped across the transistor lead between the transistor and the soldering iron during the soldering or unsoldering of its leads. When replacing a transistor the leads should not be cut shorter than $\frac{5}{8}$ inch.

Printed circuit.—To avoid damaging the printed circuit with excessive heat, use a soldering iron with a small tip and having a maximum rating of 60W. The iron should be applied to the joint only long enough for the solder to flow, and then quickly removed. Avoid running solder into adjoining circuits. Resistors and capacitors may be replaced by clipping out the defective component, leaving enough of the original connecting wire to solder to the new component.

Instability.—The positions of **X1, C22** and **C18** should not be altered, or instability may result.

Battery.—The battery recommended by the manufacturers is an Ever Ready type PP8, rated at 6V.

Modifications.—In early versions of this receiver **C12, C24, S9** are omitted and **R13** is 4.7kΩ.

Pre-set Resistors.—R10 was pre-set in our sample receiver, but will normally be 470Ω fixed. Where pre-set is fitted, it is adjusted at the works and should in no circumstances be readjusted.

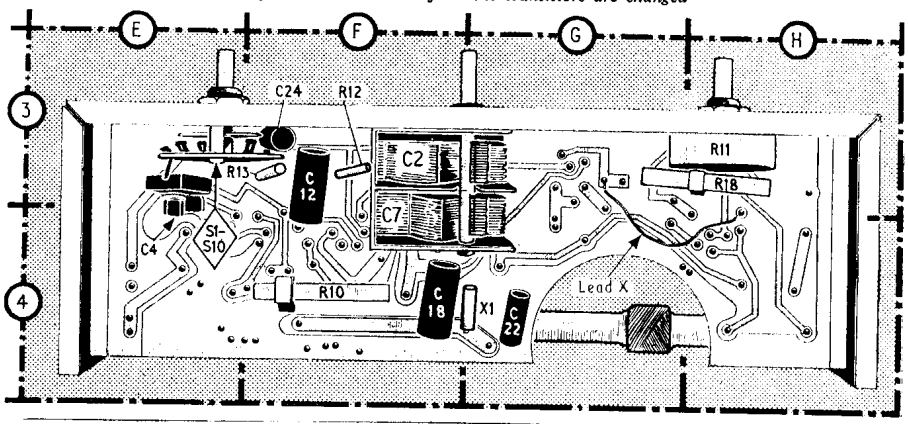
R18 pre-set requires adjustment only if an output transistor is replaced, as explained below the transistor analysis table. A black flexible lead beneath the chassis (lead **X**, location G3) can be conveniently unsoldered to insert the milliammeter in series with the negative battery feed at the tapping on **T2** primary.

TRANSISTOR ANALYSIS

Voltages and currents given in the table below are those derived from the manufacturers' information. Except where otherwise indicated, they were measured on the 10V range of a model 8 Avometer, chassis being the positive connection in every case. With no signal input the total battery current is 11mA, increasing to 90mA at 300mW output.

Transistor		Emitter (V)	Base (V)	Collector (V)	Collector (mA)
TR1	OC44	1·27	1·25	4·28	*
TR2	OC45	0·6	0·75	4·28	*
TR3	OC45	0·43	0·6	4·28	*
TR4	OC71	0·71	0.85	5·82	*
TR5} TR6}	OC72's	0·025	0·2	6·0	4·0[1]

[1]*Total current is adjusted under quiescent conditions to 4·0mA at 20 deg C by means of* **R18** *(see "General Notes"). This should not need readjustment unless the transistors are changed*



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