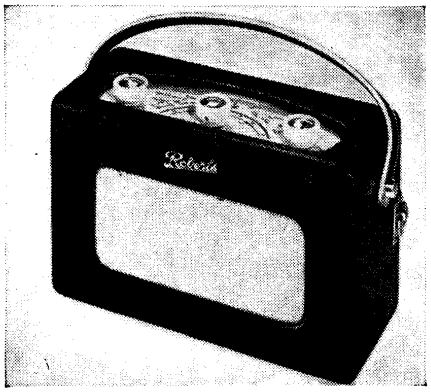
"TRADER" SERVICE SHEET

1449

ROBERTS R200

2-band Transistor Portable with Printed Circuit



Appearance of the Roberts R200

DESIGNED to operate from a single 9V battery, the Roberts R200 is a 2-band portable receiver fitted with six transistors, a germanium diode, a ferrite rod aerial, a 5in speaker, and a printed circuit panel. Provision is made for the connection of an external aerial. The waveband ranges are 188-556m (M.W.) and 1,130-1,970m (L.W.).

Release date and original price: February 1960, £14 6s, *including battery. Purchase tax extra.*

TRANSISTOR ANALYSIS

Transistor voltages given in the table below are those derived from the manufacturers' information. They were measured with a 20,000Ω/V meter, chassis being the positive connection in every case. The receiver was switched to M.W. but there was no signal input.

Transistor	Emitter (V)	Base (V)	Collector (V)
TR1 OC44 ..	1·5	1·43	7·5
TR2 OC45 ..	0·52	0·64	7·5
TR3 OC45 ..	0·9	1·08	7·5
TR4 OC78D ..	1·08	1·21	8·7
TR5 OC78† ..	0·022	0·18	9·0
TR6 OC78† ..	0·022	0·18	9·0

† *Matched pair.*

CIRCUIT DESCRIPTION

Aerial coils **L2** and **L3** are mounted, together with low impedance coupling coils **L4** and **L5**, on a ferrite rod to form an internal aerial. **L2** is tuned by **C1** and **C2** on M.W., for L.W. reception, **L2** and **L3** are connected in series, additional capacitance being provided by **C3**. A socket is provided for the connection of an external aerial, which is coupled to the ferrite rod via **L1**.

TR1 operates as a self-oscillating frequency changer. Oscillator coil **L8** is tuned by **C9** and **C10** on M.W. and, in addition, by **C7** and **C8** on L.W. Reaction coupling between the collector and emitter by **L6** and **L7**.

The intermediate frequency output of **TR1** is coupled via a two-stage I.F. amplifier formed by earthed-emitter transistors **TR2, TR3,** and single-tuned transformers **L9, L10; L11, L12;** and **L13, L14,** to germanium diode detector **X1. TR2** and **TR3** are neutralized by **C12** and **C15.**

Intermediate frequency 470kc/s.

The audio frequency component in the rectified output of **X1** is developed across the combined diode load and volume control **R8,** and is passed via **R9** and **C21** to the base of A.F. amplifier **TR4.**

Base bias for **TR1, TR2** and **TR4** is provided by potential dividers **R1, R2; R4, R5, R8;** and **R10, R11,** respectively. Base bias for **TR3** is obtained from the

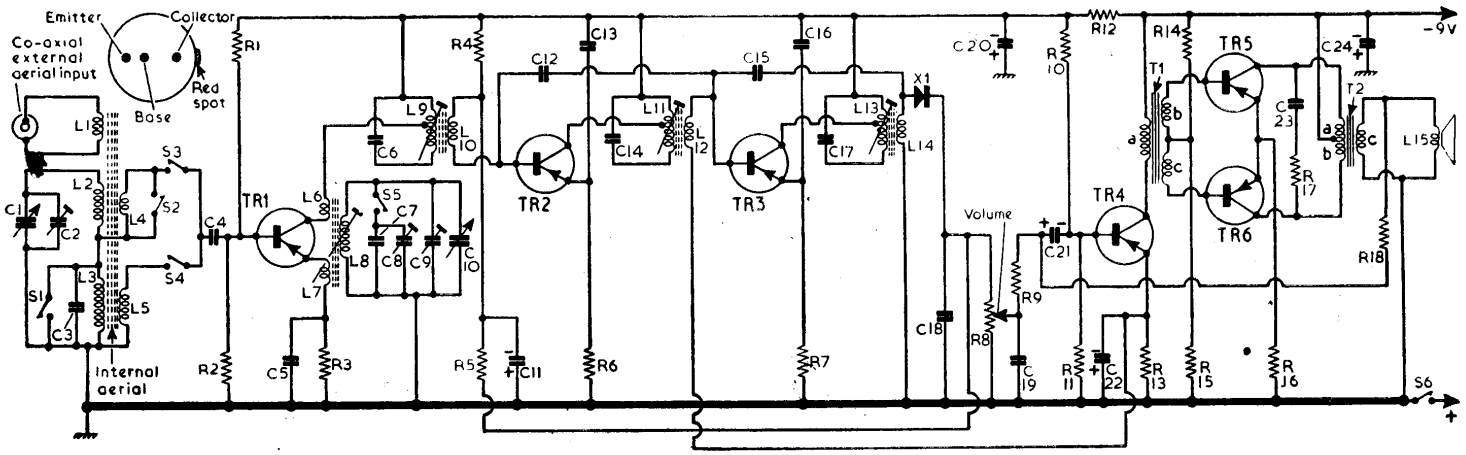
(*Continued overleaf, col. 1.*)

COMPONENT VALUES AND LOCATIONS

Resistors		
R1	33kΩ	C2
R2	8·2kΩ	B2
R3	3·9kΩ	B2
R4	82kΩ	C1
R5	8·2kΩ	B2
R6	560Ω	B2
R7	1kΩ	B2
R8	5kΩ	F3
R9	4·7kΩ	B1
R10	33kΩ	C1
R11	8.2kΩ	C1
R12	560Ω	C1
R13	560Ω	C1
R14	3·9kΩ	C2
R15	82Ω	C2
R16	5·6Ω	C2
R17	100Ω	D4
R18	220kΩ	C1
Capacitors		
C1	196pF	E3
C2	30pF	B1
C3	40pF	F4
C4	0·04μF	B2
C5	0·01μF	B2
C6	250pF	B2
C7	160pF	B1
C8	110pF	C1
C9	30pF	A1
C10	110pF	E3
C11	10μF	D4
C12	58pF	B2
C13	0·1μF	B1
C14	250pF	B1
C15	18pF	B1
C16	0·04μF	B2
C17	250pF	B1
C18	0·02μF	B1
C19	0·02μF	E3
C20	100μF	C2
C21	2μF	B1
C22	100μF	C1
C23	0·1μF	C2
C24	50μF	D4
Coils*		
L1	2·3	E4
L2	1·6	D4
L3	7·0	F4
L4	—	E4
L5	—	F4
L6	—	C2
L7	—	C2
L8	2·1	C2
L9	4·0	B2
L10	—	B2
L11	4·0	B1
L12	—	B1
L13	4·0	B1
L14	—	B1
L15	3·0	—
Miscellaneous*		
T1 a	135·0	C1
T1 b	78·0	C1
T1 c	total	C1
T2 a	4·1	C2
T2 b	4·1	C2
T2 c	0·27	C2
X1	OA70	B1
S1-S6	—	D3

* *Approximate D.C. resistance in ohms.*

If the component numbers in these tables are used when ordering spare parts, dealers are requested to mention the fact on the order, as these numbers may differ from those used in the manufacturers' service manual.



Circuit diagram of the Roberts R200. *The coupling coil* **L1** *and the co-axial socket permit the use of a car aerial.*

Circuit Description—*continued.*

emitter current of **TR4** flowing through **R13.** Collector currents are stabilized against changes in temperature by emitter resistors **R3, R6, R7** and **R13.** The bias potential divider for **TR2** includes the volume control **R8,** so that the positive-going D.C. component of the rectified signal developed across **R8,** reduces its gain on strong signals, thus providing A.G.C.

The output of **TR4** is coupled via phase-splitting transformer **T1** to the bases of the common emitter, class B, push-pull output transistors **TR5, TR6.** Coupling to low impedance speech coil **L15** is via **T2.** Base bias for **TR5** and **TR6** is provided by the potential divider **R14, R15,** their collector currents being stabilized by the common emitter resistor **R16.** Negative feedback is applied to the base of **TR4** from **T2** secondary winding via **R18.**

CIRCUIT ALIGNMENT

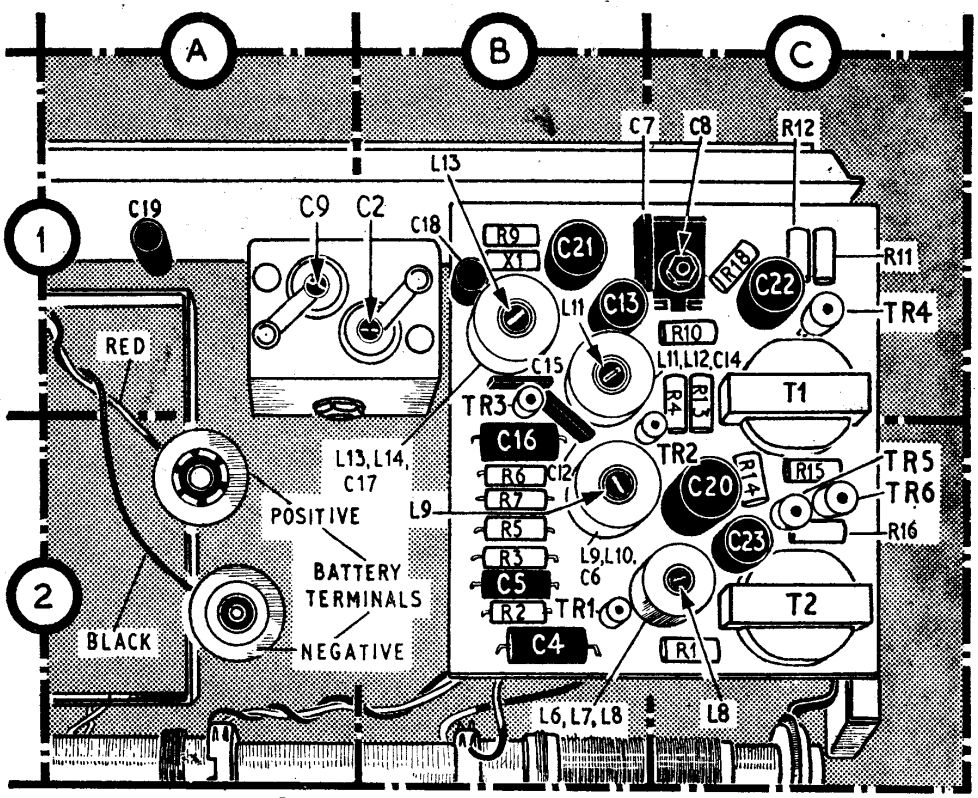
1.—Connect an output meter of 3Ω impedance in place of the speaker, or an A.C. voltmeter across the speaker. Connect a signal generator between chassis and the junction of **S3, S4** and **C4.** The generator output should be maintained as low as possible at all times during the alignment operations to prevent A.G.C. action from masking the adjustment peaks.

2.—Switch the receiver to M.W., turn the tuning gang to minimum capacitance and the volume control fully clockwise. Feed in a modulated 470kc/s signal and adjust the cores of **L13** (B1), **L11,** (B1) and **L9** (B2) for maximum output. Repeat these adjustments until no further improvement can be obtained.

3.—Turn the tuning gang to maximum capacitance and check that the pointer coincides with the high wavelength ends of the tuning scales.

4.—Loosely couple the signal generator output to the ferrite rod aerial coils **L1-L5.** Tune the receiver to 500m. Feed in a 600kc/s signal and adjust the core of **L8** (C2) for maximum output. Then slide the former of **L2** (D4) along the ferrite rod for maximum output.

5.—Tune the receiver to 214m. Feed in a 1,400kc/s signal and adjust **C9** (A1) and **C2** (B1) for maximum output.



Rear view of the chassis. Details of the ferrite rod aerial assembly are given in the front view illustration below.

6.—Repeat operations 4 and 5.

7.—Switch the receiver to L.W. and tune it to 425m. Feed in a 185kc/s signal and adjust **C8** (C1) for maximum output. Then slide the former of **L3, L5** (F4) along the ferrite rod for maximum output.

GENERAL NOTES

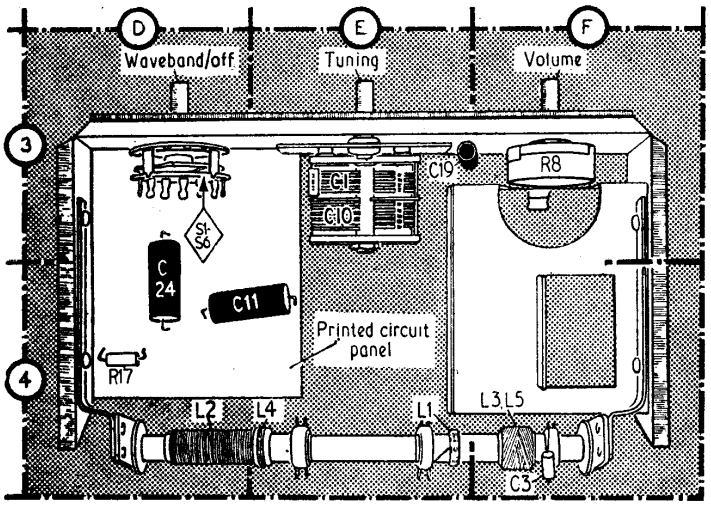
Battery.—The battery recommended by the manufacturer is an Ever Ready PP9, rated at 9V. Total battery current with no signal input is 8mA.

TR5,TR6.—In the event of the replacement of transistors **TR5** or **TR6** (OC78's) being necessary, *both* transistors must be replaced with a matched pair.

Warning.—Transistors may be permanently damaged if the full negative voltage is connected to their bases, or if continuity measurements are made with the transistors in circuit. They may also be damaged by the application of excessive heat. If a transistor has to be removed or replaced, the soldering or unsoldering operation should be completed as quickly as possible using an earthed soldering iron. 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.

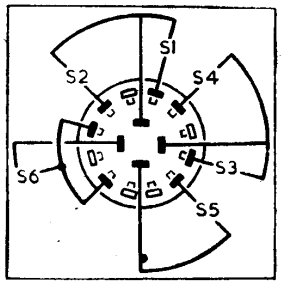
Removing Chassis.—Remove the control knobs (recessed grub screws). Lay the receiver face down and remove the screws which secure the two wooden wedges to the inside of the cabinet, one below each end of the chassis. Ease the tuning scale and panel from the recess in the top of the case and withdraw the chassis to the limit of the speaker and external aerial socket leads.

Switches.—**S1-S6** are the on/off and waveband switches, ganged in a rotary unit on the printed side of the panel. The unit is indicated in our front view illustration of the chassis (location reference D3) and a detailed sketch is shown below, where the contacts are drawn as seen when viewed in the direction of the arrow in the chassis illustration. **S1, S3** and **S6** close on M.W.; **S2, S4, S5** and **S6** close on L.W.



Left: *Front view of the chassis. The printed circuit panel is shown on the left in this view.*

Right: *Diagram of the on/off and waveband switch unit drawn as seen from the point of view indicated by the arrow in our front view illustration.*



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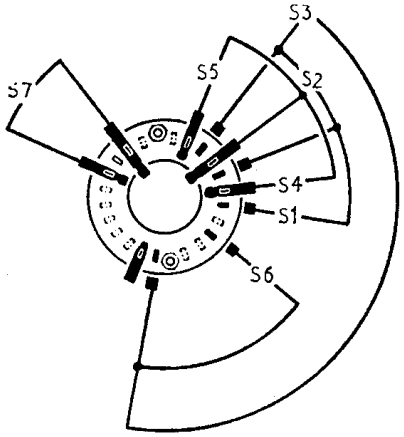
"TRADER" SERVICE SHEET
1602

ROBERTS R200

Second and Third Main Versions

THERE are now three distinct versions of the Roberts R200 portable radio receiver, all known as model R200. The original one up to serial number 36,546 is covered by *Service Sheet* 1449 whereas the information contained here deals with the two later versions, those with serial numbers from 36,547 to 70,000 and those with serial numbers from 70,001 onwards, plus modifications that have since been made to the original version. The external appearance is the same in all three versions.

Release dates February 1961 *and January* 1962 (70,000 *onwards*).



Switch diagram for the circuit diagram below, as seen from rear of inverted chassis.

TRANSISTOR ANALYSIS

Transistor voltages given in the tables in col. 3 and overleaf in col. 2 were derived from information supplied by the manufacturer. They were measured on an Avometer model 8 with the positive terminal connected to chassis in every case. The receiver was switched to m.w. with no signal input.

MODIFICATIONS TO EARLY RECEIVERS
(Refer to Service Sheet 1449)

Since the issue of the above *Service Sheet* some circuit changes have been made affecting receivers up to serial number 36,546 as follows.

From Serial Number 8,200.—C5 changed to 0.02μF. Waveband switch connections are changed so that **S1** is connected between **C1, C2** and **L2;** and **S2** is connected between **C1, C2** and **L3, C3.** The lower end of **L2, L4** is removed and connected to chassis. The connections to **S5** are modified and in the m.w. position the junction of **L8** and **C8** is switched to the top of **L3** and **C3** by an additional switch. **S3, S4** and **S6** remain unaltered.

From Serial Number 12,962.—TR4 changed to OC81D, **TR5** and **TR6** changed to OC81, **R15** changed to 68Ω, **R18** changed to 330kΩ and **C23** changed to 0.25μF.

From Serial Number 26,705.—Waveband switch changed to a different type and wired according to the diagram in col. 3 overleaf of coil and switch unit.

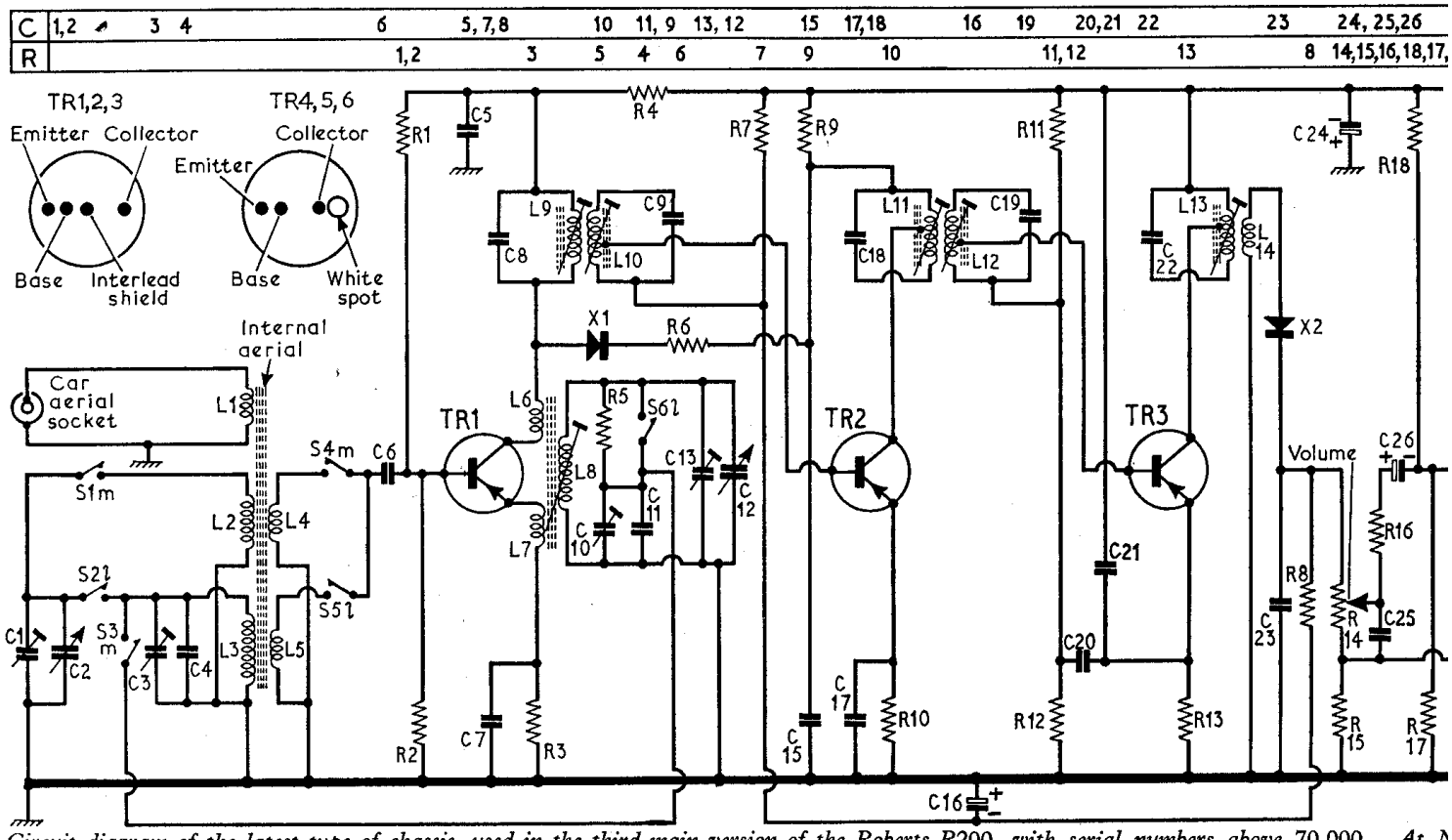
From Serial Number 27,340.—A 5.6Ω resistor inserted between the bottom of **R8, C19** and chassis. **R18** is removed from the junction **R9, C21** and connected to the junction **R8, C19** and 5.6Ω resistor. **R18** changed to 47Ω.

From Serial Number 27,600.—R15 changed back to 82Ω.

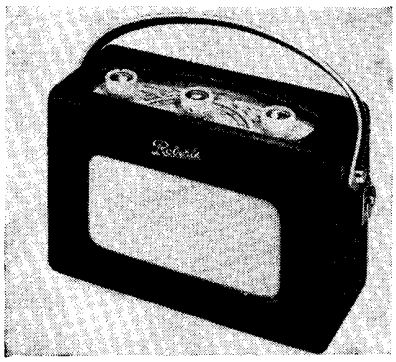
Transistor Table
(Serial Number 70,001 onwards)

Transistor	Emitter (V)	Base (V)	Collector (V)
TR1 AF117	1·0	1·1	6·6*
TR2 AF117	0·56	0·8	4·65*
TR3 AF117	0·9	1·14	6·75*
TR4 OC81D	1·2	1·27	8·4
TR5, TR6 OC81's	—	—	8·75

**Measured at remote end of i.f. primary.*



Circuit diagram of the latest type of chassis, used in the third main version of the Roberts R200, with serial numbers above 70,000. *At N between* **X2, C23,** *and* **R8, R14,** *and at* 90,000 **C4** *was removed from the l.w. aerial c*



Appearance of all three versions.

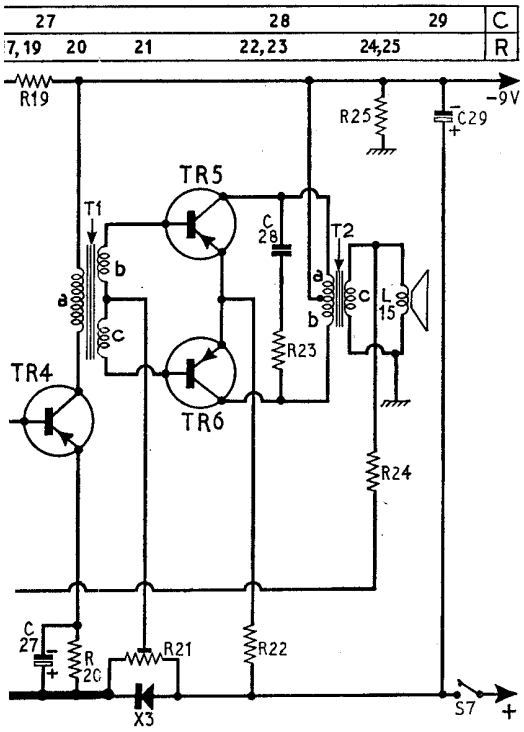
MODIFICATIONS TO LATER RECEIVERS

From Serial Number 85,690.—An additional resistor of 330Ω is inserted between the junction **X2, C23** and the top of the volume control **R14.**

From Serial Number 90,000.—C4 is omitted.

BASE BIAS ADJUSTMENT
(R21 in Serial Number 70,001 Onwards)

Adjustment of this pre-set resistor should not normally be required except after the replacement of **TR5** and **TR6** or **X2(X3).** Insert a 0-10mA meter in the lead from battery negative to **T2** centre tap (positive to **T2**) and adjust **R20 (R21)** for a quiescent output current of 4mA at 20 deg. C. A flex link connecting **T2** c.t. to −9V is provided to facilitate connection of the meter.



No. 85,690 a 330Ω resistor was subsequently inserted coil.

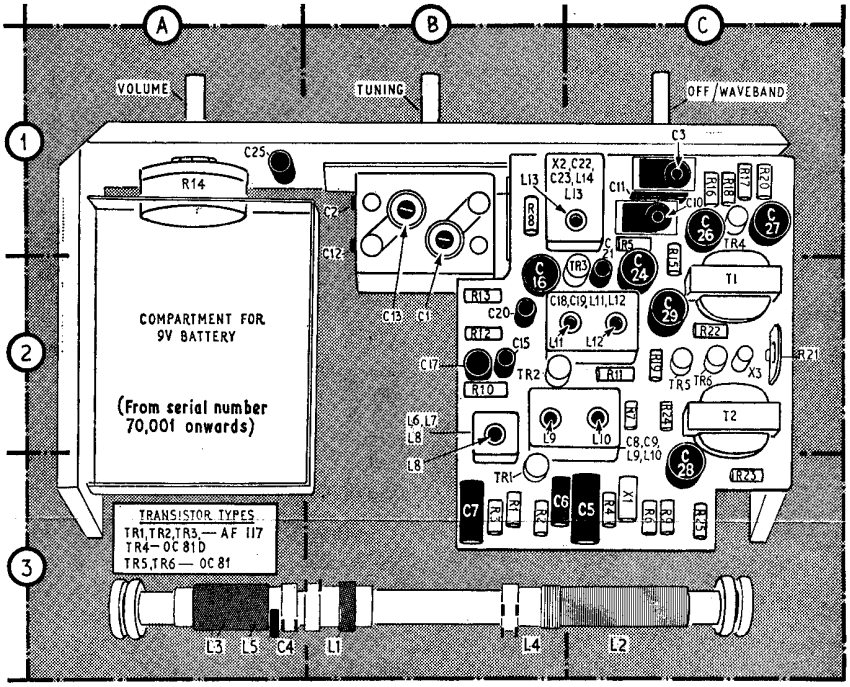
CIRCUIT ALIGNMENT
Serial Numbers Above 70,000

1.—Connect an output meter of 3Ω impedance in place of the loudspeaker or an a.c. voltmeter across the speaker. Connect a signal generator across **L4.** During alignment the input signal should be progressively reduced so that the output does not exceed 20mW (245mV).

2.—Switch receiver to m.w., turn the tuning gang to minimum capacitance and the volume control to maximum output. Feed in a 470kc/s signal modulated 30 per cent at 400c/s and adjust the cores of **L13** (B1), **L12** (C2), **L11** (C2), **L10** (C2) and **L9** (C2) for maximum output.

3.—With the tuning gang at maximum, check that the pointer coincides with the high wavelength end of the tuning scale. Loosely couple the signal generator output to the ferrite rod aerial coils **L1-L5.** Connect an Avometer model 8 switched to its 2.5V range across **R10** (B2) and carry out the operations which follow for minimum

(Continued overleaf col. 1)



Rear view of the vertical chassis of the third main version, with the ferrite rod aerial in its normal position, at the bottom of the assembly. It can be distinguished from the other two by the cut-away corner at bottom right.

Resistors

R1	33kΩ	B3
R2	6·8kΩ	B3
R3	1kΩ	B3
R4	100Ω	C3
R5	330kΩ	C1
R6	560Ω	C3
R7	68kΩ	C2
R8	8·2kΩ	B1
R9	2·2kΩ	C3
R10	560Ω	B2
R11	22kΩ	C2
R12	4·7kΩ	B2
R13	1kΩ	B2
R14	5kΩ	A1
R15	5·6Ω	C2
R16	4·7kΩ	C1
R17	8·2kΩ	C1
R18	33kΩ	C1
R19	560Ω	C2
R20	560Ω	C1
R21	100Ω	C2
R22	5·6Ω	C2
R23	100Ω	C3
R24	47Ω	C2
R25	4·7kΩ	C3

Capacitors

C1	—	B2
C2	—	B1
C3	—	C1
C4	20pF	A3
C5	0·04μF	C3
C6	0·01μF	B3
C7	0·02μF	B3
C8	560pF	C2
C9	560pF	C2
C10	—	C1
C11	—	C1
C12	—	B1
C13	—	B2
C14	—	†
C15	0·04μF	B
C16	10μF	B
C17	0·1μF	A
C18	270pF	
C19	270pF	
C20	0·02μF	
C21	0·02μF	
C22	250pF	
C23	0·01μF	
C24	100μF	
C25	0·02	
C26		
C27	10	
C28	0·	
C29		

Coils

L1		
L2		
L3		A2
L4	—	B3
L5	—	A3
L6	—	B2
L7	—	B2
L8	—	B2
L9	—	C2
L10	—	C2
L11	—	C2
L12	—	C2
L13	—	B1
L14	—	B1
L15	—	—

sformers

T1	a	200·0	C2
	b	30·0	
	c	30·0	
T2	a	2·5	C2
	b	2·5	
	c	—	

Miscellaneous

S1-S7	—	
X1	OA79	C3
X2	OA90	B1
X3	OC78§	C2

**Approximate d.c. resistance in ohms.*
§With collector and base s/c.
†No component.

Circuit Alignment—*continued*

reading on the meter. Remove 3Ω meter.

4.—Switch receiver to m.w. and tune to 517m. Feed in a 580kc/s signal and adjust **L8** (B2) and **L2** (C3).

5.—Tune receiver to 222m, feed in a 1,350kc/s signal and adjust **C12** (B1) and **C1** (B2).

6.—Repeat operations 4 and 5.

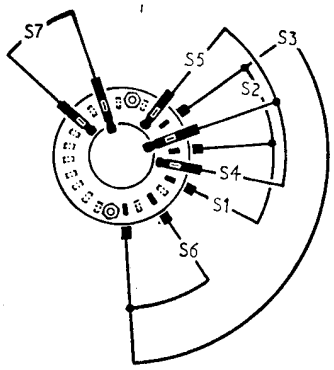
7.—Switch receiver to l.w. and set the pointer at 222. Feed in a 245kc/s signal and adjust **C10** (C1) and **C3** (C1).

8.—Set the pointer at 517, feed in a 155kc/s signal and adjust **L3** (A3).

9.—Repeat operation 7.

10.—Switch receiver to m.w. and tune to 517m. Feed in a 580kc/s signal and adjust **L2** (C3).

11.—Repeat operations 5 and 8.



Switch unit diagram associated with the circuit diagram below, drawn as seen from the bottom of an inverted chassis, looking over the printed circuit panel.

Transistor Table
(Serial Number 36,547-70,000)

Transistor	Emitter (V)	Base (V)	Collect (V)
TR1 OC44	1·5	1·4	7·4*
TR2 OC45	0·5	0·6	7·4*
TR3 OC45	0·9	1·0	7·4*
TR4 OC81D	1·0	1·2	8·8
TR5, TR6 OC81's	—	—	—

**Measured at remote end of i.f. primary.*

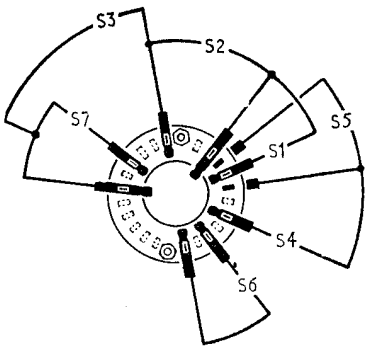
Serial Numbers between 36,547 and 70,000

1.—Connect an output meter of 3Ω impedance in place of the speaker, or an a.c. voltmeter across the speaker. Connect a signal generator, between chassis and the junction of **S4, S5** and **C4**. The generator output should be maintained as low as possible at all times during the alignment operations to prevent a.g.c. action from masking the adjustment peaks.

2.—Switch the receiver to m.w., turn the tuning gang to minimum capacitance and the volume control fully clockwise. Feed in a modulated 470kc/s signal and adjust the cores of **L13** (E5), **L11** (F5) and **L9** (F5) for maximum output. Repeat these adjustments until no further improvement can be obtained.

3.—Turn the tuning gang to maximum capacitance and check that the pointer coincides with the high wavelength ends of the tuning scales.

4.—Loosely couple the signal generator output to the ferrite rod aerial coils **L1-L5**. Tune the receiver to 500m. Feed in a 600kc/s signal and adjust the core of **L7** (F6) for maximum output. Then slide the former of **L1** (D6) along the ferrite rod for maximum output.



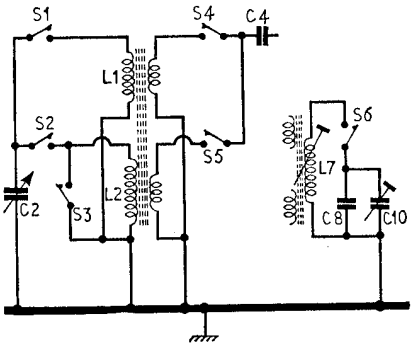
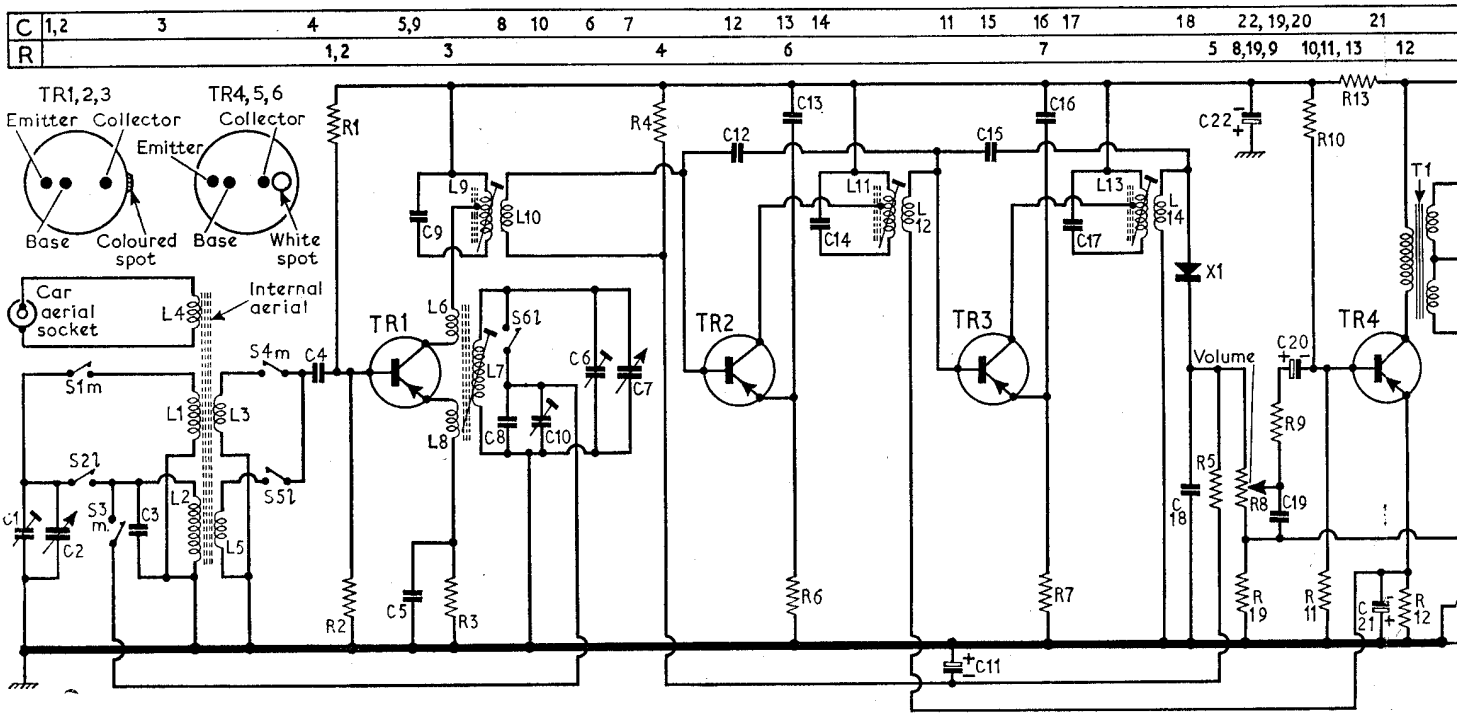


Diagram of modified switch unit (above) in the later production of first version, introduced at serial number 26,705. Changes to the tuning coils are shown below it, with switch numbers that agree with the diagram above. These are different from the numbers used in Service Sheet 1449.



Circuit diagram of the second main version, starting at serial number 36,547 and continuing up to number 70,000. This version comprises the original one of Service Sheet 1449 and all the modifications to it described overleaf, with certain other additions.

5.—Tune 214m calibration mark. Feed in a 1,400kc/s signal and adjust **C6** (E4) and **C1** (E5) for maximum output.

6.—Repeat operation 4 for maximum output, then repeat operations 4 and 5 for optimum response.

7.—Switch the receiver to l.w. and tune it to 425m. Feed in a 185kc/s signal and adjust **C10** (F4) for maximum output. Then slide the former of **L2** (D6) along the ferrite rod for maximum output.

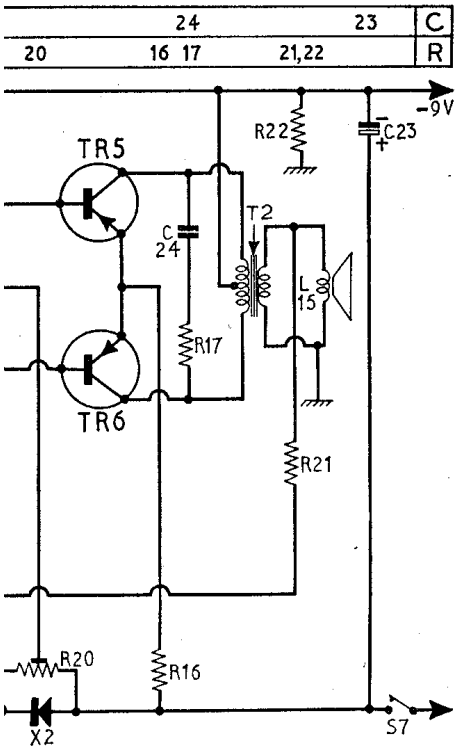
GENERAL NOTES

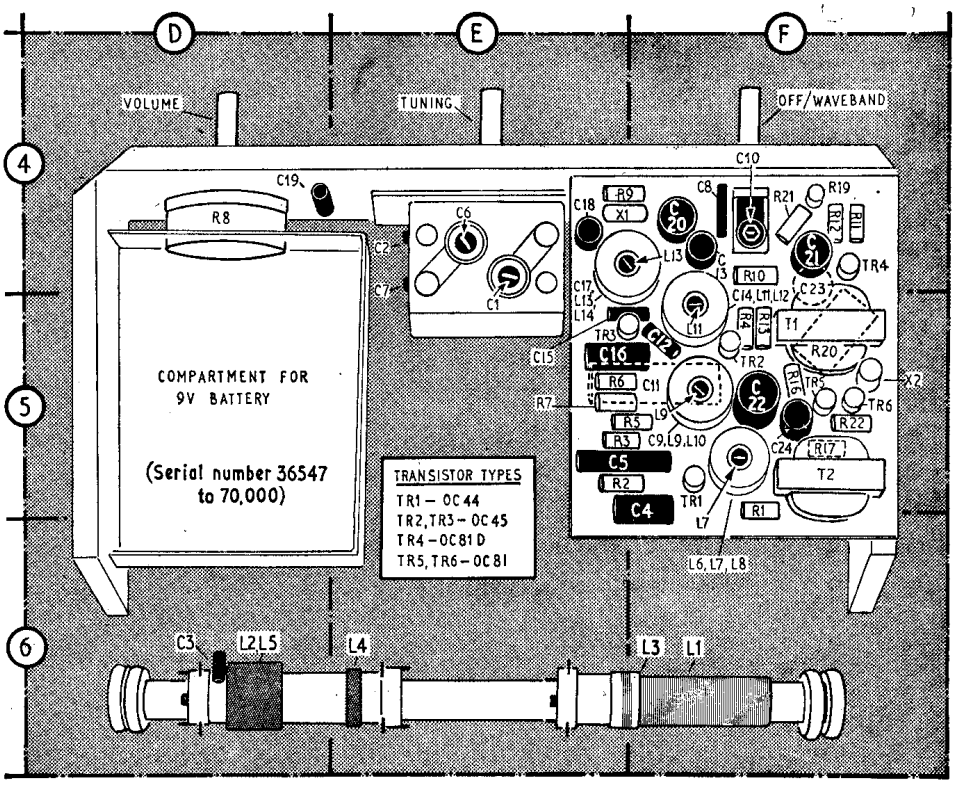
Battery.—The battery recommended by the manufacturer is an Ever Ready PP9, rated at 9V.

TR5, TR6.—In the event of the replacement of transistors **TR5** or **TR6,** whether they are OC78's or OC81's, being necessary, *both* transistors must be replaced with a matched pair.

Removing Chassis.—Remove the control knobs (recessed grub screws). Lay the receiver face down and remove the screws which secure the two wooden wedges to the inside of the cabinet, one below each end of the chassis. Ensure that the tuning gang is turned to maximum capacitance to prevent the possibility of the vanes fouling the speaker magnet on withdrawal. Ease the tuning scale and panel from the recess in the top of the case and withdraw the chassis to the limit of the speaker and external aerial socket leads.

Switches.—S1-S7 (**S1-S6** in the case of serial numbers 26,705-36,546) are the waveband and on/off switches which are ganged in a rotary unit secured to the ~~chassis~~ frame. Our illustrations of the switch contacts are drawn as seen when viewed from below looking over the foil side of the chassis.





Rear view of the vertical chassis of the second main version, seen in the same position as those of the two other versions. Its range of serial numbers is shown against the background of the battery compartment.

Resistors

R1	33kΩ	F5
R2	8·2kΩ	E5
R3	3·9kΩ	E5
R4	82kΩ	F5
R5	8·2kΩ	E5
R6	560Ω	E5
R7	1kΩ	E5
R8	5kΩ	D4
R9	3·9kΩ	E4
R10	33kΩ	F4
R11	8·2kΩ	F4
R12	560Ω	F4
R13	560Ω	F5
R14	—	†
R15	—	†
R16	5·6Ω	F5
R17	100Ω	F5
R18	—	†
R19	5·6Ω	F4
R20	100Ω	F5
R21	47Ω	F4
R22	3·9kΩ	F5

Capacitors

C1	30pF	E5
C2	196pF	E4
C3	40pF	D6
C4	0·04μF	F5
C5	0·02μF	E5
C6	30pF	E4
C7	110pF	E4
C8	160pF	F4
C9	250pF	F5
C10	110pF	F4
C11	10μF	F5
C12	58pF	F5
C13	0·1μF	F4
C14	250pF	F5
C15	18pF	E5
C16	0·04μF	E5
C17	250pF	E5
C18	0·02μF	E4
C19	0·02μF	D4
C20	2μF	F4
C21	100μF	F4
C22	100μF	F5
C23	50μF	F4
C24	0·25μF	F5

Coils & Transformers

L1	—	F6
L2	—	D6
L3	—	F6
L4	—	E6
L5	—	D6
L6	—	F6
L7	—	F6
L8	—	F6
L9	—	F5
L10	—	F5
L11	—	F5
L12	—	F5
L13	—	E5
L14	—	E5
L15	—	—
T1	—	F5
T2	—	F5

Miscellaneous

S1-S7	—	
X1	OA70	E4
X2	OA81*	F5

**Or OC78 with collector and base short-circuited.*
†No component.

The component numbers in this service sheet correspond with those used in the receiver manufacturer's service manual.

ADDITIONAL NOTES

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