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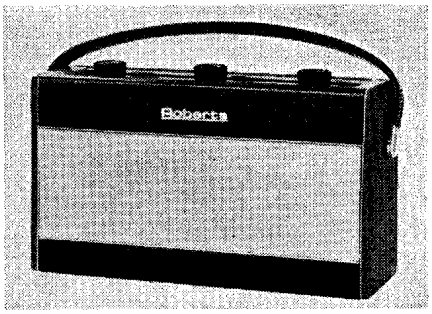
"TRADER" SERVICE SHEET

1824

ROBERTS R303

Transistored Portable Radio Receiver



THIS nine transistor Roberts portable radio receiver of handbag proportions, has medium (182–555m) and long (1,160–2,000m) waveband coverage, and a circuit panel which is a five transistor audio amplifier with an i.f. module containing three transistors attached.

Audio output is handled by a 7in by 3½in elliptical loudspeaker of 10Ω impedance.

Two sockets are provided, one for a car type aerial and the other, a 3·5mm jack suitable for an earphone of 10Ω impedance or more.

It is powered by a 9V (Ever Ready PP9 type) battery, and is housed in a case that has a turntable at the base, allowing the directional property of the internal ferrite rod aerial to be exploited with ease.

TRANSISTOR ANALYSIS

All voltages given in the table below were taken from data supplied by the manufacturers. They were measured with a model 8 Avometer and are all negative with respect to chassis.

CIRCUIT DESCRIPTION

With **S2** and **S4** in the m.w. position, m.w. signals induced in the ferrite rod aerial are tuned by **L3, CV1** and **CV2,** and inductively coupled by **L5** to the input of the mixer transistor, point 3 on i.f. module. When switched to l.w. **S1** completes the circuit for l.w. tuning which includes **L1, CV1, CV2** and **CV3. S3** connects coupling coil **L4** to point 3.

Oscillator tuning on m.w. is provided by **CV4, CV5** and **L6,** which is located on the i.f. module. **S6** short circuits **R1** thereby introducing additional capacitance **CV6** and **C1** for tuning over the long waveband.

Points 2 and 7 on the module are common to chassis, and the voltage at point 4 should be 7·35V. **C2** connected to point 6 decouples the series resistance in the power supply within the module.

R16 and **RV1** are the diode load, i.f. filtering being accomplished inside the module before point 5. Audio frequencies at the volume control **RV1** are amplified by a normal R/C coupled amplifier stage, amplification being provided by **TR1.**

The current in the pre-driven stage **TR2** is stabilized by emitter resistor **R13** in combination with the d.c. feed back loop. A fraction of the signal voltage at the emitter of **TR2** is fed back via **C10** and **R8** to the base of **TR1** (selective negative feedback) in suitable proportion to introduce some top cut. **TR2** collector is directly coupled to the driver **TR3,** base. Because of the complementary symmetry of the output stage no phase splitting is required. The signal voltage appearing across **TR3** load **R14** is applied simultaneously to n.p.n./p.n.p. pair **TR4, TR5. TR4** will conduct on the positive half cycles and **TR5** on the negative half cycles. The resultant of these two signals is then capacitively coupled via **C13** to the loudspeaker **L7.**

Output Stage Thermal Quiescent Stabilizing and Balancing.—Because of the very non-linear voltage/current characteristic of diode **MR1** when operated with a small forward bias (in this case 0·75V), it can be used to compensate for falling battery voltage and, in conjunction with the thermistor **TH1,** wide variations in temperature.

If the ambient temperature decreases,

(*Continued overleaf col.* 1)

Transistor Table

Transistor		Emitter (V)	Base (V)	Collector (V)
TR1	BC148	6·5	5·65	2·4
TR2	AC127	4·1	4·0	0·13
TR3	AC128	0	0·13	4·6
TR4	AC127	4·8	4·6	0
TR5	AC128	4·8	†	9·0

† *This voltage will be between 4·6V and 5·35V depending upon setting of RV3.*

Resistors

R1	470kΩ	B1
R2	10kΩ	B2
R3	82kΩ	B2
R4	22kΩ	B2
R5	2·2kΩ	B2
R6	390Ω	B1
R7	6·8kΩ	B2
R8	33kΩ	B2
R9	10kΩ	B2
R10	6·8kΩ	B2
R11	330Ω	B2
R12	33Ω	B2
R13	1·5kΩ	B2
R14	680Ω	B1
R15	330Ω	B2
R16	1·5kΩ	B2
RV1	4·7kΩ	A1
RV2	10kΩ	B2
RV3	470Ω	B2

Capacitors

C1	200pF	B1
C2	125µF	B2
C3	0·047µF	B2
C5	2·5µF	B2
C6	200µF	B2
C7	16µF	B2
C8	2·5µF	B2
C9	64µF	B2
C10	0·033µF	B2
C11	200µF	B2
C12	2,200pF	B2
C13	200µF	B2
C14	200µF	B1
CV1	207pF	B1
CV2	30pF	B1
CV3	80pF	B1
CV4	110pF	A1
CV5	30pF	A1
CV6	80pF	B1

Coils

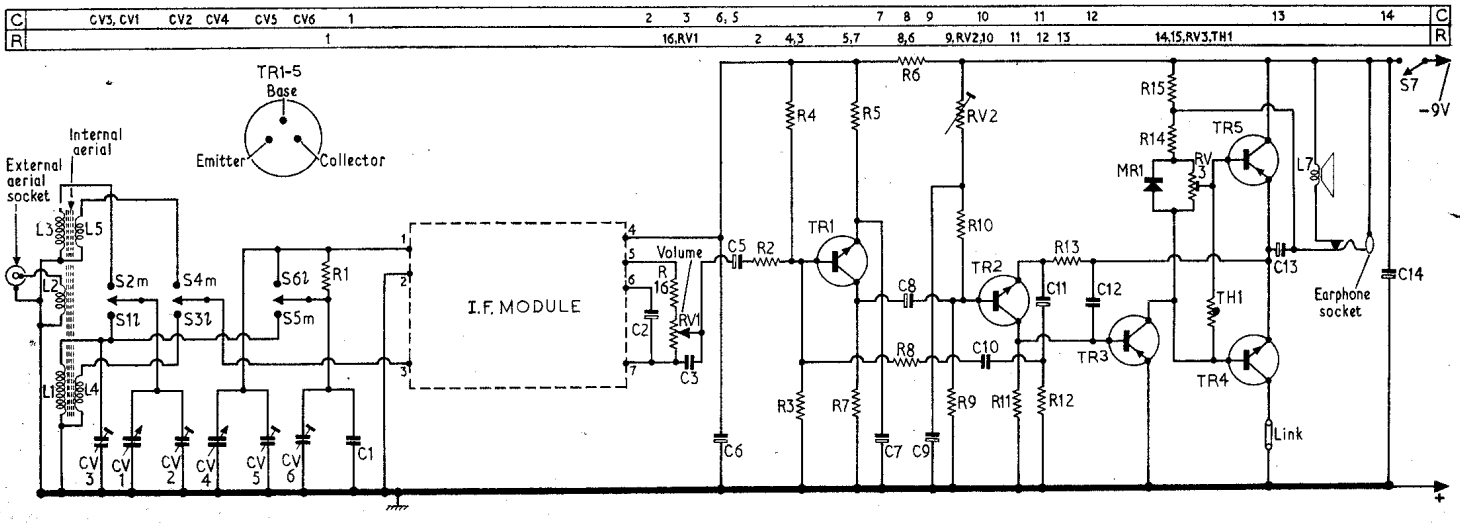
L1	—	A2
L2	—	A1
L3	—	B1
L4	—	A2
L5	—	B1
L6	—	B2
L7	10Ω	†

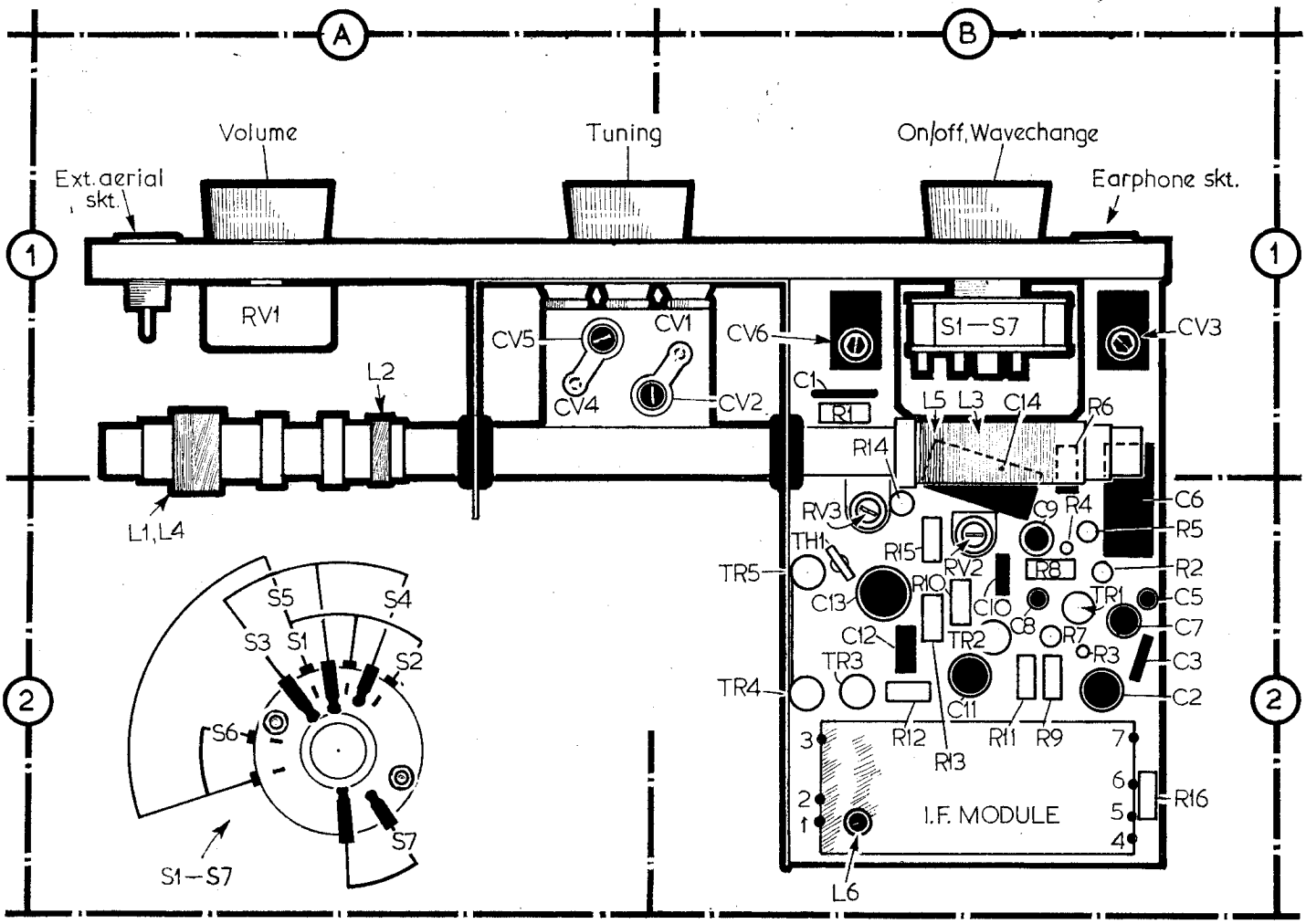
Miscellaneous

MR1	BA114	
TH1	VA1040	B2
S1–S7	—	A2

† *Loudspeaker*

Below: Circuit diagram of the Roberts R303.





General view of the receiver when removed from the case. The wavechange switch (S1-S7) is shown in detail in location A2.

Circuit Description—*continued*

the reduced current in **MR1** raises its effective resistance, and because this resistance is connected in parallel with **RV3** it compensates the output transistors **TR4, TR5** bias against the fall in **TR3** collector current. Similarly for a fall in battery voltage.

Conversely, if the temperature should increase, the resistance of the thermistor **TH1** falls, along with that of the diode, thereby maintaining the correct operating bias on **TR4** and **TR5.**

Balance is achieved by adjusting the base bias of **TR2** by variation of **RV2.** This establishes the current drawn through **R13** from the emitter of **TR2** to emitter junction of **TR4, TR5** and fixes the crossover point for the output pair.

CIRCUIT ALIGNMENT

Equipment Required.—An a.m. signal generator and an r.f. coupling loop; an audio output meter with an impedance to match 10Ω. This should be connected in place of the loudspeaker. If an output meter is not available, an a.c. voltmeter may be connected across the loudspeaker.

I.f. alignment instructions are not given, however, the i.f. is 470kc/s. The manufacturers advise that the i.f. module complete should be returned to them in the event of a fault developing.

With the tuning capacitor at maximum the pointer should coincide with the low frequency end of the tuning scale.

Connect output meter in place of loudspeaker.

Connect signal generator to coupling loop and loosely couple to aerial. Keep signal generator output as low as possible consistent with a readable indication on the output meter, thus avoiding a.g.c. action.

Turn volume control to maximum.

1.—Switch receiver to m.w., set tuning pointer to calibration mark at 1,224m, adjust signal generator to 1·36Mc/s.
2.—Adjust **CV5** and **CV2** for maximum output.
3.—Tune receiver to calibration mark at 1,936m, set signal generator to 580kc/s.
4.—Adjust **L6** and **L3** for maximum output.
5.—Repeat operations 1 to 4 for optimum results finishing with operation 2.
6.—Switch receiver to l.w. Tune to calibration mark at 1,224m and feed in a 245kc/s signal.
7.—Adjust **CV6** and **CV3** for maximum output.
8.—Tune receiver to calibration mark at 1,936m and feed in a 155kc/s signal.
9.—Adjust **L1** for maximum output.
10.—Repeat operations 6 to 9 for optimum results finishing with operation 6.

AUDIO ADJUSTMENTS

In order to adjust **RV2** and **RV3** the following equipment is required: A voltmeter; a milliammeter (0–10mA); an oscilloscope and an a.f. signal generator. Check with receiver switched on, that the battery voltage measured across **C14** is 9V.

1.—Turn volume control to minimum.
2.—Connect voltmeter between the junction of **TR4** and **TR5** emitters and chassis.
3.—Adjust **RV2** to give a reading of 4·8V on the meter.
4.—Remove voltmeter and connect the milliammeter in place of the red flex link on circuit side of the panel.
5.—Adjust **RV3** for a current of 4·5mA at 20°C. Allow one minute and recheck this figure.
6.—Remove milliammeter and reconnect link.
7.—Connect the oscilloscope across the loudspeaker and apply a 1kc/s sine wave to the base of **TR1.**
8.—Adjust **RV2** for symmetry at the onset of clipping.

GENERAL NOTES

Dismantling.—Take off the bottom of case and remove battery. Loosen three 4BA nuts holding battery bracket in place and remove bracket. Remove the two 4BA nuts holding the loudspeaker and carefully remove to the extent of its connecting leads. Unscrew two woodscrews located either side of chassis and remove the two wooden side members. The chassis may now be withdrawn from the case.

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